
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.: 522-8633
SRP Section: 07.07 - Control Systems
Application Section: 7.7
Date of RAI Issue: 10/01/2016

Question No. 07.07-18

10 CFR 50.55a(h)(3) requires compliance to IEEE Std. 603-1991. IEEE Std. 603-1991, Clause 5.6.3, states, in part, the safety system design shall be such that credible failure in, and consequential actions by other systems, as documented in Clause 4.8 of the design basis section of this standard, shall not prevent the safety systems from meeting the requirements of this standard. In a response to RAI 356-7881, Question 07-08, the applicant provided technical information with regard to its analysis of postulated common cause failure (CCF) of components with embedded digital devices in Section 4.10 of the Control System CCF Analysis technical report, APR1400-Z-J-NR-14012. The information provided by the applicant was vital in the staff's understanding of the background information used to make analytical conclusions within the report as this information provided clear and concise technical basis for these conclusions. However, in order to make its safety finding, the NRC staff needs more detail added to the technical report than the applicant committed to provide.

The staff requests the following from the applicant:

1. Update Section 4.10 of the Control System CCF Analysis technical report to specifically state the embedded technology used in safety and non-safety applications are diverse from each other, as stated in part one of the applicant's response.
2. Add the table that lists the different types of embedded digital devices and their functions, provided in part one of the applicant's response, to Section 4.10 of the Control System CCF Analysis technical report.
3. Add the explanation regarding Class 1E devices with embedded technology in part 4 of the response to Question 07-08, to Section 4.10 of the Control System CCF Analysis technical report or another suitable area of the licensing documentation. This is essential as this explanation describes the existence of embedded technology in safety applications.

Response

Section 4.10 of technical report APR1400-Z-J-NR-14012-P, Rev. 0, "Control System CCF Analysis" will be revised as indicated in the attachment to specifically state the embedded technology used in safety and non-safety applications are diverse from each other, to add the table that lists the different types of embedded digital devices and their functions, and to add the explanation regarding Class 1E devices with embedded technology that is included in part 4 of the response to RAI 356-7881 Question 07-08.

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

Technical report APR1400-Z-J-NR-14012-NP, Rev. 0, "Control System CCF Analysis," Section 4.10 will be revised, as indicated in the attachment associated with this response.

LIST OF TABLES

Table 4.1-1	Credible Failure Types.....	5
Table 4.5-1	Segregation of Power Source	16
Table 4.5-2	Control Group.....	24
Table 4.7-1	Control Limit and Interlocks on Digital Rod Control System.....	26
Table 4.9-1	Non-safety Control Signals sent from P-CCS to ESF-CCS	35
Table 5.1-1	Shared Signals.....	62
Table 5.1-2	Multiple Failure due to a Single Failure of Shared Signals (1 of 18).....	64
Table 5.1-3	Multiple Failure due to a Single Failure of Shared Signals (2 of 18).....	65
Table 5.1-4	Multiple Failure due to a Single Failure of Shared Signals (3 of 18).....	66
Table 5.1-5	Multiple Failure due to a Single Failure of Shared Signals (4 of 18).....	67
Table 5.1-6	Multiple Failure due to a Single Failure of Shared Signals (5 of 18).....	68
Table 5.1-7	Multiple Failure due to a Single Failure of Shared Signals (6 of 18).....	69
Table 5.1-8	Multiple Failure due to a Single Failure of Shared Signals (7 of 18).....	70
Table 5.1-9	Multiple Failure due to a Single Failure of Shared Signals (8 of 18).....	71
Table 5.1-10	Multiple Failure due to a Single Failure of Shared Signals (9 of 18).....	72
Table 5.1-11	Multiple Failure due to a Single Failure of Shared Signals (10 of 18).....	73
Table 5.1-12	Multiple Failure due to a Single Failure of Shared Signals (11 of 18)	74
Table 5.1-13	Multiple Failure due to a Single Failure of Shared Signals (12 of 18).....	75
Table 5.1-14	Multiple Failure due to a Single Failure of Shared Signals (13 of 18).....	76
Table 5.1-15	Multiple Failure due to a Single Failure of Shared Signals (14 of 18).....	77
Table 5.1-16	Multiple Failure due to a Single Failure of Shared Signals (15 of 18).....	78
Table 5.1-17	Multiple Failure due to a Single Failure of Shared Signals (16 of 18).....	79
Table 5.1-18	Multiple Failure due to a Single Failure of Shared Signals (17 of 18).....	80
Table 5.1-19	Multiple Failure due to a Single Failure of Shared Signals (18 of 18).....	81
Table 5.2-1	Control Group Segmentation.....	82
Table 5.2-2	Multiple Failures of Single Control group (SBCS Main)	85
Table 5.2-3	Multiple Failures of Single Control group (SBCS Permissive).....	86
Table 5.2-4	Multiple Failures of Single Control group (FWCS1)	87
Table 5.2-5	Multiple Failures of Single Control group (FWCS2)	88
Table 5.2-6	Multiple Failures of Single Control group (PPCS).....	89
Table 5.2-7	Multiple Failures of Single Control group (PLCS)	90
Table 5.2-8	Multiple Failures of Single Control group (CVCS).....	91

Table 4.10-1 Embedded Digital Device Types used in Non-Safety Systems

4.10. CCF Analysis of Embedded Devices in Field Equipment

TS

Page intentionally blank