

KHNPDCRAIsPEm Resource

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Sent: Tuesday, June 23, 2015 7:39 AM
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Subject: APR1400 Design Certification Application RAI 44-7877 (07.04 - Safe Shutdown Systems)
Attachments: APR1400 DC RAI 44 ICE1 7877.pdf; image001.jpg

KHNP

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

Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 44-7877

Issue Date: 06/23/2015
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 07.04 - Safe Shutdown Systems
Application Section:

QUESTIONS

07.04-1

Demonstrate how the transfer of control functions from the main control room (MCR) to the remote shutdown room (RSR) operates independently. Describe how the hardware transfer switches that trigger software switches within the software portion of the design shown in APR1400 FSAR, Tier 2, Figures 7.4-1, 7.4-2, and 7.4-3, maintain independence.

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 19, "Control room," and NUREG-0800, SRP Section 7.4, require, in part, that equipment at appropriate locations outside the control room shall be provided and should be capable of operating independently of (i.e., without interaction with) the equipment in the main control room. According to APR1400 FSAR, Tier 2, Figures 7.4-1, 7.4-2, and 7.4-3, the hardware transfer switches provide input to trigger software switches within the software portion of the design. It is not apparent from the design as to how the transfer of control functions from the MCR to the RSR operates independently. Revise APR1400 FSAR, Tier 2, Figure 7.1-1, and other supporting figures, to reflect the transfer switches located at the maintenance and test panel (MTP) and RSR, the fiber optic cable, and the connection to which components within the safety-related I&C system.

07.04-2

APR1400 FSAR, Tier 2, Section 7.4.1.l, describes how the use fiber optic cables for the MCR/RSR master transfer switches provides the isolation between the Engineered Safety Features - Component Control System (ESF-CCS) divisions and the Process-Component Control System (P-CCS). However, as shown in APR1400 FSAR, Tier 2, Figures 7.4-1 and 7.4-2, the isolation occurs in software switches within the ESF-CCF and the P-CCS.

10 CFR Part 50, Appendix A, GDC 24, "Separation of Protection and Control Systems" requires in part, the protection system be separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system as well as assuring that interconnection of the protection and control systems is limited to assure that safety is not significantly impaired. APR1400 FSAR, Tier 2, Figures 7.4-1 and 7.4-2 reflect both MCR/RSR Master Transfer Switches triggering the MCR/RSR Master Transfer Logic and does not provide any isolation between ESF-CCF and P-CCS divisions. Clarify the design descriptions for interconnections involving the MCR/RSR Master Transfer Switches.

REQUEST FOR ADDITIONAL INFORMATION 44-7877

07.04-3

Clarify whether equipment in the RSR is fully operational after the transfer of control has taken place.

10 CFR Part 50 Appendix A, GDC 19, "Control room," requires in part that equipment at appropriate locations outside the control room shall be provided and should be capable of operating independently of (i.e., without interaction with) the equipment in the main control room. Digital instrumentation must respond quickly enough so that the behavior of variables can be ascertained by operators. The staff was not able to find in the application whether the equipment in the RSR needed to be booted up, or it was already in an operational condition when a transfer of control is made from the MCR. Describe the readiness condition of the RSR equipment and any prerequisites to its readiness. Revise the FSAR and other documentation as necessary.

07.04-4

Clarify how signals from ESF-CCS Software Control Module (ESCM) in both the MCR and RSR are transferred via the MCR/RSR Master Transfer Switches.

10 CFR Part 50, Appendix A, GDC 19, "Control room," requires in part that equipment at appropriate locations outside the control room shall be provided and should be capable of operating independently of (i.e., without interaction with) the equipment in the main control room. APR1400 FSAR, Tier 2, Section 7.4.1.l, states "all signals from the MCR are disabled and signals from the RSR are enabled. This includes signals from the ESCM and signals interfaced via the control panel multiplexers (CPMs)." The staff found in APR1400 FSAR, Tier 2, Figure 7.1-1, that signals from the ESCMs (located in safety console (SC), MCR, and RSR) input into the Safety System Networks, whereas, signals from the CPMs (located in SC and RSR) have serial data links into the ESF-CCF GC. It is unclear as to how the Safety System Networks signals are transferred to the RSR using the MCR/RSR Master Transfer Switches. Clarify how signals from the ESCMs (SC, MCR, and RSR) are transferred via the MCR/RSR Master Transfer Switches.

07.04-5

Clarify what control signals are being transferred in ITAAC Item 8 of APR1400 FSAR, Tier 1, Tables 2.5.1-5 and 2.5.4-4.

10 CFR 52.47(b)(1), requires that a DC application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations. Item 8 of APR1400 FSAR, Tier 1, Table 2.5.1-5, describes each PPS division being controlled from either the MCR or the RSR as selected from the master transfer switches and Item 8 of Table 2.5.4-4, describes each ESF-CCS division is controlled by the transfer switches. However, APR1400 FSAR, Tier 2, Figure 7.4-1 only shows signals from the ESF-CCF going through the transfer switch, not the PPS. Identify the APR1400 FSAR, Tier 2, sections that describe the signals being transferred by the the Master Transfer Switches as they relate to the ITAAC described in Item 8 of APR1400 FSAR Tier 1, Tables 2.5.1-5 and 2.5.4-4.

REQUEST FOR ADDITIONAL INFORMATION 44-7877

07.04-6

Clarify what control signals are transferred for the PCS and P-CCS as described in ITAAC Item 3 of APR1400 FSAR, Tier 1, Table 2.5.5-2. Also, describe how those signals are controlled in the RSR (what components).

10 CFR 52.47(b)(1) requires that a design certification application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations. APR1400 FSAR, Tier 2, Section 7.4 does not describe what signals from the PCS and P-CSS are transferred, and APR1400 FSAR, Tier 2, Figure 7.1-1, does not show any interface of the PCS and P-CSS except via the Non-Safety Network. Additionally, APR1400 FSAR, Tier 2, Figure 7.1-1, and Section 7.4, do not identify the component(s) that control the PCS and P-CSS signals in the RSR.

