
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.: 348-8279
SRP Section: 07.09 – Data Communication Systems
Application Section:
Date of RAI Issue: 12/24/2015

Question No. 07.09-9

Describe the interconnections between Division A/B and C/D for shutdown cooling pump start on CS pump trouble and demonstrate the functional dependency will not challenge the independence between the divisions.

10 CFR 50.55a(h) requires compliance to IEEE Std 603-1991. IEEE Std 603-1991, Clause 5.6.1, states, in part, "Redundant portions of a safety system provided for a safety function shall be independent of and physically separated from each other to the degree necessary to retain the capability to accomplish the safety function during and following any design basis event requiring that safety function," and Clause 5.6.3, states, in part, "The safety system design shall be such that credible failures in and consequential actions by other systems, as documented in 4.8 of the design basis, shall not prevent the safety systems from meeting the requirements of this standard." Digital I&C Interim Staff Guidance (DI&C-ISG)-04 provides acceptance criteria for communication and functional independence between redundant divisions of safety for meeting the independence requirements of IEEE Std 603-1991, Clause 5.6. The containment spray actuation signal (CSAS) is used to actuate the containment spray system (CSS). The logic diagram for CSAS is provided in APR1400 FSAR Tier 2, Figure 7.3-5, and it shows four divisions. However, there are only two containment spray pumps. Staff requests the applicant to describe the control logic for the two spray pumps, to describe the interconnections between Division A/B and C/D for shutdown cooling pump start on CS pump trouble, and to demonstrate that the functional dependency will not challenge the independence between the divisions.

Response

The containment spray function is primarily achieved by two redundant and independent containment spray pumps (CSPs) of divisions C and D. Each CSP has 100% capacity of the containment spray function.

The shutdown cooling pumps (SCPs) are designed to backup the CSPs' function when the CSPs are not available. Each SCP has 100% capacity of the containment spray function. The inoperable signal of the CSP in division C is used for actuation of the SCP in division A

when a safety injection actuation signal (SIAS) or a containment spray actuation signal (CSAS) is present. Likewise, the inoperable signal of the CSP in division D is used for actuation of the SCP in division B. These cross-connect signals between electrical divisions are done using class 1E qualified electrical isolation devices which achieve the required electrical isolation and physical separation, as described in RG 1.75 and IEEE Std. 384.

A spurious inoperable signal from the CSP in division C cannot result in spurious actuation of the SCP in division B, because actuation of the SCP in division B is dependent upon an inoperable signal of the CSP in division D when a SIAS or CSAS is present.

Therefore, the functional dependency between CSPs and SCPs does not challenge the independence between divisions.

Impact on DCD

There is no impact on the DCD.

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 any Technical, Topical, or Environmental Report.