

SUPPLEMENTAL 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.: 45-7883
SRP Section: 07.09 – Data Communication System
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Question No. 07.09-6

Provide summary of how communication independence requirements are met between redundant portions of the safety system.

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.” RG 1.75 provides guidance on the physical separation requirements of IEEE Std. 603-1991, Clause 5.6. BTP 7-11 provides guidance on application and qualification of isolation devices to meet the electrical isolation requirements of IEEE Std. 603-1991 Clause 5.6. DI&C-ISG-04 provides guidance for meeting the communications independence requirements of IEEE Std. 603-1991, Clause 5.6.

APR1400 FSAR, Tier 2, Section 7.2.2.3, "Independence" states, “Independence between redundant portions of the safety system. The routing of Class 1E and associated cabling and sensing lines from sensors meets the guidance of NRC RG 1.75 (Reference 7) and NRC RG 1.151 (Reference 8). The cablings for the four safety divisions are routed separately. The PPS divisions receive ac power from the vital bus power supply system. The PPS does not share the power between divisions.” This section of the FSAR does not discuss how data communication independence between redundant portions of the Plant Protection System (PPS) is achieved to meet the requirements of IEEE Std. 603-1991, Clause 5.6.1. Provide either a summary of how communications independence requirements are met or reference the particular section of the Safety I&C System Technical Report where data communication independence between redundant portions of the safety system is being analyzed.

Response

Section 4.6 of the Safety I&C System Technical Report describes the data communication system, and subsection 4.6.2.1 describes the interdivisional serial data links used for data communication between safety portions of the plant protection system (PPS) in particular. This subsection states that both the bistable processor (BP) and local coincidence logic (LCL) processor include a communication processor as shown in Figure 4-19 of the Safety I&C System Technical Report. The data flow between redundant PPS divisions is buffered at the outgoing side of the communication processor of the BP and at the incoming side of the communication processor of the LCL processor to ensure independence of the redundant safety divisions. One way communication over fiber optic cable is used to ensure communication independence and electrical isolation between redundant portions of the safety system.

Further discussion regarding compliance of interdivisional communication between redundant portions of the safety system is provided in C.5.1 of the Safety I&C System Technical Report.

Supplemental Response

Subsection 4.6.2.1, "Interdivisional Serial Data Links" of the Safety I&C System technical report describes the interdivisional serial data links used for data communication between safety portions of the plant protection system (PPS) in particular. This information will be added to Section 7.2.2.3, "Independence" of DCD Tier 2.

Impact on DCD

Section 7.2.2.3 of DCD Tier 2 will be revised as indicated in 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 any Technical, Topical or Environmental Reports.

APR1400 DCD TIER 2**7.2.2.3 Independence**

Insert the descriptions on the next page.

- a. Independence between redundant portions of the safety system

The routing of Class 1E and associated cabling and sensing lines from sensors meets the guidance of NRC RG 1.75 (Reference 7) and NRC RG 1.151 (Reference 8). The cablings for the four safety divisions are routed separately.

The PPS divisions receive ac power from the vital bus power supply system. The PPS does not share the power between divisions.

- b. Independence between safety systems and effects of design basis events

Independence between the components of the RPS and the effects of design basis event is provided by qualifying the equipment in accordance with the requirements in Subsections 7.2.2.2 and 7.2.2.8.

- c. Independence between safety systems and non-safety systems

The PPS and non-safety systems are isolated using qualified isolation devices or fiber-optic cables so that any failure in a non-safety system does not cause loss of the safety system function. The PPS signals transmitted to the IPS/QIAS-N are isolated using fiber-optic cable.

Data flow is unidirectional from Class 1E systems to non-Class 1E systems.

7.2.2.4 Diversity and Defense-in-Depth

The diversity and defense-in-depth analysis is described in Reference 3. The diversity features of the PPS are described in Subsection 7.2.1.9.

7.2.2.5 System Testing and Inoperable Surveillance

The system integrity is confirmed through self-diagnostics and surveillance testing. Testing features are provided for RPS testing during power operation or shutdown.

The RPS testing covers the trip path from the sensor input to the RTSG, as shown in Figure 7.2-11. The system test does not affect the protective functions. The testing system meets

Both BP and LCL processors within the PPS include a communication processor, separate from the function processor.

The data flow between redundant PPS divisions is buffered at the outgoing side of the communication processor of the BP and at the incoming side of the communication processor of the LCL processor to ensure independence of the redundant safety divisions.

One way communication over fiber optic cable is used to ensure communication independence and electrical isolation between redundant portions of the safety system.