

## REVISED 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.: 317-8271

SRP Section: 14.03.05 – Instrumentation and Controls – Inspections, Tests, Analyses, and Acceptance Criteria

Application Section: 14.03.05

Date of RAI Issue: 11/17/2015

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### **Question No. 14.03.05-17**

Modify APR1400 FSAR Tier 1, Table 2.5.1-5, "Reactor Trip System and Engineered Safety Features Initiation ITAAC," Items 3.b.ii and 3.b.iii to clarify that qualified isolation devices used between interfaces of redundant Class 1E divisions and between safety and non-safety interfaces are Class 1E as required by IEEE Std. 603-1991, Clause 5.6. In addition, amend the inspection, test, and analysis (ITA) and the corresponding acceptance criterion to verify that Class 1E qualified isolation devices exist between redundant portions of safety systems and between safety and non-safety systems.

10 CFR 50.55a(h)(3) states, in part, that an application filed on or after May 13, 1999, for design certifications must meet the requirements for safety systems in IEEE Std. 603-1991 and the correction sheet dated January 30, 1995. IEEE Std. 603-1991, Clause 5.6.1, requires redundant portions of safety systems provided for a safety function 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. IEEE Std. 603-1991, Clause 5.6.3, requires the safety system design to be such that credible failures in and consequential actions by other systems, as documented in Clause 4.8 of the design basis, shall not prevent the safety systems from meeting the requirements of this standard. IEEE Std. 603-1991, Clause 5.6.3.1, states, in part, "isolation devices used to effect a safety system boundary shall be classified as part of the safety system."

APR1400, FSAR, Tier 1, Section 2.5.1.1, "Design Description," Item 3.a and the associated ITAAC state "Class 1E equipment identified in Table 2.5.1-1, "Reactor Trip System and Engineered Safety Features Initiation Equipment Location and Classification," is powered from its respective Class 1E train." FSAR, Tier 1, Section 2.5.1.1, Item 3.b states "Redundant Class 1E divisions listed in Table 2.5.1-1 and associated field equipment are physically separated and electrically independent from each other and physically separated and

electrically independent from non-Class 1E equipment.” The associated acceptance criterion in FSAR Tier 1, Table 2.5.1-5, Item 3.b.ii states, “A report exists and concludes that independence of as-built redundant Class 1E divisions listed in Table 2.5.1-1 and associated field equipment is achieved by independent power sources and electrical circuits for each division, and by fiber optic cable interfaces, qualified isolation devices at interfaces between redundant divisions, and at interfaces between safety and non-safety systems.” The acceptance criterion for Item 3.b.iii states, “A report exists and concludes that the electrical isolation devices prevent credible faults from propagating into a safety system division.”

The staff finds that additional information is needed to clarify whether the qualified isolation devices at interfaces between redundant safety divisions and at interfaces between safety and non-safety systems are Class 1E. In addition, it is not clear that an inspection will be performed as part of this ITAAC to verify that Class 1E qualified isolation devices exist between redundant portions of safety systems and between safety and non-safety systems. As such, the staff requests the applicant to modify the FSAR Tier 1, Table 2.5.1-5, Items 3.b.ii and 3.b.iii to clarify that these qualified isolation devices are Class 1E as required by IEEE Std. 603-1991, Clause 5.6, and to amend the ITA and acceptance criterion to verify that Class 1E qualified isolation devices exist between redundant portions of safety systems and between safety and non-safety systems.

## **Response**

The design description Item 3.b of Section 2.5.1.1 in DCD Tier 1 provides the design commitment for physical separation and electrical isolation between redundant portions of the safety systems and between safety and non-safety systems. The isolation devices used to achieve the electrical isolation are Class 1E qualified isolation devices.

The Acceptance Criteria for Items 3.b.ii and 3.b.iii in DCD Tier 1 Table 2.5.1-5 will be modified to clarify that the qualified isolation devices that pertain to the item are Class 1E.

## **Supplemental Response – (Rev. 1)**

The design description of Item 3.b) of DCD Tier 1 Section 2.5.1.1 will be supplemented to add to the physical isolation of electrical divisions the inclusion of Class 1E qualified isolation devices such as fiber optic modems or interposing relays which are applied at interfaces between redundant safety divisions and at interfaces between safety and non-safety systems.

Accordingly, the inspection and its acceptance criteria will be added as Item 3.b.ii), in the associated Tier 1 Table 2.5.1-5 ITAAC resulting in the original Items 3.b.ii) and 3.b.iii) being renumbered to Items 3.b.iii) and 3.b.iv), respectively.

Also, the “Inspections, Tests, Analyses” column for Items 3.b.i) and 3.b.iii) in Table 2.5.1-5 will be changed to include the inspection of the physical separation and electrical independence between the safety and non-safety systems.

The acceptance criteria for Item 3.b.ii) in DCD Tier 1 Table 2.5.1-5 will be revised to contain the generic information for verifying the electrical isolation devices.

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**Impact on DCD**

Section 2.5.1.1 and Table 2.5.1-5 of DCD Tier 1 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 Report.

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- 3.a Class 1E equipment identified in Table 2.5.1-1 is powered from its respective Class 1E train.
- 3.b Redundant Class 1E divisions listed in Table 2.5.1-1 and associated field equipment are physically separated and electrically independent from each other and physically separated and electrically independent from non-Class 1E equipment.
- 3.c Communication independence is achieved between redundant divisions of the Class 1E equipment listed in Table 2.5.1-1 or between non-safety systems and the Class 1E equipment listed in Table 2.5.1-1.
- 4.a The PPS provides an automatic reactor trip (RT) and ESF initiation signals, as indicated in Tables 2.5.1-2 and 2.5.1-3, if plant process signals reach predetermined setpoints.
- 4.b Once RT is initiated (automatically or manually), the reactor trip breakers remain open until completion of the protective action, and do not automatically return to normal after the trip condition is reset.
- 4.c Manual reactor trip switches are provided in the MCR and the RSR for reactor trip.
5. The OM in the MCR displays the status information for variables listed in Tables 2.5.1-2 and 2.5.1-3.
6. Each local coincidence logic (LCL) receives trip signals from four channels of bistable processors (BPs) and utilizes a 2-out-of-4 coincidence logic to perform RPS and ESF initiation functions identified in Tables 2.5.1-2 and 2.5.1-3.
- 7.a The PPS provides manual trip bypasses on the MTP switch panel, for RT and ESF initiation identified in Tables 2.5.1-2 and 2.5.1-3, respectively.
- 7.b The PPS automatically removes the operating bypasses listed in Table 2.5.1-4 when permissive conditions are not met.

Class 1E qualified isolation devices such as fiber optic modems or interposing relays are applied at interfaces between redundant safety divisions and at interfaces between safety and non-safety systems.

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Table 2.5.1-5 (2 of 10) Supplemental RAI 317-8271 - Question 14.03.05-17\_Rev.1

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3.a Class 1E equipment identified in Table 2.5.1-1 is powered from its respective Class 1E division.	3.a Tests of the as-built Class 1E equipment will be performed using a simulated test signal.	3.a The Class 1E equipment identified in Table 2.5.1-1 is powered from its respective Class 1E division .
3.b Redundant Class 1E divisions listed in Table 2.5.1-1 and associated field equipment are physically separated and electrically independent from each other and physically separated and electrically independent from non-Class 1E equipment.	3.b.i Inspection for separation of the as-built redundant Class 1E divisions listed in Table 2.5.1-1 and associated field equipment will be performed.	3.b.i The physical separation of as-built redundant Class 1E divisions identified in Table 2.5.1-1 and associated field equipment is provided by distance or barriers in accordance with NRC RG 1.75.
	3.b.ii Analyses, tests or a combination of analyses and tests of the as-built redundant Class 1E divisions listed in Table 2.5.1-1 and associated field equipment will be performed to verify its electrical independence.	3.b.ii A report exists and concludes that independence of as-built redundant Class 1E divisions listed in Table 2.5.1-1 and associated field equipment is achieved by independent power sources and electrical circuits for each division, and by fiber optic cable interfaces, <del>qualified</del> <b>Class 1E qualified</b> isolation devices at interfaces between redundant divisions, and at interfaces between safety and non-safety systems.
	3.b.iii Testing, analysis or combination of testing and analysis will be performed for the electrical isolation devices.	3.b.iii A report exists and concludes that the electrical isolation devices prevent credible faults from propagating into a safety system division.

and between safety and non-safety systems

Class 1E qualified isolation devices such as fiber optic modems or interposing relays are applied at interfaces between redundant safety divisions and at interfaces between safety and non-safety systems.

Class 1E qualified

Class 1E qualified

3.b.ii Inspection for Class 1E qualified isolation devices will be performed at interfaces between redundant safety divisions and at interfaces between safety and non-safety systems.

3.b.ii Electrical isolation devices are ~~confirmed by the LED status of the process module or relay operation at the related interfaces.~~

installed to prevent propagation of faults between redundant safety divisions and interfaces between safety and non-safety systems.