

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

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### **Question No. 16-111**

The proposed ACTIONS Table and SR Table and Table 3.3.5-1 for generic TS 3.3.5 contains the following differences from STS 3.3.5B 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. Suggest inserting “automatic” before “operating bypass removal channel” in Required Action C.2.2.
2. Completion Time for generic TS 3.3.5 Required Actions A.2 and C.2.2 should match STS (“Prior to entering MODE 2 following next MODE 5 entry”);
3. Condition B should match STS and include “automatic ESFAS” before “trip channels inoperable.”
4. The Required Action Note in Condition E and Condition F should say “Functions” instead of “function.”
5. The Note in the Required Action column of Condition B, that states “LCO 3.0.4 is not applicable” with the unit in Condition B, is unnecessary, since the ACTIONS will permit operation to continue indefinitely with one automatic ESFAS trip channel in trip and one automatic ESFAS trip channel in bypass for affected RPS Function(s).
6. The logical connector between Required Actions C.2.1 and C.2.2 should align with the period before the last digit of the labels C.2.1 and C.2.2;
7. The Note in the Required Action column of Condition D, that states “LCO 3.0.4 is not applicable” with the unit in Condition D, is unnecessary, since the ACTIONS will permit operation to continue indefinitely with bypass removal channels disabled, or one affected

automatic ESFAS trip channel in trip and one affected trip channel in bypass for affected RPS Function(s).

8. Required Actions C.1 and D.1, which say “Disable [automatic operating] bypass [removal] channel(s).” are unclear. Since the function being disabled is to automatically remove the bypass and enable the associated ESFAS trip channel, unbypassing the ESFAS trip channel would need to be done manually before reaching the reset setting. The applicant is requested to clarify the meaning of these action requirements.

9. In generic TS SR 3.3.5.2 and SR 3.3.5.3, insert “the” before “Setpoint Control Program.” In SR 3.3.5.3 insert “associated automatic operating” before “bypass removal function.”

10. In generic TS Table 3.3.5-1 in the second column heading (APPLICABLE MODES or OTHER SPECIFIED CONDITIONS), “or” should be “OR”; also, the Applicability should be stated for each ESFAS trip instrument Function (trip signal from each bistable processor), and not for the ESFAS signal from coincidence logic, and processed through initiation logic and actuation logic, which is covered by LCO 3.3.6.

11. Justify not including Mode 4 in the Applicability of generic TS Table 3.3.5-1 Functions 3a, Containment Isolation Actuation Signal (CIAS) on Containment Pressure – High and 3b, CIAS on Pressurizer Pressure – Low; else add Mode 4 and revise the Required Action Notes for ACTIONS E and F and associated Bases discussions accordingly.

12. 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 and should span the width of the Condition statement.

### **Response – (Rev. 1)**

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

1. The word “automatic” will be inserted before “operating bypass removal channel” in Required Action C.2.2 and included in the associated Bases paragraph.
2. The completion time for Required Actions A.2 and C.2.2 will be changed to “Prior to entering MODE 2 following next MODE 5 entry”. And the Bases will be changed to be consistent with the wording.
3. The phrase “automatic ESFAS” will be added to Condition B.
4. The word “function” in the Required Action Note in Condition E and Condition F will be changed to “Function.”
5. The Note in the Required Action column of Condition B will be deleted.
6. The logical connector “AND” between Required Actions C.2.1 and C.2.2 will be aligned with the period before the last digit of the labels C.2.1 and C.2.2.

7. The Note in the Required Action column of Condition D will be deleted.
8. Required Actions C.1, which states “Disable bypass channel” means that if the inoperable bypass removal function for any bypass channel cannot be restored to an OPERABLE status within 1 hour (except for the case that the bypass is not in effect), the associated trip channel must be declared inoperable as stated in Condition A. Required Action D.1, which states “Disable bypass channels” means that if the inoperable bypass removal function for two bypass channels cannot be restored to OPERABLE status within 1 hour (except for the case that the bypass is not in effect), the associated trip channels must be declared inoperable as stated in Condition B.
9. The word “the” in generic TS SR 3.3.5.2 and SR 3.3.5.3 will be inserted before “Setpoint Control Program.” The phrase “automatic operating” will be inserted before “bypass removal function” described in SR 3.3.5.3 to be consistent with RAI 239-8076, Question 16-90.
10. The word “or” described in the second column heading of generic TS Table 3.3.5-1 will be changed to “OR”. [The Applicable Modes will be relocated for each ESFAS instrumentation function in Table 3.3.5-1 as described in the response to RAI 498-8595, Question 16-153 \(3.a\).](#)
11. [The Applicable Modes for CIAS stated in Tables 3.3.5-1 and 3.3.6-1 will be changed to Modes 1, 2, 3, 4 as described in the response to RAI 498-8595, Question 16-153 \(3.a\).](#)
12. 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.

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### **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 3.3.5 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

3.3.5 Engineered Safety Features Actuation System (ESFAS) Instrumentation

LCO 3.3.5 Four ESFAS trip channels and associated operating bypass removal channels for each Function in Table 3.3.5-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5-1.

ACTIONS

NOTE

1. Separate Condition entry is allowed for each ESFAS Function.
2. When one channel is bypassed and the bypassed condition exceeds 7 days duration, it shall be reviewed in 24 hours whether to maintain the operation in bypassed condition within the specified Completion Time of the Required Action A.2 or administrative controls.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one automatic ESFAS trip channel inoperable.	A.1 Place trip channel in bypass or trip.  <u>AND</u>  A.2 Restore trip channel to OPERABLE status.	1 hour  <del>Prior to next entry into MODE 2 following entry into MODE 5</del>
B. One or more Functions with two trip channels inoperable.	<del>NOTE</del> <del>LCO 3.0.4 is not applicable.</del>  B.1 Place one trip channel in bypass and the other in trip.	1 hour

Prior to entering MODE 2 following next MODE 5 entry

automatic ESFAS

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>C. One or more Functions with one automatic operating bypass removal channel inoperable.</p>	<p>C.1 Disable bypass channel.</p> <p><u>OR</u></p> <p>C.2.1 Place affected automatic trip channel in bypass or trip.</p> <p><b>AND</b></p> <p>C.2.2 Restore operating bypass removal channel and associated automatic trip channel to OPERABLE status.</p>	<p>1 hour</p> <p>1 hour</p> <p>Prior to next entry into MODE 2 following entry into MODE 5</p>
<p>D. One or more Functions with two automatic operating bypass removal channels inoperable.</p>	<p><del>NOTE</del></p> <p><del>LCO 3.0.4 is not applicable.</del></p> <p>D.1 Disable bypass channels.</p> <p><u>OR</u></p> <p>D.2 Place one affected automatic trip channel in bypass and place the other in trip.</p>	<p>1 hour</p> <p>1 hour</p>

Prior to entering MODE 2 following next MODE 5 entry

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required Action and associated Completion Time not met.	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">                         E.1 NOTE                          Only applicable to functions 3, 5, and 6 of Table 3.3.5-1.                     </div> Be in MODE 3.  AND E.2 Be in MODE 4.	6 hours  12 hours
F. Required Action and associated Completion Time not met.	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">                         E.1 NOTE                          Only applicable to functions 1, 2, and 4 of Table 3.3.5-1.                     </div> Be in MODE 3.  AND F.2 Be in MODE 5.	6 hours  36 hours

Delete

E.1

Delete

F.1

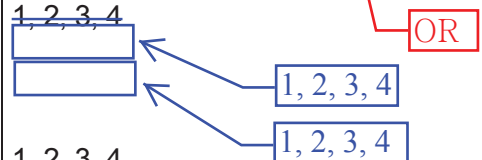

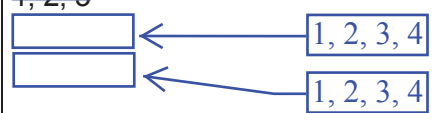
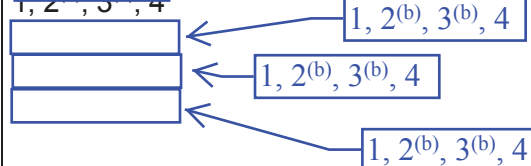


Functions

Expand the width to fit the cell

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.5.1	Perform CHANNEL CHECK of each ESFAS channel.	12 hours
SR 3.3.5.2	Perform CHANNEL FUNCTIONAL TEST of each ESFAS channel in accordance with Setpoint Control Program.	31 days
SR 3.3.5.3	Perform CHANNEL CALIBRATION of each ESFAS channel, including bypass removal function in accordance with Setpoint Control Program.	18 months
SR 3.3.5.4	Verify ESFAS RESPONSE TIME is within limits.	18 months on a STAGGERED TEST BASIS
SR 3.3.5.5	Perform CHANNEL FUNCTIONAL TEST on each automatic operating bypass removal channel.	Once within 31 days prior to each reactor startup

Table 3.3.5-1 (Page 1 of 1)  
 Engineered Safety Features Actuation System Instrumentation

FUNCTION	APPLICABLE MODES <sup>or</sup> OTHER SPECIFIED CONDITIONS
1. Safety Injection Actuation Signal a. Containment Pressure – High b. Pressurizer Pressure – Low <sup>(a)</sup>	1, 2, 3, 4 
2. Containment Spray Actuation Signal a. Containment Pressure – High High	1, 2, 3, 4 
3. Containment Isolation Actuation Signal a. Containment Pressure – High b. Pressurizer Pressure – Low <sup>(a)</sup>	1, 2, 3 
4. Main Steam Isolation Signal a. Steam Generator Pressure – Low <sup>(c)</sup> b. Containment Pressure – High c. Steam Generator Level – High	1, 2 <sup>(b)</sup> , 3 <sup>(b)</sup> , 4 
5. Auxiliary Feedwater Actuation Signal SG #1 (AFAS-1) a. Steam Generator Level – Low	1, 2, 3 
6. Auxiliary Feedwater Actuation Signal SG #2 (AFAS-2) a. Steam Generator Level – Low	1, 2, 3 

(1) The setpoint may be manually decreased to a minimum value of 7.0 kg/cm<sup>2</sup>A (100 psia), as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained  $\leq 28.1$  kg/cm<sup>2</sup> (400 psi). Trips may be bypassed when pressurizer pressure is  $< 28.1$  kg/cm<sup>2</sup>A (400 psia). Bypass shall be automatically removed when pressurizer pressure is  $\geq 35.2$  kg/cm<sup>2</sup>A (500 psia). The setpoint shall be automatically increased to the normal setpoint as pressurizer pressure is increased.

(2) Main Steam Isolation Signal (MSIS) Function (Steam Generator Pressure – Low, Containment Pressure – High, and Steam Generator Level – High signals) is not required to be OPERABLE when all associated valves isolated by the MSIS Function are closed and deactivated.

(3) The setpoint may be decreased as steam pressure is reduced, provided the margin between steam pressure and the setpoint is maintained  $\leq 14.1$  kg/cm<sup>2</sup> (200 psi). The setpoint shall be automatically increased to the normal setpoint as steam pressure is increased.



## BASES

## ACTIONS (continued)

3. CIAS  
Containment Pressure – High  
Pressurizer Pressure – Low
4. MSIS  
Steam Generator Pressure – Low  
Containment Pressure – High  
Steam Generator Level – High
5. AFAS-1  
Steam Generator #1 Level – Low
6. AFAS-2  
Steam Generator #2 Level – Low

automatic ESFAS  
trip

ESFAS coincidence logic is normally two-out-of-four.

If one ~~ESFAS~~ channel is inoperable, startup or power operation is allowed to continue providing the inoperable channel is placed in bypass or trip within 1 hour (Required Action A.1).

The Completion Time of 1 hour allotted to restore, bypass, or trip the channel is sufficient to allow the operator to take all appropriate actions for the failed channel and still ensures that the risk involved in operating with the failed channel is acceptable.

The failed channel is restored to OPERABLE status prior to ~~next~~ entry into MODE 2 following entry into MODE 5. With a channel bypassed, the coincidence logic is in a two-out-of-three configuration. In this configuration, common cause failure of dependent channels cannot prevent trip.

next

The Completion Time of prior to ~~next~~ entry into MODE 2 following entry into MODE 5 is based on adequate channel to channel independence, which allows a two-out-of-three channel operation, since no single failure will prevent a ESFAS initiation.

BASES


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## ACTIONS (continued)

B.1

The Required Action is modified by a Note stating that LCO 3.0.4 is not applicable. The Note was added to allow the changing of MODES even though two channels are inoperable, with one channel bypassed and one tripped. In this configuration, the protection system is in a one-out-of-two logic, which is adequate to ensure that no random failure will prevent protection system operation.

Condition B applies to the failure of two channels of one or more input parameters in any ~~AFAS~~ automatic trip Function as following:

1. SIAS  ESFAS  
Containment Pressure – High  
Pressurizer Pressure – Low
2. CSAS  
Containment Pressure – High High
3. CIAS  
Containment Pressure – High  
Pressurizer Pressure – Low
4. MSIS  
Steam Generator Pressure – Low  
Containment Pressure – High  
Steam Generator Level – High
5. AFAS-1  
Steam Generator #1 Level – Low
6. AFAS-2  
Steam Generator #2 Level – Low

BASES

automatic ESFAS  
trip

ACTIONS (continued)

With two inoperable channels, power operation may continue, provided one inoperable channel is placed in bypass and the other channel is placed in trip within 1 hour. With one channel of protection instrumentation bypassed, the ESFAS Function is in two-out-of-three logic in the bypassed input parameter, but with another channel failed, the ESFAS could be operating with a two-out-of-two logic. This is outside the assumptions made in the analyses and should be corrected. To correct the problem, the second channel is placed in trip. This places the ESFAS Function in a one-out-of-two logic. If any of the other OPERABLE channels receives a trip signal, ESFAS actuation will occur.

automatic ESFAS  
trip

One of the two inoperable channels will need to be restored to OPERABLE status prior to the next required CHANNEL FUNCTIONAL TEST because channel surveillance testing on an OPERABLE channel requires that the OPERABLE channel be placed in bypass. However, it is not possible to bypass more than one ESFAS channel, and placing a second channel in trip will result in an ESFAS actuation. Therefore, if one ESFAS channel is in trip and a second channel is in bypass, a third inoperable channel would place the unit in LCO 3.0.3.

C.1, C.2.1 and C.2.2.

Condition C applies to one automatic operating bypass removal function inoperable. The only automatic operating bypass removal on an ESFAS is on the Pressurizer Pressure – Low signal. This bypass removal is shared with the RPS Pressurizer Pressure – Low bypass removal.

If the bypass removal function for any operating bypass cannot be restored to OPERABLE, the associated ESFAS channel may be considered OPERABLE only if the operating bypass is not in effect. Otherwise the affected ESFAS channel must be declared inoperable, as in Condition A, and the bypass either removed, or the operating bypass removal channel repaired. The Bases for the Required Actions and required Completion Times are consistent with Condition A.

automatic