

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.: 295-8263
SRP Section: 16 – Technical Specifications
Application Section: 16.3.3
Date of RAI Issue: 11/05/2015

Question No. 16-114

The proposed ACTIONS Table and SR Table and Table 3.3.6-1 for generic TS 3.3.6 contain the following differences from STS 3.3.6B that do not appear to be justified or self consistent. The applicant is requested to conform to the STS phrasing and provisions, and suggested consistency changes, or justify the difference:

1. Justify not including Mode 4 in the Applicability of generic TS Table 3.3.6-1 Functions 3a, Containment Isolation Actuation Signal (CIAS) Coincidence Logic, and 3b, CIAS Initiation Logic; else add Mode 4 and revise the Required Action Notes for ACTIONS E and F and associated Bases discussions accordingly.
2. The Required Action Notes for ACTIONS E and F should appear above Required Action E.1 and F.1, respectively, and span the width of the Required Action column. (See Writer's Guide Section 5.1.8.) Alternatively, these Notes may be moved to the Condition column to be in line with the Condition letter designator and should span the width of the Condition statement. In addition, neither Note includes Function 2, Containment Spray Actuation Signal, and Function 7, Diverse Manual ESF Actuation Signal (Switch on MCR Safety Console). The applicant is requested to explain this omission, or correct the error. Finally, staff suggest clarifying Conditions E and F to say:
 - E. Required Action and associated Completion Time **of Condition A, B, or C** not met.
 - F. Required Action and associated Completion Time **of Condition A, B, C, or D** not met.
3. The applicant is requested to explain the following concerning the Diverse Manual ESF Actuation Signal Function:
 - a. Why does LCO 3.3.6 not explicitly refer to Diverse Manual ESF Actuation Signal channels,

Functions 7a through 7f? The “LCO” section of the Bases for generic TS 3.3.6 says “This LCO requires two channels of safety injection, containment spray, auxiliary feedwater, and one channel for each main steam isolation valve and one channel for containment isolation to be OPERABLE in MODES 1, 2, 3, and 4.” But LCO 3.3.6 says, “Four channels of ESFAS Coincidence Logic, four channels of ESFAS Initiation Logic, four channels of Actuation Logic, and four channels of Manual Trip shall be OPERABLE for each Function in Table 3.3.6-1.” The applicant is requested to consider revising Table 3.3.6-1 to include a “REQUIRED CHANNELS” column, and to revise LCO 3.3.6 to say: “The ESFAS Coincidence Logic, Initiation Logic, Actuation Logic, Manual Trip, and Diverse Manual ESF Actuation channels required for each Function in Table 3.3.6-1 shall be OPERABLE.”

- b. The last sentence of the Bases for Required Action D.1 needs clarification, and should say: “If the inoperable **Diverse Manual ESF Actuation** channel is not restored to OPERABLE status within 72 hours, it **Condition F** is entered to the Condition F.
 - c. The applicant is requested to make the following corrections or justify the currently proposed text: Condition D should say: “One or more **Diverse Manual ESF Actuation** Functions with one Diverse Manual ESF Actuation Channels channel inoperable.” Required Action D.1 should say: “Restore channels to OPERABLE Sstatus.” Because separate condition entry is *apparently* allowed by the ACTIONS Table Note, for each Diverse Manual ESF Actuation Function. So, the ACTIONS Table Note should say: “Separate Condition entry is allowed for each ESFAS Function **and for each Diverse Manual ESF Actuation Function**.”
 - d. Since only one Diverse Manual ESF Actuation channel is provided for each main steam isolation valve and only one Diverse Manual ESF Actuation channel is provided for containment isolation, the proposed rationale (in the Bases for Action D of generic TS 3.3.6) for the proposed 72 hour Completion Time to restore an inoperable channel to operable status is not acceptable for these two Diverse Manual ESF Actuation Functions. The applicant is requested to propose and justify a more restrictive restoration action Completion Time for these two Diverse Manual ESF Actuation Functions.
4. The applicant is requested to revise as indicated the first sentence of the Bases for Required Actions E.1 and E.2, and for Required Actions F.1 and F.2 of generic TS 3.3.6 to say “If ~~the~~ **any** Required Actions and associated Completion Times ~~for the~~ **of** Condition **A, B, [or C] [C, or D]** cannot be met, the plant must be brought to a MODE in which the LCO does not apply.” Also, these Bases paragraphs should address the Required Action Note (or Condition Note if the Note is moved) and state which of the six sets of ESFAS Logic and Manual Trip Functions apply to each Action (E or F) and why; also, the Bases for Action F should say why only Action F applies to Functions 7a through 7f, Diverse Manual ESF Actuation Functions a. Safety Injection; b. Containment Spray; c. Auxiliary Feedwater (SG #1); d. Auxiliary Feedwater (SG #2); e. Main Steam Isolation per MSIV; and f. Containment Isolation.
 5. For consistency in terminology, the applicant is requested to revise the surveillance column Note for SR 3.3.6.1, as indicated by the markup, to say: “Testing of Actuation Logic shall include the verification of proper operation of each actuation **circuit signal**.” Also for clarity, the applicant is requested to revise the surveillance column Notes for SR 3.3.6.2, as indicated by the markup, to say:

-----NOTES-----

1. Components exempt from testing during operation shall be tested once every 18 months (MODE 6) or in MODE 5 if not tested ~~until~~ **within** the previous 62 days.
 2. Subgroup of Actuation Logic channel A, C and B, D shall be tested on a staggered basis.
-

Response

The following changes will be made to TS 3.3.6 to be consistent with STS 3.3.5B:

1. Regarding the coincidence logic and initiation logic located in the PPS, Applicable Modes for ESFAS functions such as SIAS, CSAS, and MSIS in generic TS Table 3.3.6-1 are extended from Modes 1, 2, and 3 to Modes 1, 2, 3, and 4 in order to enhance the safety of nuclear power plants. This approach is consistent with Applicable Modes for ESFAS functions such as SIAS, CSAS, and MSIS in generic TS Table 3.3.5-1. Therefore, no revision pertaining to Applicable Modes is necessary.

2. The required Action Notes for ACTIONS E and F will be moved to above Required Actions E.1 and F.1. The width of the Note in the Required Action column will be extended to span the entire column.

The required Action Notes for ACTIONS E and F will be changed to "Applies to Functions 3, 5 and 6 of Table 3.3.6-1" and "Applies to Functions 1, 2, 4 and 7 of Table 3.3.6-1," respectively.

3.a LCO 3.3.6 will be changed to state "Four channels of ESFAS Coincidence Logic, ESFAS Initiation Logic, Actuation Logic, and Manual Trip and one or two channels of Diverse Manual ESF Actuation shall be OPERABLE for each Function in Table 3.3.6-1."

3.b. The last sentence of the Bases for Required Action D.1 will be changed to state "If the inoperable Diverse Manual ESF Actuation channel is not restored to OPERABLE status within 72 hours, Condition F is entered.

3.c The Condition D will be changed to state "One or more Functions with one Diverse Manual ESF Actuation Channel inoperable." The Required Action D.1 will be changed to state "Restore channel to OPERABLE status." The ACTIONS Table Note will be changed to state "separate Condition entry is allowed for each ESFAS Function and for each Diverse Manual ESF Actuation Function."

3.d The Diverse Manual ESF Actuation Function requires that the operator manually actuate ESF systems from the MCR after a postulated common cause failure of the PPS and ESF-CCS. The probability for a multiple failure in the automatic ESFAS actuation logic and other manual controls within the 72 hour duration is low. Therefore, the proposed 72 hour

Completion Time to restore an inoperable channel to operable status is reasonable based on operating experience for the repair and restoration of the diverse manual ESF equipment.

4. The first sentence of the Bases for Required Actions E.1 and E.2, and for Required Actions F.1 and F.2 of generic TS 3.3.6 will be changed to state “If any Required Actions and associated Completion Time of Condition A, B, or C cannot be met, the plant must be brought to a MODE in which the LCO does not apply,” “If any Required Actions and associated Completion Time of Condition A, B, C, or D cannot be met, the plant must be brought to a MODE in which the LCO does not apply,” respectively.

The following sentence will be added to the Bases for Required Action E.1 and E.2.

“A Note to the Required Action indicates that Functions 3, 5, and 6 of Table 3.3.6-1 are applicable.”

The following sentence will be added to the Bases for Required Action F.1 and F.2.

“A Note to the Required Action indicates that Functions 1, 2, 4, and 7 of Table 3.3.6-1 are applicable.”

5. The surveillance column Note for SR 3.3.6.1 will be revised to change the word ‘signal’ to ‘circuit’.

The surveillance column Notes for SR 3.3.6.2 will be revised to add an ‘s’ the word ‘month’ and to change the word ‘until’ to ‘within.’

Supplemental Response

Supplemental response to 4th question : The first sentence of the Bases for Required Actions E.1 and E.2, and for Required Actions F.1 and F.2 of generic TS 3.3.6 will be changed to state “If any Required Action and associated Completion Time of Condition A, B, or C cannot be met, the plant must be brought to a MODE in which the LCO does not apply,” and “If any Required Action and associated Completion Time of Condition A, B, C, or D cannot be met, the plant must be brought to a MODE in which the LCO does not apply,” respectively.

Second Supplemental Response

Supplemental response to question 3.b: In the case for the maximum restoration time of 72 hours for one channel’s diverse manual ESF equipment, there is a low probability of simultaneous failure of the corresponding automatic and manual functions. Therefore, the second paragraph of the Bases for 3.3.6 Required Action D.1 will be changed to state “The associated Completion Time is reasonable based on operating experience for repair and restoration of this type of diverse manual ESF equipment. In addition, it is assumed that the probability of multiple failures occurring in the automatic ESFAS actuation logic and other manual controls within 72 hours is small. If the inoperable Diverse Manual ESF Actuation channel is not restored to OPERABLE status within 72 hours, Condition F is entered.”

The third paragraph of the Bases for 3.3.6 Required Action A.1 will be changed to “Failure of a single initiation logic channel affects one trip leg of a selective 2-out-of-4 actuation logic channel. In this case, for the purposes of this Specification, the actuation logic is not inoperable. This prevents the need to enter LCO 3.0.3 in the event of an initiation logic channel failure. This Action is different from Required Action related to the RPS Manual channel inoperable because open contact of reactor trip switchgear is implemented and confirmed easily in RPS. If the channel cannot be restored to OPERABLE status with 48 hours, Condition E or F is entered.”

Additional supplemental response: The ESFAS Manual Trip is addressed in TS LCO 3.3.6 including Table 3.3.6-1. Applicable Safety Analyses section of B 3.3.6 states that the ESFAS functions listed in Table 3.3.6-1, which correspond to the ESF actuation signal level of SIAS, CSAS, CIAS, MSIS, AFAS-1 and AFAS-2, ensure acceptable consequences during associated design basis events, but does not address detailed items such as coincidence logic, initiation logic, actuation logic, and manual logic that are specified in each ESF actuation signal. This approach is the same as that of the STS.

The prior revisions of the RAI response were incorporated into Rev. 1 of the DCD and TS; therefore this revision starts with and only contains mark-ups to Revision 1 of the TS.

Impact on DCD

Same as changes described in the impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

Technical Specifications 3.3.6 and the associated Bases will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical or Environmental Reports.

BASES

ACTIONS (continued)

A.1

Condition A applies to one manual trip, coincidence logic, or initiation logic channel inoperable.

The channel must be restored to OPERABLE status within 48 hours. Operating experience has demonstrated that the probability of a random failure in a second channel is low during any given 48 hour period.

Failure of a single initiation logic channel affects one leg of 2-out-of-4 actuation logic channel. In this case, according to the purpose of operation Technical Specification, actuation logic is not inoperable status. When initiation logic channel is failure, LCO 3.0.3 may be not entered.

This prevents the need to enter LCO 3.0.3 in the event of an initiation logic channel failure.

This Action is different from Required Action related to the RPS Manual channel inoperable because open contact of reactor trip switchgear is implemented and confirmed easily in RPS. If the channel cannot be restored to OPERABLE status with 48 hours, Condition E or F is entered.

B.1 and B.2

Condition B applies to the failure of both initiation logic channels affecting the same trip leg.

In this case, the actuation logic channels are not inoperable, since they are in one-out-of-two logic and capable of performing as required. This obviates the need to enter LCO 3.0.3 in the event of a coincidence logic or vital bus power failure.

The failure of vital electrical power to two PPS divisions which exclude the same trip leg of the selective 2-out-of-4 actuation logic causes the inputs from both PPS divisions to go to a failed (i.e., safe) state. The ESF-CCS recognizes the failed input signals as actuated state in the actuation logic. Therefore, a loss of vital electrical power to two PPS divisions generates ESF actuation signals to all ESF trains of equipment.

If a LCL power supply or vital instrument bus is lost, the initiation logic channels in the same trip leg will generate the initiation signal. This will open the actuation logic contacts, satisfying the Required Action to generate at least the actuation logic signal in the affected trip leg from actuation logic.

The channel must be restored to OPERABLE status within 48 hours. This provides the operator with time to take appropriate actions and still ensures that any risk involved in operating with a failed channel is acceptable. Operating experience has demonstrated that the probability of a random failure of a second initiation logic is low during any given 48 hour period.

BASES

ACTIONS (continued)

D.1

The Required Action D applies to the diverse manual ESF Actuation equipment.

The associated Completion Time and LCO are reasonable based on operating experience for repair and restoration of this type of diverse manual ESF equipment. In addition, it is assumed that a low probability for a multiple failures in the automatic ESFAS actuation logic and other manual controls within 72 hours will occur. If the inoperable Diverse Manual ESF Actuation channel is not restored to OPERABLE status within 72 hours, Condition F is entered.

E.1 and E.2

If any Required Actions and associated Completion Time of Condition A, B, or C cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

A Note to the Required Action indicates that Functions 3, 5, and 6 of Table 3.3.6-1 are applicable.

F.1 and F.2

If any Required Actions and associated Completion Time of Condition A, B, C, or D cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

A Note to the Required Action indicates that Functions 1, 2, 4, and 7 of Table 3.3.6-1 are applicable. Since the applicable MODES for the Diverse Manual ESF Actuation Function are 1, 2, 3, and 4, Action F applies to Function 7 in Table 3.3.6-1. This takes the plant out of the applicable MODES and restores the plant to operation within the bounds of the safety analyses.