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.: **301-8280**

SRP Section: **07.01 – Instrumentation and Control - Introduction**

Application Section:

Date of RAI Issue: **11/10/2015**

Question No. 07.01-47

Discuss the equipment protective functions for safety-related plant equipment.

10CFR 50.55a(h) requires compliance with IEEE Std 603-1991. Clause 4.11 of IEEE Std. 603-1991requires identification of the equipment protective provisions that prevent the safety systems from accomplishing their safety functions. ITem 11 of Section A.4, "Safety System Designation," of Technical Report APR1400-Z-J-NR-14001 states "there is no equipment protective provisions that prevent the safety systems from accomplishing their safety functions" but did not discuss the equipment protective functions. Typically, nuclear power plant actuators have equipment protective functions, such as overcurrent protection, thermal overload protection, and emergency diesel generator protective features; some of which could cause the equipment to trip even in the presence of a safety actuation signal. Discuss the protective functions for safety-related equipment and describe whether these protective functions could trip/disable the safety-related equipment in the presence of a safety actuation signal or why it could not trip/disable safety-related equipment in the presence of a safety actuation signal.

Response

The plant protection system (PPS) and engineered safety features-component control system (ESF-CCS) consist of redundant channels with independence features. The safety functions are initiated and accomplished by the PPS and ESF-CCS at the system level. Therefore, there is no single failure of an equipment protective device which prevents initiating and accomplishing the safety functions at the system level.

Each component control logic in the ESF-CCS loop controller (LC) detects the conditions of equipment and determines if the equipment can be operated. Examples for the load center circuit are as follows:

1) Circuit breaker not in the operating position, detected by a cell switch that indicates the draw-out circuit breaker position,

2) Loss of trip or closing circuit control power, detected by a control power monitoring circuit,

3) Loss of breaker trip or closing circuit continuity, detected by a coil circuit continuity monitoring circuit

4) Absence of starting circuit permissive interlock signals that normally exist to permit starting of the equipment, when shown on individual control logic,

5) Existence of mechanical protection signal that would block starting of the equipment, when shown on individual control logic,

6) Module disable condition including internal disabled conditions, detected by self-test and error detection by ESF-CCS.

In addition, descriptions of the protective devices for electrical power circuits, such as protection relays, are provided in the following sections of APR1400 DCD Tier 2:

- Section 8.3.1.1.1.1 for large motors,

- Section 8.3.1.1.1.2 for 4.16kV motors,

- Section 8.3.1.1.1.3 for 480V load centers,

As described in DCD Tier 2, Section 8.3.1.1.3.12, protective devices for the Class 1E ac power system are designed with the same non-Class 1E ac power system described in Subsections 8.3.1.1.1.1, 8.3.1.1.1.2, and 8.3.1.1.1.3.

The description of the protective relay trip of the emergency diesel generator (EDG) is described in Section 8.3.1.1.3.3 of APR1400 DCD Tier 2.

The description in Section A.4, Item 11,“Safety System Designation,” of the Safety I&C System Technical Report, APR1400-Z-J-NR-14001-P/NP, Rev. 0, will be revised as indicated in the attachment associated with this response.

Supplemental Response

The ESCM provides component control signals such as start or stop signal for components. The equipment protective logic is implemented in the component control system or electrical panel. Therefore, the component data from IFPD to ESCM are not used to control equipment protective devices.

The supplemental response will be added to Section A.4, Item 11, “Safety System Designation,” of the Safety I&C System Technical Report, APR1400-Z-J-NR-14001-P/NP, Rev. 0.

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

Section A.4, Item 11 of the Safety I&C System Technical Report, APR1400-Z-J-NR-14001-P/NP, will be revised, as indicated in the attachment associated with this response.

The completion of the ESFAS function means from the ESFAS initiation to the generation of the required function.

In this time, plant maintains the following conditions.

Core reactivity maintains the subcritical state with sufficient margin corresponding to TS and, does not exceed thermal design limit of core and reactor coolant system by removing core decay heat at controlled cooling rate.

The vital equipment and system operate within design range for maintaining the above conditions.

The equipment and system for maintaining offsite dose within an acceptable limit are operating appropriately.

10.3 The points in time or the plant conditions that require automatic control of protective actions

The accident analysis in Chapter 15 of the DCD does not consider manual control in the first 30 minutes after accident and the point in time (RPS trip set point (Refer to Table 7.2-4 of the DCD)) for automatic control of protection system is set based on accident analysis results.

The accident analysis in the DCD Chapter 15 does not consider manual control in the first 30 minutes after accident and the point (ESF actuation set point (Refer to Table 7.3-5A of the DCD)) for automatic control of protection system is established based on accident analysis results.

Automatic initiation is required for maintaining item 10.2 condition when reaching setpoint.

Manual control is possible after the 30 minutes according to the EOP based on the plant condition, if required.

10.4 The points in time or the plant conditions that allow returning a safety system to normal

When the plant operates in condition of 10.2 above, returning a safety system to normal is allowed.

11. The equipment protective provisions that prevent the safety systems from accomplishing their safety functions:

~~There is no equipment protective provisions that prevent the safety systems from accomplishing their safety functions.~~

12. Any other special design basis that may be imposed on the system design (example., diversity, interlocks, regulatory agency criteria):

The system is designed to reduce the failure of redundant divisions anticipated by CCF.

Replace with the following page

A.5 Safety System Criteria

Clause 5 states:

The safety systems shall, with precision and reliability, maintain plant parameters within acceptable limits established for each design basis event. The power, instrumentation, and control portions of each safety system shall be comprised of more than one safety group of which any one safety group can accomplish the safety function.

The PPS and ESF-CCS consist of redundant channels with independence features. The safety functions are initiated and accomplished by the PPS and ESF-CCS at the system level. Therefore, there is no single failure of an equipment protective device which prevents initiating and accomplishing the safety functions at the system level.

Each component control logic in the ESF-CCS LC detects the conditions of equipment and determines if the equipment can be operated. Examples for the load center circuit are as follows:

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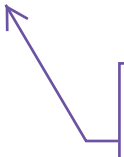
The description of the protective relay trip of the EDG is described in Section 8.3.1.1.3.3 of APR1400 DCD Tier 2.



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