

## KHNPDCDRAIsPEm Resource

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**Sent:** Thursday, June 18, 2015 10:01 AM  
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**Subject:** APR1400 Design Certification Application RAI 38-7878 (07.05 - Information Systems Important to Safety)  
**Attachments:** APR1400 DC RAI 38 ICE1 7878.pdf; image001.jpg

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. However, KHNP requests, and we grant, 45 days to respond to questions 07.05-2 and 07.05-3, and 90 days to respond to question 07.05-1. We may adjust the schedule accordingly.

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

Thank you,

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## REQUEST FOR ADDITIONAL INFORMATION 38-7878

Issue Date: 06/18/2015

Application Title: APR1400 Design Certification Review – 52-046

Operating Company: Korea Hydro & Nuclear Power Co. Ltd.

Docket No. 52-046

Review Section: 07.05 - Information Systems Important to Safety

Application Section:

### QUESTIONS

07.05-1

APR1400 FSAR Tier 2, Section 7.5.1.1 does not provide the basis or analysis for the selection of the accident monitoring instrumentation (AMI) variables.

10 CFR Part 50, Appendix A, General Design Criteria 13, "Instrumentation and Controls," requires, in part, instrumentation to be provided to monitor variables and systems over their anticipated ranges for normal operation, anticipated operational occurrences, and accident conditions. APR1400 FSAR Tier 2, Table 7.5-1, "Accident Monitoring Instrumentation Variables," identifies a list of AMI variables and states that the design conforms to RG 1.97, Revision 4, in APR1400 FSAR Tier 2, Section 7.5.1.1. However, the applicant did not clearly demonstrate how they conform with RG 1.97, Revision 4, for each variable, including the analysis or basis for the variable. Provide the basis for the AMI variable selection in accordance with RG 1.97, Revision 4. If alternative criteria to RG 1.97, Revision 4 are used, identify that criteria and the justification for why it provides a comparable level of safety to the guidance in RG 1.97, Revision 4.

07.05-2

Clarify why the APR1400 has no Type A variables when there are manual actions described in FSAR Tier 2, Chapter 15 (e.g., manual actions for a steam generator tube rupture).

10 CFR Part 50, Appendix A, General Design Criteria 13, "Instrumentation and Controls," requires, in part, instrumentation to be provided to monitor variables and systems over their anticipated ranges for normal operation, anticipated operational occurrences, and accident conditions. Staff regulatory guidance RG 1.97, Rev. 4 endorses IEEE 497-2002. IEEE 497-2002, Section 4.1, states "Type A variables are those variables that provide the primary information required to permit the control room operating staff to:

a) Take specific planned manually-controlled actions for which no automatic control is provided and that are required for safety systems to perform their safety-related functions as assumed in the plant Accident Analysis Licensing Basis.

b) Take specific planned manually-controlled actions for which no automatic control is provided and that are required to mitigate the consequences of an AOO.

Type A variables provide information essential for the direct accomplishment of specific safety-related functions that require manual action. These variables are a subset of those necessary to implement the plant specific emergency procedure guidelines (EPGs) or the plant specific emergency operating procedures (EOPs) or the plant abnormal operating procedures (AOPs)."

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Specifically, Section 15.6.3.1.1, states "After a reactor trip, the operator begins to cool down the hot leg temperature using the turbine bypass valves to the saturation temperature corresponding to the main steam safety valve (MSSV) opening setpoint. The operator then cools the nuclear steam supply system (NSSS) to shutdown cooling entry conditions using the unaffected SG after isolating the affected SG or verifying that it is isolated. The analysis conservatively assumes that operator action is delayed until 30 minutes after initiation of the event." Therefore, it appears to the staff that manual actions are credited in the plant safety analysis to address a steam generator tube rupture, but there are no Type A variables to support such manual actions within the AMI variable list. Clarify why the APR1400 has no Type A variables, when there are manual actions described in APR1400 FSAR Tier 2, Chapter 15.

07.05-3

Clarify the classification of bypassed and inoperable status indication (BISI); whether it is safety-related or non-safety-related.

10 CFR 50.55a(h)(3) requires compliance to IEEE Std 603-1991. Clause 5.6.3.1(1) of IEEE Std 603-1991 specifies, in part, that interconnected equipment that is used for both safety and nonsafety functions shall be classified as part of the safety systems. RG 1.47 states the following:

"If the bypass and inoperable status indication is part of the safety systems, then the single-failure criterion of IEEE Std 603-1991, Section 5.1, would apply to the indication system."

"In addition to meeting the single-failure criterion, if the bypass and inoperable status indication is part of the safety systems, then maintaining independence between redundant portions of the safety system is essential to the effective use of the single-failure criterion."

"If a bypass and inoperable status indication is part of the safety systems, the equipment qualification criterion of IEEE Std 603-1991, Section 5.4, would apply to the indication system."

APR1400 FSAR, Tier 2, Section 7.5.1, states that BISI is one of the systems that is used in "(1) assessing plant conditions and safety system performance, (2) making decisions related to plant responses to abnormal events, and (3) taking preplanned manual operator actions related to accident mitigation." FSAR Tier 2, Section 7.5.1.3, does not specifically state if the BISI fully complies with RG 1.47 or just partially. Revise the APR1400 FSAR to clarify the safety classification of BISI and demonstrate how BISI conforms to RG 1.47. Identify all signal paths in and out of BISI to safety and non safety systems.

In addition, APR1400 FSAR, Tier 2, Section 7.5.1.3, states "The trip logic is converted from a 2-out-of-4 to a 2-out-of-3 logic for the parameters being bypassed, while maintaining a coincidence of two for actuation." Describe how the trip logic is converted from a 2-out-of-4 to a 2-out-of-3 logic for the parameters being bypassed, while maintaining a coincidence of two for actuation.

