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 ~~S~~status.” 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 Time~~s 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 month**s** (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.
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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.

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 Report.

3.3 INSTRUMENTATION

3.3.6 Engineered Safety Features Actuation System (ESFAS) Logic and Manual Trip

LCO 3.3.6 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 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.

APPLICABILITY: According to Table 3.3.6-1.

ACTIONS

NOTE

Separate Condition entry is allowed for each ESFAS Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one Coincidence Logic channel, Initiation Logic channel, or Manual Trip channel inoperable.	A.1 Restore channel to OPERABLE status.	48 hours
B. One or more Functions with two Initiation Logic channels affecting the same trip leg inoperable.	B.1 Open at least one contact in affected trip leg of both ESFAS Actuation Logic channels. AND B.2 Restore channels to OPERABLE status.	Immediately 48 hours

Separate Condition entry is allowed for each ESFAS Function and for each Diverse Manual ESF Actuation Function.

One or more Diverse Manual ESF Actuation Functions with one channel inoperable.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or more Functions with one Actuation Logic channel inoperable.	~~C.~~ NOTE One channel of Actuation Logic may be bypassed for up to 1 hour for Surveillances, provided the other channel is OPERABLE.	
	C.1 Restore inoperable channel to OPERABLE status.	48 hours
D. ~~One or more Functions with one Diverse Manual ESF Actuation Channels inoperable~~	D. ~~Restore channels to OPERABLE Status.~~	72 hours
E. Required Action and associated Completion Time not met.	~~E.~~ NOTE Applies ~~only~~ to Functions 3, ~~5~~ and 6 of Table 3.3.6-1	
	E.1 Be in MODE 3.	6 hours
	AND	
	E.2 Be in MODE 4.	12 hours
F. Required Action and associated Completion Time not met.	~~F.1~~ NOTE ~~Applies only to Functions 1 and 4 of Table 3.3.6-1.~~	
	F.1 Be in MODE 3.	6 hours
	AND	
	F.2 Be in MODE 5.	36 hours

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Restore inoperable channel to OPERABLE status.

5,

Expand the width to fit the cell

of Condition A, B, or C

Applies to Functions 1, 2, 4, and 7 of Table 3.3.6-1.

of Condition A, B, C, or D

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.6.1	---------- NOTE ---------- Testing of Actuation Logic shall include the verification of proper operation of each actuation ~~signal~~ circuit. ---------- Perform CHANNEL FUNCTIONAL TEST on each ESFAS logic channel and Manual ESF Actuation channel.	31 days
SR 3.3.6.2	---------- NOTE ---------- Components exempt from testing during operation shall be tested once every 18 month(MODE 6) or in MODE 5 if not tested until the previous 62 days. Subgroup of Actuation Logic channel A, C and B, D shall be tested on a staggered basis. ---------- Perform a verification of the OPERABILITY of subgroup for Actuation signal of each Actuation Logic channel	31 days on a STAGGERED TEST BASIS
SR 3.3.6.3	Perform CHANNEL FUNCTIONAL TEST on each Diverse Manual ESF Actuation channel	18 months

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

Table 3.3.6-1 (Page 1 of 2)
Engineered Safety Features Actuation System Logic and Manual Trip Applicability

FUNCTION	APPLICABLE MODES
1. Safety Injection Actuation Signal	
a. Coincidence Logic	1, 2, 3, 4
b. Initiation Logic	1, 2, 3, 4
c. Actuation Logic	1, 2, 3, 4
d. Manual Trip	1, 2, 3, 4
2. Containment Spray Actuation Signal	
a. Coincidence Logic	1, 2, 3, 4
b. Initiation Logic	1, 2, 3, 4
c. Actuation Logic	1, 2, 3, 4
d. Manual Trip	1, 2, 3, 4
3. Containment Isolation Actuation Signal	
a. Coincidence Logic	1, 2, 3
b. Initiation Logic	1, 2, 3
c. Actuation Logic	1, 2, 3, 4
d. Manual Trip	1, 2, 3, 4
4. Main Steam Isolation Signal	
a. Coincidence Logic	1, 2, 3, 4
b. Initiation Logic	1, 2, 3, 4
c. Actuation Logic	1, 2, 3, 4
d. Manual Trip	1, 2, 3, 4
5. Auxiliary Feedwater Actuation Signal SG #1 (AFAS-1)	
a. Coincidence Logic	1, 2, 3
b. Initiation Logic	1, 2, 3
c. Actuation Logic	1, 2, 3, 4
d. Manual Trip	1, 2, 3, 4

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FUNCTION	REQUIRED CHANNELS	APPLICABLE MODES
1. Safety Injection Actuation Signal		
a. Coincidence Logic	4	1, 2, 3, 4
b. Initiation Logic	4	1, 2, 3, 4
c. Actuation Logic	4	1, 2, 3, 4
d. Manual Trip	4	1, 2, 3, 4
2. Containment Spray Actuation Signal		
a. Coincidence Logic	4	1, 2, 3, 4
b. Initiation Logic	4	1, 2, 3, 4
c. Actuation Logic	4	1, 2, 3, 4
d. Manual Trip	4	1, 2, 3, 4
3. Containment Isolation Actuation Signal		
a. Coincidence Logic	4	1, 2, 3
b. Initiation Logic	4	1, 2, 3
c. Actuation Logic	4	1, 2, 3, 4
d. Manual Trip	4	1, 2, 3, 4
4. Main Steam Isolation Signal		
a. Coincidence Logic	4	1, 2, 3, 4
b. Initiation Logic	4	1, 2, 3, 4
c. Actuation Logic	4	1, 2, 3, 4
d. Manual Trip	4	1, 2, 3, 4
5. Auxiliary Feedwater Actuation Signal SG #1 (AFAS-1)		
a. Coincidence Logic	4	1, 2, 3
b. Initiation Logic	4	1, 2, 3
c. Actuation Logic	4	1, 2, 3, 4
d. Manual Trip	4	1, 2, 3, 4

Table 3.3.6-1 (Page 2 of 2)
Engineered Safety Features Actuation System Logic and Manual Trip Applicability

FUNCTION	APPLICABLE MODES
6. Auxiliary Feedwater Actuation Signal SG #2 (AFAS-2)	
a. Coincidence Logic	1, 2, 3
b. Initiation Logic	1, 2, 3
c. Actuation Logic	1, 2, 3, 4
d. Manual Trip	1, 2, 3, 4
7. Diverse Manual ESF Actuation Signal	
a. Safety Injection	1, 2, 3, 4
b. Containment Spray	1, 2, 3, 4
c. Auxiliary Feedwater (SG #1)	1, 2, 3, 4
d. Auxiliary Feedwater (SG #2)	1, 2, 3, 4
e. Main Steam Isolation per MSIV	1, 2, 3, 4
f. Containment Isolation	1, 2, 3, 4

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FUNCTION	REQUIRED CHANNELS	APPLICABLE MODES
6. Auxiliary Feedwater Actuation Signal SG #1 (AFAS-2)		
a. Coincidence Logic	4	1, 2, 3
b. Initiation Logic	4	1, 2, 3
c. Actuation Logic	4	1, 2, 3, 4
d. Manual Trip	4	1, 2, 3, 4
7. Diverse Manual ESF Actuation Signal		
a. Safety Injection	2	1, 2, 3, 4
b. Containment Spray	2	1, 2, 3, 4
c. Auxiliary Feedwater (SG #1)	2	1, 2, 3, 4
d. Auxiliary Feedwater (SG #2)	2	1, 2, 3, 4
e. Main Steam Isolation per MSIV	1	1, 2, 3, 4
f. Containment Isolation	1	1, 2, 3, 4

BASES

ACTIONS (continued)

D

~~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 channel is not restored to OPERABLE status within 72 hours, it is entered to the Condition F.~~

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

Action

~~If the Required Actions and associated Completion Times for the Condition 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.

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.

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

Action

~~If the Required Actions and associated Completion Times for the Condition are not 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.

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.

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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Manual ESF Actuation Testing

Manual ESF actuation testing is tested every 31 days to verify that manual pushbutton can actuate the actuation logic as designed.

The 31-day Surveillance period is determined by operating experience and shows that equipment can meet the Surveillance requirement condition when equipment is tested as this Surveillance period.

SR 3.3.6.2

Individual subgroup must also be tested, one at a time, to verify the individual ESFAS components will actuate when required.

The 31-day Frequency on a staggered test basis complies with the operating experience and ensures the problems of individual logic signal can be detected within this time frame.

Some components cannot be tested at power operation since their actuation may lead to plant trip or equipment damage. Actuation logic subgroups not tested at power operation must be tested in accordance with the ~~Note~~ to this SR.

SR 3.3.6.3 Notes

A CHANNEL FUNCTIONAL TEST for diverse ESF manual actuation channel performs the diverse manual ESF actuation circuit by manual actuation of each Function. This testing is performed every 18 months to verify that the trip pushbutton can actuate the actuation logic as designed.

REFERENCES 1. DCD Tier 2, Section 7.3.