ITS DISCUSSION OF DIFFERENCES

ITS Section 3.3C: Instrumentation - EFIC

Note: The ITS Section 3.3C package addresses the following NUREG-1430 RSTS:

RSTS 3.3.11 EFIC System Instrumentation
RSTS 3.3.12 EFIC Manual Initiation
RSTS 3.3.13 EFIC Logic
RSTS 3.3.14 EFIC Vector Logic

1 NUREG 3.3.11 - The ANO-1 design of the Emergency Feedwater Initiation and Control (EFIC) System does not include a separate Main Feedwater Isolation Function which is typically provided to protect against overfilling the steam generators. The Main Steam Line Isolation Function, however, includes isolation of both the main steam lines and the main feedwater lines for protection against simultaneous blowdown of both steam generators. Therefore, all NUREG-1430 references to a separate Main Feedwater Isolation Function are omitted from ITS 3.3.11, ITS 3.3.12, and ITS 3.3.13. The associated Bases are also revised to omit references to this Function.

Similarly, the ANO-1 design of the EFIC System does not include a separate Vector Valve Enable Logic Function. Rather, the Emergency Feedwater (EFW) Initiation Function includes both the actuation of the EFW System and enabling of the EFIC vector (valve control) logic. Therefore, the NUREG-1430 identification of a separate Vector Valve Enable Logic is omitted from ITS 3.3.13. The associated Bases are also revised to provide appropriate references to this Function.

Finally, the "EFW Actuation Function" identifier in ITS 3.3.12 and ITS 3.3.13, and their associated Bases, is revised to "EFW Initiation" to be consistent with the Function identifier in ITS 3.3.11.

2 NUREG 3.3.11 - Required Actions A.2 and B.3 are not adopted. These Required Actions are not consistent with the current licensing basis for ANO-1. ITS 3.3.11 provides requirements for CTS Table 3.5.1-1, EFIC Functional Units 1.b, 1.c, 1.d, 1.e, 2.b, and 3.b. Each of these Functional Units is identified as having 4 channels (or 4 channels per steam generator), with only two of these four channels required to initiate the function. CTS Table 3.5.1-1, Column 5, requires action only if the number of OPERABLE channels falls below the number required for actuation, i.e., two, or below the number required to maintain single failure capability, i.e., a degree of redundancy. (The latter is maintained as long as one channel is in a tripped condition, as required by ITS Required Action B.2.) Therefore, CTS does not require restoration within a specific time for either one or two of these channels inoperable. The incentive provided by having a channel in trip (which leaves the unit vulnerable to automatic actuation and probable unit trip) is sufficient to cause initiation and completion of restoration of inoperable channels. This change maintains requirements consistent with CTS Table 3.5.1-1 Column 5 and Note 1, which are sufficient.

3 NUREG 3.3.11 - Response time testing of the EFIC System, i.e., NUREG SR 3.3.11.4, is not adopted in ITS. Testing of this type is not required by ANO-1 CTS. Administrative control of response time testing to-date has been sufficient to assure compliance with the design and analysis assumptions. Therefore, response time testing is proposed to continue under administrative control. Deletion of NUREG SR 3.3.11.4 maintains consistency with the current ANO-1 licensing basis and neither removes any current requirement nor adds any additional requirement.

4 NUREG 3.3.11 - Table 3.3.11-1, Function 2.c, "SG Level--High," is not required by CTS and is not adopted in ITS. The design of the ANO-1 EFIC System does not include this Function. Therefore, all NUREG-1430 references to this Function are omitted from ITS 3.3.11. The associated Bases are also revised to omit references to this Function.

5 NUREG 3.3.11 - CTS 3.5.1.15.c requires that the "main feedwater pumps tripped" Function for EFW initiation be OPERABLE when neutron flux exceeds 10% power. CTS Table 3.5.1-1, EFIC Functional Unit 1.d further reflects this "applicability" by the function name of "Loss of Both MFW Pumps and PWR > 10%." This unit specific Applicability of the ANO-1 EFIC Function is retained for ITS and is appropriate since the MFW pumps are not generally placed in service until approximately 5-10% RTP. Further, this Applicability is consistent with the ITS Applicability for the Loss of MFW Pumps RPS trip Function, and with the design of the EFIC System which includes an automatic bypass of this Function below 10% RTP. The NUREG Table 3.3.11-1, Function 1.a, identifies a generic Applicability of MODES 1, 2, and 3 with MODES 2 and 3 modified by Note (a): "When not in shutdown bypass." Retaining the CTS Applicability removes the need for NUREG-1430 Table 3.3.11-1 Note (a) and associated Required Action D.2.1. Further, since the Applicability is similar to ITS EFIC Function 1.d, Condition E is applicable and modified to show it as such. Appropriate revisions are also made to the Bases. This change is consistent with CTS.

3.3.11-02

6 NUREG 3.3.11 - The Required Actions for NUREG Condition F are revised to ensure the unit is placed in a non-applicable mode as appropriate. The Condition is inconsistent with similar Conditions for inoperable equipment in that it does not require that the unit be in MODE 3 within 6 hours. This inconsistency is corrected. This change is consistent with CTS Table 3.5.1-1, Note 1.

3.3.11-02

3.3.11-03

7 Not Used.

8 NUREG 3.3.11 - The CTS Table 4.1-1, item 53.e does not include a calibration Surveillance Requirement for the "loss of four reactor coolant pumps" Function. No setpoint is specified because the status indication used by EFIC is binary in nature. Similarly, no calibration of this "binary" indication is required. The binary signal is generated from the RPS Function based on reactor coolant pump status, and the RPS signal generation is calibrated per the requirements of ITS 3.3.1. Therefore, the NUREG requirement to perform SR 3.3.11.3 for ITS Table 3.3.11-1, Function 1.d is not adopted. The associated Bases are also revised to omit references to this SR for this Function. This change is consistent with CTS and plant specific design.

9 ANO-1 unit specific terminology and design details are included in ITS 3.3.9 and ITS 3.3.14 and in the Bases of ITS 3.3.11, 3.3.12, 3.3.13, and 3.3.14. Additionally, information which is not specifically pertinent to the Bases discussion for these specifications and which may be duplicative of information contained in the SAR has been removed. These changes provide unit specific details of system design, maintain usage of terminology consistent with design and license basis documentation and reduce duplication of discussion which is not specifically pertinent to the specifications.

3.3.11-04

10 Not Used

11 NUREG 3.3.12, 3.3.13, & 3.3.14 - The Applicability and ACTIONS for ITS 3.3.12, ITS 3.3.13, and ITS 3.3.14 are revised to reflect Applicability requirements consistent with the EFIC Function Applicabilities identified in ITS 3.3.11.

NUREG 3.3.12 - The EFIC Manual Initiation capabilities required by ITS 3.3.12 are provided only as backups to the automatic EFIC Functions required by ITS 3.3.11, and are not credited in any safety analysis. Therefore, the Applicability is revised from "MODES 1, 2 and 3" to "when associated EFIC Function is required to be OPERABLE." This removes an inconsistency in the NUREG that requires the Main Steam Line Isolation Manual Initiation Function to be OPERABLE in MODE 3 when SG pressure is < 750 psig when NUREG 3.3.11 does not otherwise require the Main Steam Line Isolation Function to be OPERABLE. A similar inconsistency exists when the unit is in MODE 3 with all associated valves closed. In other words, this LCO requires the backup Function to be OPERABLE when even the primary Function is not required. No change is required for the EFW Initiation Function since it is required to be OPERABLE in MODES 1, 2, and 3 by ITS 3.3.11. An inconsistency does not exist in CTS because CTS 3.5.1.1 provides an Applicability of "startup and operation" (i.e., ITS MODES 1 and 2) for the EFIC manual Functions, while CTS 3.5.1.16 extends the Applicability for automatic steam generator isolation beyond MODES 1 and 2. ACTION D is also incorporated to be consistent with placing the unit in a condition in which the equipment is not required. Finally, the associated Bases are also revised to reflect these changes in the Applicability and ACTIONS.

NUREG 3.3.13 - The EFIC Logic capabilities required by ITS 3.3.13 are provided only to support the associated Functions required by ITS 3.3.11, Functions 1 and 3. Therefore, the Applicability is revised from "MODES 1, 2 and 3" to "when associated EFIC Function is required to be OPERABLE." This removes an inconsistency in the NUREG that requires the Main Steam Line Isolation Logic Function to be OPERABLE in MODE 3 when SG pressure is < 750 psig when NUREG 3.3.11 does not otherwise require the Main Steam Line Isolation Function to be OPERABLE. A similar inconsistency exists when the unit is in MODE 3 with all associated valves closed. In other words, the NUREG requires the Logic Function to be OPERABLE when even the Instrumentation which feeds the Logic Function is not required. No change is required for the EFW Initiation Logic Function since it is required to be OPERABLE in MODES 1, 2, and 3 by ITS 3.3.11. An inconsistency does not exist in CTS because CTS 3.5.1.1 provides an Applicability of "startup and operation" (i.e., ITS MODES 1 and 2) for the EFIC Logic Functions, while CTS 3.5.1.16 extends the Applicability for automatic steam generator isolation beyond MODES 1 and 2. ACTION C is also incorporated to be consistent with placing the unit in a condition in which the equipment is not required. Finally, the associated Bases are also revised to reflect these changes in the Applicability and ACTIONS.

NUREG 3.3.14 - The EFIC Vector Logic capabilities required by ITS 3.3.14 are provided only to support NUREG Table 3.3.11-1, Functions 2.a and 2.b. Therefore, the Applicability is revised from "MODES 1, 2 and 3" to "MODES 1 and 2, MODE 3 when SG pressure is ≥ 750 psig" which is equivalent to the Applicability requirements for EFW Vector Valve Control in NUREG 3.3.11. This removes an inconsistency in the NUREG that requires the EFIC Vector Logic Function to be OPERABLE in "MODE 3 when SG pressure is < 750 psig" when NUREG 3.3.11 does not otherwise require the EFW Vector Valve Control (which the EFIC Vector Logic supports) to be OPERABLE. An inconsistency does not exist in CTS because CTS does not directly require EFIC Vector Logic. Required Action B.2 is also revised to be consistent with placing the unit in a condition in which the equipment is not required. Finally, the associated Bases are also revised to reflect these changes in the Applicability and ACTIONS.

12 NUREG 3.3.12 Bases - The LCO Bases discussion is revised to omit "whenever the SGs are being relied on to remove heat" since this language is not consistent with the Applicability of the Specification. Such language would imply that the EFIC Manual Initiation Function should be OPERABLE during a portion of MODE 4 as well as MODES 1, 2, and 3. The Applicability of ITS 3.3.12 does not require OPERABILITY in MODE 4, and the misleading language is not necessary in the LCO discussion. Therefore, it is removed.

13 NUREG Bases - The Criterion statement at the conclusion of the Applicable Safety Analysis section was modified to refer to 10 CFR 50.36 instead of the NRC Policy Statement. This is an editorial change associated with the implementation of the 10 CFR 50.36 rule changes after NUREG-1430, Revision 1 was issued.

NUREG 3.3.12 Bases - The Applicable Safety Analyses Bases discussion is revised to identify 10 CFR 50.36 Criterion 4 as the applicable criterion rather than Criterion 3. The discussion in the first paragraph of the Applicable Safety Analyses Bases identifies that the EFIC Manual Initiation Function as in the design but not credited in the safety analyses. Since the Function is not part of the primary success path but is included in Technical Specifications only because it is a backup system considered to be "significant to public health and safety." This basis more closely aligns with Criterion 4.

NUREG 3.3.11 Bases - the 10 CFR 50.36 Criterion satisfied was modified to preserve consistency with the ANO-1 license basis. Specifically, ANO-1 safety analyses upon which ITS LCOs 3.3.11, 3.3.13, and 3.314 are based were performed with the reactor critical. Thus, the Criterion statement was revised to specify that the LCO satisfies Criterion 3 of 10 CFR 50.36 when in MODES 1 and 2. When in MODE 3, the LCO satisfies Criterion 4 of 10 CFR 50.36. This change is consistent with current license basis and 10 CFR 50.36.

14 NUREG 3.3.12 LCO, Actions and Bases were revised to refer to the Manual Trip as being a train/trip bus function rather than a channel function. One manual trip button for each function is located on each trip bus, with two trip buses associated with each train. Clarifying this configuration ensures the operator will trip only the affected trip bus and not the entire train. Tripping the train (both trip buses) would result in the undesired full emergency feedwater actuation for that train of equipment. This terminology better describes the actual location where the manual trip function is located within the EFIC system.

3.3.12-01

Due to the design of the ANO-1 EFIC system, a new Action B/B.1 was added to address scenarios where two manual trip functions of a single channel and like function are inoperable simultaneously. The 72-hour Completion time for the new Action is acceptable since it is consistent with the Completion Time associated with one inoperable train of emergency feedwater (Reference Section 3.3C CTS DOC L1). The letter designations of the subsequent Actions have also been modified accordingly.

In addition, the manual trip function may be satisfied by the manual trips actuated from the remote switch matrix on the control room console or by the manual trip pushbuttons located on the trip modules in the EFIC cabinets, which are also located in the control room. Either trip location may satisfy the manual trip function. Therefore, "required" has been added to Condition A and Condition B to allow crediting either location.

This change is consistent with the ANO-1 SAR system description and represents a plant specific terminology preference. This is consistent with current license basis.

ITS DISCUSSION OF DIFFERENCES

15 NUREG 3.3.13 LCO, Actions and Bases were revised to refer to the EFIC Logic Function as being a train function rather than a channel function. This terminology better describes the actual location that the logic function is located within the EFIC system. This change is consistent with the ANO-1 SAR system description and represents a plant specific terminology preference. This is consistent with current license basis.

16 The Bases have been revised to reflect the unit specific methodology associated with the determination of instrument uncertainty. In addition, the Bases have been revised to correct the terminology used to describe uncertainties with terminology used at ANO. These changes are considered to be administrative in nature.

 CTS

3.3 INSTRUMENTATION

3.3.11 Emergency Feedwater Initiation and Control (EFIC) System Instrumentation

LCO 3.3.11 The EFIC System instrumentation channels for each Function in Table 3.3.11-1 shall be OPERABLE. [See Table]

APPLICABILITY: According to Table 3.3.11-1. [See Table]

ACTIONS

------------------------------------NOTE------------------------------------
Separate Condition entry is allowed for each Function. NA

CONDITION	REQUIRED ACTION	COMPLETION TIME	
A. One or more Emergency Feedwater (EFW) Initiation, Main Steam Line Isolation, or Main Feedwater (MFW) Isolation Functions listed in Table 3.3.11-1 with one channel inoperable.	A.1 Place channel(s) in bypass or trip.	1 hour	NA
	AND		
	A.2 Place channel(s) in trip.	72 hours	(2)
			(1)
B. One or more EFW Initiation, Main Steam Line Isolation, or MFW Isolation Functions listed in Table 3.3.11-1 with two channels inoperable.	B.1 Place one channel in bypass.	1 hour	NA
			(1)
	AND		Table 3.5.1-1 Note 6
	B.2 Place second channel in trip.	1 hour	
			(2)
	AND		
		(continued)	

CTS

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. (continued)	B.3	Restore one channel to OPERABLE status.	72 hours
C. One EFW Vector Valve Control channel inoperable.	C.1	Restore channel to OPERABLE status.	72 hours
D. Required Action and associated Completion Time not met for Functions 1.a or 1.b.	D.1	Be in MODE 3.	6 hours
	AND		
	D.2.1	-----NOTE----- Only required for Function 1a. ----- Open CONTROL ROD drive trip breakers.	6 hours
	AND		
	D.2.2	-----NOTE----- Only required for Function 1b ----- Be in MODE 4.	12 hours
E. Required Action and associated Completion Time not met for Function 1.d.	E.1	Reduce THERMAL POWER to ≤ 10% RTP.	6 hours

(continued)

(2) NA Table 3.5.1-1 Note 1 (5) NA NA (5) 1.a or

CTS

RAI 3.3.11-02

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time not met for Functions 1.c, 2, 3 or 4.	F.1 Be in MODE 3. AND F.2 Reduce once through steam generator pressure to < 750 psig.	6 hours 12 hours

Table 3.5.1-1 Note 1 NA

NA

NA

SURVEILLANCE REQUIREMENTS

----------------------------------NOTE----------------------------------
Refer to Table 3.3.11-1 to determine which SRs shall be performed for each EFIC Function.

SURVEILLANCE	FREQUENCY
SR 3.3.11.1 Perform CHANNEL CHECK.	12 hours
SR 3.3.11.2 Perform CHANNEL FUNCTIONAL TEST.	31 days
SR 3.3.11.3 Perform CHANNEL CALIBRATION.	[18] months
SR 3.3.11.4 Verify EFIC RESPONSE TIME is within limits.	[18] months on a STAGGERED TEST BASIS

NA

[See Table]

CTS

Table 3.3.11-1 (page 1 of 1)
Emergency Feedwater Initiation and Control System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	
1. EFW Initiation					
a. Loss of MFW Pumps (Control Oil Pressure)	≥ 10% RTP ~~1,2(a), 3(a)~~ (5)	4	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3	≥ 55.5 ~~> [55]~~ psig	T3.5.1-1 EFIC 1.d 3.5.1.15.c T4.1-1, #53d
b. SG Level — Low	1,2,3	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3 ~~SR 3.3.11.4~~ (3)	≥ 11.1 ~~[9]~~ inches	T3.5.1-1 EFIC 1.b T4.1-1, #53b NA
c. SG Pressure — Low	1,2,3(a) ~~(b)~~	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3	≥ 584.2 ~~[600]~~ psig	T3.5.1-1 EFIC 1.c 3.5.1.15.a T4.1-1, #53c
d. RCP Status	≥ 10% RTP (5)	4	SR 3.3.11.1 SR 3.3.11.2 ~~SR 3.3.11.3~~ (8)	NA	T3.5.1-1 EFIC 1.e 3.5.1.15.b T4.1-1, #53e
2. EFW Vector Valve Control					
a. SG Pressure — Low	1,2,3(a) ~~(b)~~	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3	≥ 584.2 ~~[600]~~ psig	NA T4.1-1, #56a&b
b. SG Differential Pressure — High	1,2,3(a) ~~(b)~~	4	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3	≤ 150 ~~[125]~~ psid	NA T4.1-1, #56c
~~c. SG Level — High~~ (4)	~~1,2,3(b)~~	~~4~~	~~SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3~~	~~≤ [ ] inches~~	
3. Main Steam Line Isolation					
a. SG Pressure — Low	1,2,3(a)(b) ~~(b)(c)~~ (5)	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3 ~~SR 3.3.11.4~~ (3)	≥ 584.2 ~~[600]~~ psig	T3.5.1-1 EFIC #2.b & #3.b 3.5.1.16 T4.1-1, #54b&55b
~~4. MFW Isolation~~ (1)					
~~a. SG Pressure — Low~~	~~1,2,3(b)(d)~~	~~4 per SG~~	~~SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3 SR 3.3.11.4~~	~~≥ [600] psig~~	

~~(a) When not in shutdown bypass.~~ (5)

(a) ~~(b)~~ When SG pressure ≥ 750 psig. — 3.5.1.15.a/3.5.1.16/NA

(b) ~~(c)~~ Except when all associated valves are closed and ~~[deactivated]~~. — NA

~~(d) Except when all [MFSVs], [MFCVs], [or associated SFCVs] are closed and [deactivated] [or isolated by a] closed manual valve].~~ (1)

< RAI 3.3.11-02 incorporates allowable values > RAI 3.3.11-04

R-E 3.3.11-02

 CTS

3.3 INSTRUMENTATION

3.3.12 Emergency Feedwater Initiation and Control (EFIC) Manual Initiation

LCO 3.3.12 Two manual initiation switches per actuation ~~channel~~ train for each of the following EFIC Functions shall be OPERABLE: (14) T3.5.1-1 EFIC

a. Steam generator (SG) ~~A Main Feedwater (MFW) Isolation;~~ (1)

~~b. SG B MFW Isolation;~~ #2a

~~c. SG~~ A Main Steam Line Isolation; #3a

(b) ~~d.~~ SG B Main Steam Line Isolation; and #1a

(c) ~~e.~~ Emergency Feedwater ~~Actuation~~ (EFW) Initiation.

APPLICABILITY: ~~MODES 1, 2, and 3.~~ When associated EFIC Function is required to be OPERABLE. NA (11)

ACTIONS

---NOTE---
Separate Condition entry is allowed for each Function. NA

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more EFIC Function(s) with one ~~or both~~ (required) manual initiation switch~~es~~ inoperable in one actuation ~~channel~~ train.	A.1 Place ~~actuation channel~~ (affected trip bus in affected train) for the associated EFIC Function(s) in trip.	72 hours NA (14)
~~B.~~ C. One or more EFIC Function(s) with one or both (required) manual initiation switches inoperable in both actuation ~~channels~~ trains.	~~B.~~ C.1 Restore one actuation ~~channel~~ train for the associated EFIC Function(s) to OPERABLE status.	1 hour NA (14)
B. One or more EFIC Function(s) with both manual initiation switches inoperable in a single actuation train.	B.1 Restore one manual initiation switch for each of the affected functions to OPERABLE status.	72 hours

RAI 3.3.12-01

(continued)

CTS

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~C~~ D. Required Action and associated Completion Time not met for EFW Initiation Function.	~~C~~ D.1 Be in MODE 3. AND ~~C~~ D.2 Be in MODE 4.	6 hours 12 hours

T3.5.1-1, EFIC #1a, #2a, #3a Note 1

NA

11

<INSERT 3.3-32A>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.3.12.1 Perform CHANNEL FUNCTIONAL TEST.	31 days

T4.1-1, #53a #54a, #55a

<INSERT 3.3-32A>

3.3.12-01	E.	Required Action and associated Completion Time not met for Main Steam Line Isolation Function.	E.1 Be in MODE 3. AND E.2.1 Reduce steam generator pressure to < 750 psig. OR E.2.2 Close all associated valves.	6 hours 12 hours 12 hours	T3.5.1-1 EFIC #1.f Note 1 NA NA	

CTS

3.3 INSTRUMENTATION

3.3.13 Emergency Feedwater Initiation and Control (EFIC) Logic

LCO 3.3.13 ~~Channels~~ Trains A and B of each Logic Function shown below shall be OPERABLE: (15)

~~a. Main Feedwater Isolation;~~ (1)

~~b.~~ a. Main Steam Line Isolation; and — NA T3.5.1-1 EFIC #1.f

~~c.~~ b. Emergency Feedwater ~~Actuation; and~~ (EFW) Initiation.

~~d. Vector Valve Enable Logic.~~ (1)

APPLICABILITY: ~~MODES 1, 2, and 3.~~ When associated EFIC Function is required to be OPERABLE. (11) NA

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each Function. NA

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more ~~channel~~ train A Functions inoperable with all ~~channel~~ train B Functions OPERABLE; or one or more ~~channel~~ train B Functions inoperable with all ~~channel~~ train A Functions OPERABLE.	A.1 Restore affected ~~channel~~ train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met for EFW Initiation Function.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours 12 hours

NA (15) T3.5.1-1 EFIC 1.f, Note 1 NA (11)

<INSERT 3.3-33A>

<INSERT 3.3-33A>

C. Required Action and associated Completion Time not met for Main Steam Line Isolation Function.	C.1 Be in MODE 3. AND C.2.1 Reduce steam generator pressure to < 750 psig. OR C.2.2 Close and deactivate all associated valves.	6 hours 12 hours 12 hours	T3.5.1-1 EFIC #1.f Note 1 NA NA

3.3.11-02

CTS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.13.1	Perform CHANNEL FUNCTIONAL TEST.	31 days

T4.1-1
#53.f
& NA

CTS

9

3.3 INSTRUMENTATION

3.3.14 Emergency Feedwater Initiation and Control (EFIC) ~~Emergency Feedwater (EFW)~~ Vector ~~Valve~~ Logic

edit NA

LCO 3.3.14 Four channels of the EFIC vector ~~valve~~ logic shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and ~~3~~ 2, MODE 3 when steam generator pressure is ≥ 750 psig. (11)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One vector ~~valve~~ logic channel inoperable.	A.1	Restore channel to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	B.2	Reduce steam generator ~~Be in MODE 4.~~ pressure to < 750 psig. (11)	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.3.14.1 Perform a CHANNEL FUNCTIONAL TEST.	31 days

B 3.3 INSTRUMENTATION

B 3.3.11 Emergency Feedwater Initiation and Control (EFIC) Instrumentation

BASES

BACKGROUND

INSERT B 3.3-91A

The EFIC System instrumentation is designed to provide safety grade means of controlling the secondary system as a heat sink for core decay heat removal. To ensure the secondary system remains a heat sink, the EFIC System takes action to initiate emergency feedwater (EFW) when the primary source of feedwater is lost and to isolate functional components from hydraulic faults within the secondary system. These actions ensure that a source of cooling water is available to be fed to a once through steam generator (OTSG) that has a controlled steam pressure, thereby fixing the heat sink temperature at the saturation temperature of the secondary system. The EFIC Functions that are supported and the parameters that are needed for each of these Functions are described next. 9

The EFIC instrumentation contains devices and circuitry that generate the following signals when monitored variables reach levels that are indicative of conditions requiring protective actions.

a. EFW Initiation;

b. EFW Vector Valve Control;

c. Main Steam Line Isolation; and 1

d. Main Feedwater (MFW) Isolation.

EFW is initiated to restore a source of cooling water to the secondary system when conditions indicate that the normal source of feedwater is insufficient to continue heat removal. The two indications used for this are the loss of both MFW pumps and a low level in the steam generator (SG). Also, EFW is initiated when action is being taken to isolate the MFW from the SG during conditions of uncontrolled depressurizations. This is done by initiating EFW when steam pressure reaches the low SG pressure setpoint for isolation of main steam and MFW, and EFW vector valve control. Finally, EFW is initiated when the primary system experiences a total loss of forced circulation. This initiation, on the loss of all reactor coolant pumps (RCPs), edit edit

Also

(continued)

<INSERT B 3.3-91A>

protect against the consequences of a simultaneous blowdown of both steam generators. Steam generator (SG) isolation is actuated to protect the core during an overcooling condition upon a main steam or feedwater line rupture. The Emergency Feedwater (EFW) System is actuated to protect the core during an overheating condition upon a loss of main feedwater or a loss of primary side forced circulation (loss of all four reactor coolant pumps). In addition, EFIC controls the EFW flow rate to the SG(s) to control SG level and minimize overcooling. EFIC also selects the appropriate SG(s) under conditions of steam line break or main feedwater or emergency feedwater line break downstream of the last check valve, and provides for isolation of the main steam and main feedwater lines of a depressurized steam generator.

BASES

BACKGROUND (continued)

ensures the EFW is available to raise SG levels to promote natural circulation cooling. Additionally, this ensures that EFW is available under the worst case, small break loss of coolant accident (LOCA) conditions when secondary system cooling with high SG water levels is necessary.

The EFIC System also isolates main steam and MFW to an SG that has lost pressure control. With the loss of pressure control, the heat sink temperature control is lost and the heat removal rate cannot be controlled. The main steam and MFW are isolated to an SG when the steam pressure reaches a low setpoint, a condition which is beyond the normal operating point of the secondary system.

The EFIC System also performs an EFW control function to avoid delivering EFW to a depressurized SG when the other SG remains pressurized. This continues the function of isolating functional components from an SG whose pressure cannot be controlled. This function precludes the delivery of fluid to a depressurized SG, thereby avoiding an uncontrolled cooling condition as long as the other SG remains pressurized. When both of the SGs are depressurized, the EFIC logic provides EFW flow to both SGs until a significant pressure difference between the two SGs is developed, thereby ensuring that core cooling is maintained.

Trip Setpoints and Allowable Values

The trip setpoints are the nominal value at which the bistables are set. Any bistable is considered to be properly adjusted when the "as left" value is within the band for CHANNEL CALIBRATION accuracy (i.e., ± [rack calibration + comparator setting accuracy]).

The trip setpoints used in the bistables are based on the analytical limits stated in FSAR, Section [14.1] (Refs. 1). The selection of these trip setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. The Allowable Values specified in Table 3.3.11-1 in the accompanying LCO are conservatively adjusted with respect to the analytical limits to allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environmental errors for those EFIC channels that must function in harsh

(continued)

<INSERT B 3.3-92A>

The EFIC System initiates EFW when an Engineered Safeguards Actuation System (ESAS) signal is initiated on low RCS pressure or high reactor building pressure (ESAS Channels 3 and 4) in order to support heat removal following Emergency Core Cooling System (ECCS) actuation. This is a digital signal provided by the ESAS Automatic Actuation Logic. Refer to the Bases for LCO 3.3.5, "Engineered Safeguards Actuation System (ESAS) Instrumentation," and LCO 3.3.7, "Engineered Safeguards Actuation System (ESAS) Automatic Actuation Logic," for additional discussion.

The EFIC System also initiates EFW on loss of main feedwater flow as part of the Diverse Reactor Overpressure Protection System (DROPS) which is the system provided for ANO-1 to comply with requirements to reduce risk from an anticipated transient without scram (ATWS). The DROPS consists of the Diverse Scram System (DSS) and the ATWS Mitigation System Actuation Circuitry (AMSAC) . EFW initiation for ATWS prevention and mitigation is not required by this Specification.

BASES

BACKGROUND

Trip Setpoints and Allowable Values (continued)

environments as defined by 10 CFR 50.49 (Ref. 2). A detailed description of the methodology used to calculate the trip setpoints, including their explicit uncertainties, is provided in "[Unit Specific Setpoint Methodology]" (Ref. 3). The actual nominal trip setpoint entered into the bistable is more conservative than that specified by the Allowable Value to account for changes in random measurement errors detectable by a CHANNEL FUNCTIONAL TEST. One example of such a change in measurement error is drift during the surveillance interval. A channel is inoperable if its actuation trip setpoint is not within its required Allowable Value.

Setpoints in accordance with the Allowable Value ensure that the consequences of Design Basis Accidents (DBAs) are acceptable, providing the unit is operated from within the LCOs at the onset of the DBA, and that the equipment functions as designed.

Each channel can be tested on line to verify that the setpoint accuracy is within the specified allowance requirements of Figure [ ], FSAR, Chapter [7] (Ref. 4). Once a designated channel is taken out of service for testing, a simulated signal is injected in place of the field instrument signal. The process equipment for the channel in test is then tested, verified, and calibrated. The SRs for the channels are specified in the SRs Section.

The Allowable Values listed in Table 3.3.11-1 are based on the "[Unit Specific Setpoint Methodology]" (Ref. 3), which incorporates all of the known uncertainties applicable for each channel. The magnitudes of these uncertainties are factored into the determination of each trip setpoint. All field sensors and signal processing equipment for these channels are assumed to operate within the allowances of these uncertainty magnitudes.

Figure [ ], FSAR, Chapter [7] (Ref. 4), illustrates EFIC EFW initiation logic operation.

Each EFIC train actuates on a one-out-of-two taken twice combination of trip signals from the instrumentation channels. Each EFIC channel can issue an initiate command, but an EFIC actuation will take place only if at least two

(continued)

BASES

BACKGROUND Trip Setpoints and Allowable Values (continued)

channels issue initiate commands. The one-out-of-two taken twice logic combinations are transposed between trains so that failure of two channels prevents actuation of, at most, one train.

More detailed descriptions of the EFIC instrumentation are provided next.

1. EFW Initiation

Figure 7.1, FSAR, Chapter 7 (Ref. 8), illustrates one channel of the EFIC EFW Initiation channel. The individual instrumentation channels that serve EFIC EFW Initiation Function are discussed next.

a. Loss of MFW Pumps (Control Oil Pressure)

Loss of both MFW Pumps is one of the four parameters within the EFIC System that automatically initiates EFW. Loss of MFW Pumps is detected by MFW Pump turbine control oil pressure. The MFW Pump status instrumentation is a part of the nuclear instrument (NI) and Reactor Protection System (RPS). Each RPS channel receives MFW Pump status information from pressure switches (four per pump). If both switches in a single channel trip, the associated RPS channel trips. Each RPS channel provides both MFW Pumps tripped signal to the associated EFIC channel. The trip Function is bypassed when THERMAL POWER ≤ 20% RTP and the RPS is in shutdown bypass. The bypass is automatically removed when THERMAL POWER is greater than 20% RTP.

Loss of both MFW Pumps was chosen as an EFW automatic initiating parameter because it is a direct and immediate indicator of loss of MFW.

b. SG Level—Low

Four EFIC dedicated low range level transmitters per SG Level—Low are used to generate the signals used for detection for low level

(continued)

<INSERT B 3.3-94A>

The MFW Pump status instrumentation, and associated bypasses, are internal to the Reactor Protection System (RPS). For RPS, loss of MFW Pumps is detected by MFW Pump turbine control oil pressure. Each RPS channel receives MFW Pump status information from one of four pressure switches per pump. If both switches in a single channel trip (one from each pump), the associated RPS channel trips. Each RPS channel provides a contact input into its associated EFIC channel representative of both MFW Pumps tripped. At least two EFIC channels in trip are required for EFW Initiation. This Function is automatically bypassed when THERMAL POWER is < 10% RTP and the bypass is automatically removed when THERMAL POWER is ≥ 10% RTP. The bypass functions occur internal to the RPS, i.e., prior to input to the EFIC System. This parameter value (i.e., 10% RTP) is a nominal value consistent with the requirements of LCO 3.3.1, "RPS Instrumentation".

BASES

BACKGROUND

b. SG Level—Low (continued)

conditions for EFW actuation. There is one transmitter for each of the four channels A, B, C, and D. The signals are also used after EFW is actuated to control SG level at the low level setpoint of 30 inches when one or more RCPs are operational.

The lower and upper taps for the low range level transmitters are located at 6 inches and 277 inches, respectively, above the upper face of the SG's lower tube sheet. The calibrated range is 0-150 inches.

SG Level—Low was chosen as an EFW automatic initiating parameter because it indicates that the primary feedwater source is insufficient to meet the heat removal requirements and, therefore, additional cooling water is necessary to ensure core decay heat removal.

c. SG Pressure—Low

Four transmitters per SG provide the EFIC System with channels A through D of SG Pressure—Low. These are the same transmitters used by the MFW and Main Steam Line Isolation Functions. When the SG pressure drops below the bistable setpoint of 600 psig on a given channel, an EFW Initiation signal is sent to the automatic actuation logic. The low pressure Function may be manually bypassed when both SGs are less than 750 psig. If either SG input channel exceeds 750 psig, the EFIC channel bypass is automatically removed. The low pressure operational bypass allows for normal cooldown without EFIC actuation.

SG Pressure—Low is a primary indication and actuation signal for steam line breaks (SLBs) or feedwater line breaks (FWLBs). For small breaks, which do not depressurize the SG or takes a long time to depressurize, automatic actuation is not required. The operator has time to diagnose the problem and take the appropriate actions.

(continued)

<INSERT B 3.3-95A>

At least two channels are required to initiate EFW and main steam line isolation. The Allowable Value of ≥ 584.2 psig includes consideration for instrumentation error and an allowance for margin. Allowances for instrument drift and additional margin are included in the trip setpoint.

<INSERT B 3.3-95B>

3.3.11-01

The parameter value (i.e., 750 psig) is a nominal value. Should the channel remain bypassed above 750 psig, the channel is considered inoperable and appropriate conditions are entered. Failure of the automatic bypass removal feature alone or the inability to bypass a channel when below 750 psig does not constitute channel inoperability. The automatic bypass removal feature is verified during the monthly CHANNEL FUNCTIONAL TEST.

BASES

BACKGROUND (continued)

d. RCP Status

A loss of power to all four RCPs is an indication of a pending loss of forced flow in the Reactor Coolant System. These sensing signals are input into the four channels of EFIC.

When at least two channels issue initiate commands based on loss of all RCPs, the EFIC System will automatically actuate EFW and switch the level control setpoint to approximately 50% in the SG. This higher setpoint provides a thermal center in the SG at a higher elevation than that of the reactor to ensure natural circulation of the reactor coolant.

To allow heatup and cooldown operations without actuation, a bypass permissive of 10% RTP is used. The 10% bypass permissive was chosen because it was an available, qualified Class 1E signal at the time the EFIC System was designed. When the first RCP is started, the "loss of four RCPs" initiation signal may be manually reset. If the bypass is not manually reset, it will be automatically reset when the unit reaches 10% power. During cooldown, the bypass may be inserted at any time the power has been reduced below 10%. However, for most operating conditions, it is recommended that this trip function remains active until after the Decay Heat Removal System has been initiated and the system is ready for the last RCP to be tripped. This trip function must be bypassed prior to stopping the last RCP.

2. EFW Vector Valve Control

Figure 7, SAR, Chapter 7 (Ref. 6), illustrates one channel of the EFIC EFW Vector Valve Control logic. The function of the EFW vector logic is to determine whether EFW should not be fed to one or the other SG. This is to preclude the continued addition of EFW to a depressurized SG and, thus, to minimize the overcooling effects of a steam leak.

(continued)

<INSERT B 3.3-96A>

This parameter value (i.e., 10% RTP) is a nominal value consistent with the requirements of LCO 3.3.1, "RPS Instrumentation."

<INSERT B 3.3-96B>

e. ESAS

The EFIC System initiates EFW when an ESAS signal is initiated on low RCS pressure or high reactor building pressure (ESAS Channels 3 and 4) in order to support heat removal following ECCS actuation. This is a digital signal provided by the ESAS Automatic Actuation Logic. Refer to the Bases for LCO 3.3.5, "Engineered Safeguards Actuation System (ESAS) Instrumentation," and LCO 3.3.7, "Engineered Safeguards Actuation System (ESAS) Automatic Actuation Logic," for additional discussion.

f. DROPS

The EFIC System also initiates EFW on loss of main feedwater flow as part of the DROPS which is the system provided for ANO-1 to comply with requirements to reduce risk from an ATWS. The DROPS consists of the Diverse Scram System (DSS) and the ATWS Mitigation System Actuation Circuitry (AMSAC) . EFW initiation for ATWS prevention and mitigation is not required by this Specification.

<INSERT B 3.3-96C>

inputs to the EFIC Vector Logic (See Bases for LCO 3.3.14, "EFIC Vector Logic").

<INSERT B 3.3-96D>

once enabled by the EFW Initiation Function.

BASES

BACKGROUND

2. EFW Vector Valve Control (continued)

Each set of vector logic receives SG pressure information from bistables located in the input logic of the same EFIC channel. The pressure information received is:

a. SG A pressure less than 600 psig; 584.2

b. SG B pressure less than 600 psig;

c. SG A pressure 125 100 psid greater than SG B pressure; and

d. SG B pressure 125 100 psid greater than SG A pressure.

INSERT B 3.3-97A

Each vector logic also receives a vector/control enable signal from both EFIC channel A and channel B when EFW is initiated. [Each logic also receives an SG high level signal. High level in an SG prevents opening the associated vector valves and enables closing the valves without either EFIC train vector valve enable.]

edit

4

The vector logic develops signals to open or to close SG A and B EFW valves.

9

The vector logic outputs are in a neutral state until enabled by the control/vector enable from the channel train A or B trip logics. When enabled, the vector logic can issue open or close commands to the EFW control valves and open or closed commands to the EFW isolation valves per the selected channel assignments. The level control module provides input to the flow controllors which control the position of the EFW control valves.

9

Each vector logic may isolate EFW to one SG or the other, never both.

(continued)

<INSERT B 3.3-97A>

The Allowable Value of ≥ 584.2 psig includes consideration for instrumentation error and an allowance for margin. Allowances for instrument drift and additional margin are included in the trip setpoint. The 100 psid value is considered to be a nominal value.

BASES

BACKGROUND

2. EFW Vector Valve Control (continued)

The valve open or close commands are determined by the relative values of SG pressures as follows:

PRESSURE STATUS	SG VALVES "A"	SG VALVES "B"
SG A and SG B > 600 psig	Open	Open
¦ SG A - SG B ¦ < 125 psid	Open	Open
SG A or SG B ≤ 600 psig and SG A - SG B ≥ 125 psid	Open	Close
SG A or SG B ≤ 600 psig and SG B - SG A ≥ 125 psid	Close	Open

discussed in the Bases for LCO 3.3.14.

9

edit

INSERT from page B3.3-99

Bypass

One of the four initiation channels can be put into "maintenance bypass." Bypassing one initiation channel isolates that channel's signal to the functions fed from initiation channel but does not bypass the trip logic within the actuation channel. An interlock feature prevents bypassing more than one channel at a time. In addition, since the EFIC System receives signals from NI and RPS, the maintenance bypass from the NI and RPS is interlocked with the EFIC System. If one channel of the NIS and RPS is in maintenance bypass, only the corresponding channel of the EFIC may be bypassed (e.g., channel A, NI or RPS, and channel A, EFIC). This ensures that only the corresponding channels of the EFIC and NI and RPS are placed in maintenance bypass at the same time.

train

the

9

EFIC channel maintenance bypass does not bypass EFW Initiation from Engineered Safety Feature Actuation System (ESFAS) high pressure injection (HPI). The EFIC HPI Actuation Function is, however, bypassed when ESFAS is bypassed.

EFW initiation from ESAS

its associated

channel

9

The operational bypass provisions were discussed as part of the individual Functions described earlier.

(continued)

BASES

BACKGROUND — Bypass (continued)

Operational bypass of the OTSG Level—High input to the vector valve logic is possible after EFIC initiation. [For this unit, bypassing the overfill function is for the following reasons:]

3. 4. Main Steam Line and MFW Isolation

Figure [ ], FSAR, Chapter [7] (Ref. 4) illustrates one channel of the EFIC Main Steam Line and MFW Isolation logic. Four pressure transmitters per SG provide EFIC with channels A through D logic of SG pressure. The channels are as described for EFW Initiation mentioned earlier.

Once isolated, manual action is required to defeat the isolation command if desired. The EFIC System is designed to perform its intended function with one channel in maintenance bypass (in effect, inoperable) with a single failure in one of the remaining channels. This is in compliance with IEEE-279-1971 (Ref. 8) due to the redundancy and independence in the EFIC design.

Move to Page B3.3-98; Section 7.1.4; describes; (one transmitter per channel); EFW Initiation and Main Steam Line Isolation; postulated; concurrent; any; edit

APPLICABLE SAFETY ANALYSES

1. EFW Initiation

As part of the post-TMI review, a loss of MFW was analyzed (Ref 3).

Although loss of both MFW pumps is a direct and immediate indicator of loss of MFW, other scenarios such as valve closures could potentially cause loss of feedwater. The loss of MFW analysis, therefore, conservatively assures the actuation of EFW on low SG level. If the loss of feedwater is due to loss of MFW pumps, EFW will be actuated much earlier than assumed in the analysis, which will increase the SG heat transfer capability and will lessen the severity of the transient.

The DBA which forms the basis for initiation of the EFW systems is a loss of MFW transient. In the analysis of this transient, SG Level—Low is the parameter assumed to automatically initiate EFW. This assumption yields the least SG inventory available for heat removal and is, therefore, conservative for

EFIC system response for a; assumes; it would on low SG level; analysis; For; most conservative; from which; since this

(continued)

BASES

APPLICABLE SAFETY ANALYSES

1. EFW Initiation (continued)

evaluation of this DBA. SG Level—Low would be an indicator of all accidents involving a loss of primary to secondary heat removal.

(Handwritten markup: side inventory; any event; SG; capability; 9)

SG Pressure—Low is a primary indication and provides the actuation signal for SLBs or FWLBs. For small breaks, which do not depressurize the SG or take a long time to depressurize, automatic actuation is not required. The operator has sufficient time to diagnose the problem and take the appropriate actions.

(Handwritten markup: In the SLB analyses, SAR Section 14.2.2.1 (Ref 3), EFIC initiation occurs; however, no EFW flow occurred because level did not reach the SG Level-low setpoint. edit 9)

Loss of four RCPs is a primary indicator of the need for auxiliary feedwater (AFW) in the safety analyses for loss of electric power and loss of coolant flow. It also serves as a backup indicator for SLBs and small break LOCAs.

(Handwritten markup: emergency; the; analysis, SAR Section 14.1.2.8 (Ref. 3). 9; Insert B3.3-100A)

2. EFW Vector Valve Control

Most of the FSAR SLB analyses were performed prior to the development of the safety grade EFIC System. Therefore, the EFIC vector valve control was not credited in the original licensing basis for a main SLB analysis. Instead, operator action was credited with isolating AFW to the affected SG within the first 60 seconds. However, isolating the affected SG is a function automatically performed by the EFIC System. Therefore, the FSAR analysis remains conservative relative to the inclusion of the vector valve control.

(Handwritten markup: INSERT B 3.3-100B; 9)

3. Main Steam Line and MFW Isolation

(Handwritten markup: 1)

The FSAR analysis assumed integrated control system action for MFW and Main Steam Line Isolation. The analysis took credit for turbine stop valve closure and feedwater valve isolation on reactor trip and considered the isolation functions occurring on SG pressure < 600 psig as backup. These isolation functions are currently provided by the safety grade EFIC System. Use of the EFIC System in the original safety analysis would have been consistent with the licensing position allowing mitigative functions to be

(Handwritten markup: INSERT B 3.3-100C; 9)

(continued)

<INSERT B 3.3-100A>

The SAR SBLOCA analyses, SAR Section 14.2.2.5 (Ref. 3), assume initiation of EFW based on concurrent loss of offsite power and the resultant loss of four RCPs. Initiation of EFW would also occur when an ESAS signal is generated on low RCS pressure or high reactor building pressure (ESAS Channels 3 or 4) in order to support heat removal following ECCS actuation, however these are considered backup initiation responses.

<INSERT B 3.3-100B>

The SAR SLB analyses, SAR Section 14.2.2.1 (Ref. 3), consider isolation of the affected SG as a function automatically performed by the EFIC System. The EFIC Vector Logic utilizes the EFW Vector Valve Control Functions (i.e., SG Pressure — Low and SG Differential Pressure — High) to determine which steam generator is associated with the rupture and provide appropriate isolation.

<INSERT B 3.3-100C>

The SAR SLB analyses, SAR Section 14.2.2.1 (Ref. 3), assume actuation of the Main Steam Line Isolation on SG Pressure — Low, initiating closure of the main steam isolation valves and the main feedwater isolation valves. The steam generator in the steam loop associated with the rupture blows dry after feedwater isolation. EFW flow is available to the unaffected steam generator to preserve the availability of an RCS heat sink.

BASES

APPLICABLE SAFETY ANALYSES

3.4. Main Steam Line and MFW Isolation (continued)

performed by safety grade systems in accident analysis. For these reasons, the SLB accident analysis remains conservative with the assumed integrated control system actions.

In MODE 1 The EFIC System satisfies Criterion 3 of the NRC Policy Statement. 10 CFR 50.36 (Ref. 7).

In MODES 2 and 3 EFIC System satisfies Criterion 4 of 10 CFR 50.36 since there are no specific safety analyses that credit the EFIC system for operation at less than rated power

9

13

LCO

All instrumentation performing an EFIC System Function in Table B 3.3.11-1 shall be OPERABLE. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

edit

edit

Four channels are required OPERABLE for all EFIC instrumentation channels Functions to ensure that no single failure prevents actuation of a train. Each EFIC instrumentation channel is considered to include the sensors and measurement channels for each Function, the operational bypass switches, and permissives. Failures that disable the capability to place a channel in operational bypass, but which do not disable the trip Function, do not render the protection channel inoperable.

9

Only the Allowable Values are specified for each EFIC initiation and bypass removal function in the LCO. In Table 3.3.11-1, Allowable Values for the bypass removal functions are specified in terms of applicability limits on (i.e., identified in the Applicable MODES or Other Specified Conditions column of Table 3.3.11-1) for the associated trip Function. Nominal trip setpoints are specified in the unit specific setpoint calculations or calibration procedures. The nominal setpoints are selected to ensure the setpoints measured by CHANNEL FUNCTIONAL TESTS do not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable provided that operation and testing are consistent with the assumptions of the unit specific setpoint calculations. Each Allowable Value specified is more conservative than the analytical limit assumed in the safety analysis to account for instrument uncertainties appropriate to the trip Function. These uncertainties are defined in the Unit Specific Setpoint Methodology (Ref. 3). Guidance used to calculate the trip uncertainties associated with the trip setpoints is provided Reference 4.

7

9

edit

16

(continued)

BASES

LCO (continued)

The Bases for the LCO requirements of each specific EFIC Function are discussed next.

Loss of MFW Pumps

<INSERT B3.3-102A>

Four EFIC channels shall be OPERABLE with MFW pump turbines A and B control oil low pressure actuation setpoints of ≥ [55] psig. The 55 psig setpoint is about half of the normal operating control oil pressure. The 55 psig setpoint Allowable Value was arbitrarily chosen as a good indication of Loss of MFW Pumps. Analysis only assumes Loss of MFW Pumps and a specific value of MFW pump control oil pressure is not used in the analysis. The Loss of MFW Pumps Function includes a bypass enable and removal function from the NI/RPS. The bypass removal function is based on maintaining consistency with RPS LCO and design of system. (9)

SG Level—Low

Four EFIC dedicated low (an) range level transmitters per SG (Allowable Value) shall be OPERABLE with SG Level—Low actuation setpoints of ≥ [9] (11.1) inches, to generate the signals used for detection for low level conditions for EFW Initiation. <Insert B3.3-102B> There is one transmitter for each of the four channels A, B, C, and D. The signals are also used after EFW is actuated to control at the low (at approximately) level setpoint of [?] (31) inches when one or more RCPs are in operation. In the determination of the low level setpoint, it is desired to place the setpoint as low as possible, considering instrument errors, to give the maximum operability (operational) margin between the integrated control system low load control setpoint and the EFW Initiation setpoint. This will minimize spurious or unwanted initiation of EFW. Credit is only taken for low level actuation for those transients which do not involve a degraded environment. Therefore, normal environment errors only are used for determining the SG Level—Low level setpoint. (This parameter is referenced to the top of the lower tube sheet) (9) edit edit (9) (9)

SG Pressure—Low

Four EFIC channels per SG shall be OPERABLE with (an) SG low pressure actuation setpoints (Allowable Value) of ≥ [600] (584.2) psig. The setpoint is chosen to avoid actuation under transient conditions not requiring secondary system isolation, preferring to maintain (9)

(continued)

<INSERT B 3.3-102A>

Four EFIC channels for Loss of MFW Pumps shall be OPERABLE. This ensures that upon the loss of both MFW pumps, EFW will be automatically initiated. This Function is provided as a direct digital input from the RPS and includes a bypass enable and removal function.

<INSERT B 3.3-102B>

This parameter is referenced to the top of the lower tube sheet and includes consideration for instrumentation error and an allowance for margin. Allowances for instrument drift and additional margin are included in the trip setpoint.

BASES

LCO

SG Pressure—Low (continued)

a steaming path to the condenser, if possible. Small break LOCA analyses have indicated minimum secondary system pressures of approximately 700 psig. The SG Pressure—Low Function includes a bypass enable and removal function. The Function includes a bypass enable and removal function. The bypass removal Allowable Value is chosen to allow sufficient operating margin for the operator to bypass when cooling down.

greater than the above setpoint

edit

9

INSERT B3.3-103A

SG Differential Pressure—High

Four EFIC channels for SG differential pressure shall be OPERABLE with setpoints of ≤ 125 psid. The setpoint ensures that automatic EFW isolation to a depressurized SG occurs for the range of sizes of SLBs that require rapid actuation early in the event. The setpoint has also been chosen to avoid spurious isolation of EFW during conditions due to relatively small deviations in SG pressures that can be caused by primary system conditions. The SG Differential Pressure—High Function includes a bypass enable and removal function. The bypass removal Allowable Value is chosen to allow sufficient operating margin for the operator to bypass when cooling down.

is

Function

9

edit

edit

INSERT B3.3-103B

9

RCP Status

Four EFIC channels for RCP status shall be OPERABLE. This ensures that upon the loss of four RCPs, EFW will be automatically initiated with the EFW control level automatically raised to approximately 50%, providing a higher SG level for establishing and maintaining natural circulation conditions when the forced reactor coolant flow is lost. No setpoint is specified since the status indication as used by EFIC is binary in nature. The RCP Status Function includes a bypass enable and removal function from the RPS. The Allowable Value for the bypass removal is set high enough to avoid spurious actuations during low power operation.

312 inches

edit

9

<INSERT B3.3-103C>

(continued)

<INSERT B 3.3-103A>

The above Allowable Value (i.e., 584.2 psig) includes consideration for instrumentation error and an allowance for margin. Allowances for instrument drift and additional margin are included in the trip setpoint.

<INSERT B 3.3-103B>

The MSLB analysis assumes the depressurized SG is isolated when a differential pressure of 150 psid is detected. The in plant setpoint is conservatively chosen to protect the MSLB analysis assumptions.

<INSERT B 3.3-103C>

The above parameter value (i.e., 312 inches) does contain an allowance for instrument error. This parameter is referenced to the top of the lower tube sheet.

BASES

LCO (continued)

SG Level—High

[For this unit, the basis for SG Level—High signal is as follows:]

APPLICABILITY

The EFIC System instrumentation Functions shall be OPERABLE in accordance with Table 3.3.11-1. Each Function has its own requirements that are based on the specific accidents and conditions that it is designed to protect against.

The initiation of EFW on the Loss of MFW Pumps shall only be required in MODE 1 and in MODES 2 and 3 when not in shutdown bypass, when core power production and heat removal requirements are the greatest. Below these unit conditions the EFW Initiation on low SG level is rapid enough to avoid unnecessary primary system overheating.

EFW Initiation on low SG level shall be OPERABLE at all times the SG is required for heat removal. These conditions include MODES 1, 2, and 3. To avoid automatic actuation of the EFW pumps during normal heatup and cooldown transients, the low SG pressure Function can be bypassed at or below a secondary pressure of [750] psig. This secondary pressure can normally only be reached during MODE 3 operation.

The EFW System Initiation on loss of all RCPs Function shall be operable at ≥ 10% RTP. It is possible to bypass the Function below 10% RTP; however, for most cases, the Function is kept in service until the unit is placed on the Decay Heat Removal System. To prevent inadvertent actuation of the EFW pumps, it must be bypassed prior to stopping the last RCP.

The MFW, Main Steam Line Isolation and EFW Vector Valve Control Functions shall be OPERABLE in MODES 1, 2, and 3 with SG pressure ≥ 750 psig because the SG inventory can be at a high energy level and contribute significantly to the peak pressure with a secondary side break. Both the normal feedwater and the EFW must be able to be isolated on each SG to limit overcooling of the primary and mass and energy releases to the reactor building. Once the SG pressures have decreased below 750 psig, the Main Steam Line and MFW Isolation Functions can be bypassed to avoid actuation during normal unit cooldowns. The EFW Vector Valve Control

(continued)

<INSERT B 3.3-104A>

The parameter values provided as part of the Applicability do contain an allowance for instrument error.

BASES

APPLICABILITY (continued)

logic will not perform any function when both SG pressures are low, thus, the logic can also be bypassed at the same point. In MODES 4, 5, and 6, the energy level is low and the secondary side feedwater flow rate is low or nonexistent. In MODES 4, 5, and 6, the primary system temperatures are too low to allow the SGs to effectively remove energy and EFIC instrumentation is not required to be OPERABLE. Typically, or are sufficiently low to allow for operator action. Therefore,

edit

ACTIONS

If a channel's trip setpoint is found nonconservative with respect to the Allowable Value, or any of the transmitter, signal processing electronics, or EFIC channel cabinet modules are found inoperable, then all affected Functions provided by that channel must be declared inoperable and the unit must enter the Conditions for the particular protection Function affected.

A Note has been added to the ACTIONS indicating that a separate Condition entry is allowed for each Function.

A.1 and A.2 (2)

Condition A applies to failures of a single EFW Initiation, or Main Steam Line Isolation, or MFW Isolation instrumentation channel. This includes failure of a common instrumentation channel in any combination of the Functions. (1)

With one channel inoperable in one or more EFW Initiation, or Main Steam Line Isolation, or MFW Isolation Functions listed in Table 3.3.11-1, the channel(s) must be placed in bypass or trip within 1 hour. This Condition applies to failures that occur in a single channel, e.g., channel A, which when bypassed will remove initiate Functions within the channel from service. Since the RPS and EFIC channels are interlocked, only the corresponding channel in each system may be bypassed at any time. This feature is ensured by an electrical interlock. If testing of another channel in either the EFIC or RPS is required, the EFIC channel must be placed in trip to allow the other channel to be bypassed. With the channel in trip, the resultant logic is one-out-of-two. The Completion Time of 1 hour is adequate to perform Required Action A.1. (1)

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

Required Action A.2 provides for placing the channel(s) in trip if the channel(s) is/are not restored to OPERABLE status within 72 hours.

A single inoperable EFIC instrumentation channel affects at most one train of EFW, Main Steam Line Isolation, and MFW Isolation. Therefore, the 72 hour Completion Time was selected to be consistent with the allowed out of service time for the EFW, Main Steam Line Isolation, and MFW Isolation Functions.

B.1, B.2, and B.3 2

of the same

Condition B applies to a situation where two instrumentation channels for multiple protection functions of EFW Initiation, or Main Steam Line Isolation, or MFW Isolation instrumentation are inoperable. For example, Condition B applies if channel A and B of the EFW Initiation Function are inoperable.

Condition B does not apply if one channel of different Functions is inoperable in the same protection channel. That condition is addressed by Condition A.

edit

With two EFW Initiation, or Main Steam Line Isolation, or MFW Isolation protection channels inoperable, one channel must be placed in bypass (Required Action B.1). Bypassing one of the remaining OPERABLE channels is not possible due to system interlocks. Therefore, the second channel must be tripped (Required Action B.2) to prevent a single failure from causing loss of the EFIC Function. The Completion Times of 1 hour are adequate to perform the Required Actions.

One of the channels must be returned to OPERABLE status (Required Action B.3) to minimize the time the system is permitted to operate in a configuration that is not capable of withstanding a single failure and still initiate EFW, Main Steam Line Isolation, and MFW Isolation. Restoring one channel changes system status to that of Condition A. A single inoperable EFIC channel affects at most one train of EFW, Main Steam Line Isolation, and MFW Isolation. Therefore the 72 hour Completion Time was selected to be

(continued)

BASES

ACTIONS

B.1, B.2, and B.3 (continued)

consistent with the allowed out of service time for the EFW, Main Steam Line Isolation, and MFW Isolation Functions. (2)

C.1

The function of the EFW Vector Valve Control is to meet the single-failure criterion while being able to provide EFW on demand and isolate an SG when required. These conflicting requirements result in the necessity for two valves in series, in parallel with two valves in series, and a four channel valve command system. Refer to LCO 3.3.14, "Emergency Feedwater Initiation and Control (EFIC) Emergency Feedwater (EFW) Vector Valve Logic." (1)

With one EFW Vector Valve Control channel inoperable, the system cannot meet the single-failure criterion and still meet the dual functional criteria described earlier. This condition is analogous to having one EFW train inoperable. Therefore, when one vector valve control channel is inoperable, the channel must be restored to OPERABLE status (Required Action C.1) within 72 hours, which is consistent with the Completion Time associated with the loss of one train of EFW.

D.1, D.2.1, D.2.2, E.1, and F.1, F.2 (5) (6)

If the Required Actions cannot be met within the required and associated Completion Time Times are not met, the unit must be placed in a MODE or condition in which the requirement does not apply. This is done by placing the unit in a nonapplicable MODE for the particular Function. The nonapplicable MODE is to open the CRD trip breakers for Functions 1.a, MODE 4 for Function 1.b, and 1.d, less than 10% RTP for Function 1.d, and MODE 3 with SG pressure less than 750 psig for all other Functions. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems. (5) (6)

In addition, for Function 3.a, once the unit is in MODE 3, a nonapplicable condition may be achieved by closing and deactivating the valves associated with the Main Steam Line Isolation Function.

RAI 3.3.11-02

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

A Note indicates that the SRs for each EFIC instrumentation Function are identified in the SRs column of Table 3.3.11-1. All Functions are subject to CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, and CHANNEL CALIBRATION. The SG—Low Level Function is the only Function that was modeled in transient analysis, and thus is the only EFW Initiation Function subjected to response time testing. Response time testing is also required for Main Steam Line and MFW Isolation. Individual EFIC subgroup relays must also be tested, one at a time, to verify the individual EFIC components will actuate when required. Some components cannot be tested at power since their actuation might lead to unit trip or equipment damage. These are specifically identified and must be tested when shut down. The various SRs account for individual functional differences and for test frequencies applicable specifically to the Functions listed in Table 3.3.11-1. The operational bypasses associated with each EFIC instrumentation channel are also subject to these SRs to ensure OPERABILITY of the EFIC instrumentation channel.

SR 3.3.11.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure; therefore, it is key in verifying that the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the transmitter or the signal processing equipment has drifted outside its limit. If the channels are within the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.11.1 (continued)

criteria, it is an indication that the channels are OPERABLE. If the channels are normally off scale during times when surveillance is required, the CHANNEL CHECK will only verify that they are off scale in the same direction. Off scale low current loop channels are verified to be reading at the bottom of the range and not failed downscale.

The Frequency, about once every shift, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but more frequent, checks of channel operability during normal operational use of the displays associated with the LCO required channels.

SR 3.3.11.2

A CHANNEL FUNCTIONAL TEST verifies the function of the required trip, interlock, and alarm functions of the channel. Setpoints for both trip and bypass removal functions must be found within the Allowable Value specified in the LCO. (Note that the Allowable Values for the bypass removal functions are specified in the Applicable MODES or Other Specified Condition column of Table 3.3.11-1 as limits on applicability for the trip Functions.) Any setpoint adjustment shall be consistent with the assumptions of the current unit specific setpoint analysis.

The Frequency of 31 days is based on unit operating experience with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel of a given function in any 31 day interval is a rare event.

SR 3.3.11.3

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The test verifies the channel responds to a measured parameter within the necessary range

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.11.3 (continued)

and accuracy. CHANNEL CALIBRATION leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the ~~unit specific~~ setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the ~~unit specific~~ setpoint analysis. edit edit

The Frequency is based on the assumption of at least an [18] month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. 9

~~SR 3.3.11.4~~

~~This SR verifies individual channel actuation response times are less than or equal to the maximum value assumed in the accident analysis.~~

~~Response time testing acceptance criteria are included in "Unit Specific Response Time Acceptance Criteria" (Ref. 6).~~ 3

~~Individual component response times are not modeled in the analysis. The analysis models the overall or total elapsed time, from the point at which the parameter exceeds the actuation setpoint value at the sensor, to the point at which the end device is actuated.~~

~~EFIC RESPONSE TIME tests are conducted on an [18] month STAGGERED TEST BASIS. Testing of the final actuation devices, which make up the bulk of the EFIC RESPONSE TIME, is included in the testing of each channel. Therefore, staggered testing results in response time verification of these devices every [18] months. The [18] month test Frequency is based on unit operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences. EFIC RESPONSE TIMES cannot be determined at power since equipment operation is required.~~

(continued)

BASES (continued)

REFERENCES

3. ~~1.~~ ~~F~~SAR, ~~Section [14.1]~~ Chapter 14.

~~2. 10 CFR 50.49.~~

~~3. [Unit Name], "[Unit Specific Setpoint Methodology]."~~

2. ~~4.~~ ~~F~~SAR, Chapter ~~[7]~~ 6.

6. ~~5.~~ IEEE-279-1971, April 1972.

~~6. "Unit Specific Response Time Acceptance Criteria."~~ → 3

edit

4. Instrument Loop Error Analysis and Setpoint Methodology Manual, Design Guide, IDG-001.

5. SAR, Chapter 10, Figure 10-2, Sheet 4.

7. 10 CFR 50.36.

1. 10 CFR 50.62.

edit

B 3.3 INSTRUMENTATION

B 3.3.12 Emergency Feedwater Initiation and Control (EFIC) Manual Initiation

BASES

BACKGROUND

The EFIC manual initiation capability provides the operator with the capability to actuate EFIC Functions from the control room in the absence of any other initiation condition. Manually actuated Functions include main feedwater (MFW) Isolation for once through steam generator (SG) A, MFW Isolation for SG B, Main Steam Line Isolation for SG A, Main Steam Line Isolation for SG B, and Emergency Feedwater (EFW) Actuation. These Functions are provided in the event the operator determines that an EFIC Function is needed and does not automatically actuate. These are backup Functions to those performed automatically by EFIC.

Steam generator (SG)

prior to automatic actuation or in the event that EFIC

when required.

edit

1

<Insert B3.3-112A>

The EFIC manual initiation circuitry satisfies the manual initiation and single-failure criterion requirements of IEEE-279-1971 (Ref. 1).

APPLICABLE SAFETY ANALYSES

EFIC Functions credited in the safety analysis are automatic. However, the manual initiation Functions are required by design as backups to the automatic trip Functions and allow operators to actuate EFW, Main Steam Line Isolation, or MFW Isolation whenever these Functions are needed. Furthermore, the manual initiation of EFW Actuation, Main Steam Line Isolation, and MFW Isolation may be specified in unit operating procedures.

initiation

edit

or

and

1

The EFIC manual initiation functions satisfy Criterion 3 of the NRC Policy Statement.

4

10 CFR 50.36 (Ref. 2).

13

LCO

All instrumentation performing an EFIC manual initiation Function shall be OPERABLE. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

on the main control board

9

edit

14

train

Two manual initiation switches per actuation channel (A and B) of each Function (A and B MFW Isolation, A and B Main Steam Line Isolation, and EFW Actuation) are required to be OPERABLE whenever the SGs are being relied on to remove

1

12

(continued)

<INSERT B 3.3-112A>

The manual actuation of these functions may be performed from the Remote Switch Matrix, located on the main control boards, or from the manual actuation trip switches located on the EFIC control cabinets in the control room. The required manual actuation logic within each train consists of two manual switches (one for Trip Bus 1 and one for Trip Bus 2). When one manual trip switch is depressed, a half trip occurs. When both manual trip switches are depressed, a full trip of the train actuation occurs for that particular Function. The Remote Switch Matrix and the EFIC control cabinet trip switches perform parallel functions and, therefore, any combination of switches depressed within a train that energizes both Trip Bus 1 and Trip Bus 2 for a given Function will result in an actuation of that Function. The use of two manual trip switches for each train of actuation logic allows testing without actuating the end devices and also reduces the possibility of accidental manual actuations.

BASES

LCO (continued)

heat. Each Function (MFW Isolation, Main Steam Line Isolation, and EFW Initiation) has two actuation or "trip" channels, channels A and B. Within each channel A actuation logic there are two manual trip switches. When one manual switch is depressed, a half trip occurs. When both manual switches are depressed, a full trip of channel A actuation occurs for that particular Function. Similarly, channel B actuation logic for each Function has two manual trip switches. Both switches per actuation channel must be OPERABLE and must be depressed to get a full manual trip of that channel. The use of two manual trip switches for each channel of actuation logic allows for testing without actuating the end devices and also reduces the possibility of accidental manual actuation.

<Insert B 3.3-113A> (12) (14)

APPLICABILITY

The MFW and Main Steam Line Isolation manual initiation Functions shall be OPERABLE in MODES 1, 2, and 3 because SG inventory can be at a sufficiently high energy level to contribute significantly to the peak containment pressure during a secondary side break. In MODES 4, 5, and 6, the SG energy level is low and secondary side feedwater flow rate is low or nonexistent.

The EFW manual initiation Function shall be OPERABLE in MODES 1, 2, and 3 because the SGs are relied on for Reactor Coolant System heat removal. In MODES 4, 5, and 6, heat removal requirements are reduced and can be provided by the Decay Heat Removal System.

<INSERT B3.3-113B> (11)

ACTIONS

A Note has been added to the ACTIONS indicating that separate Condition entry is allowed for each EFIC manual initiation Function.

A.1

With one or both (required) manual initiation switches of one or more EFIC Function(s) inoperable in one channel (train), the channel for the associated EFIC Function(s) must be placed in the tripped condition within 72 hours. With the channel (trip bus) in the tripped condition, the single-failure criterion is met and the operator can still initiate one actuation channel given (14)

KAI 3.3.12-01

(continued)

<INSERT B 3.3-113A>

This requirement may be satisfied by the manual trip switches located on the Remote Switch Matrix on the main control board, by the trip switches located on the EFIC control cabinets, or by any combination of switches located the Remote Switch Matrix and the EFIC control cabinets such that Trip Bus 1 and Trip Bus 2 are available for each EFIC Function in each of the two EFIC trains.

<INSERT B 3.3-113B>

The EFIC System Manual Initiation Function shall be OPERABLE when the associated EFIC Instrumentation Main Steam Line Isolation or EFW Initiation Function is required to be OPERABLE in accordance with Table 3.3.11-1. Each Function, i.e., Main Steam Line Isolation and EFW Initiation, has its own requirements that are based on the specific accidents and conditions for which it is designed to mitigate the consequences. See Bases for LCO 3.3.11, "EFIC Instrumentation," for additional discussion of each Function.

BASES

ACTIONS A.1 (continued)

a single failure in the other channel. Failure to perform Required Action A.1 could allow a single failure of another switch to prevent manual actuation of at least one of two trip channels. The Completion Time allotted to trip the channel allows the operator to take all the appropriate actions for the failed channel and still ensure that the risk involved in operating with the failed channel is acceptable.

trains

trip bus

the

14

<INSERT B3.3-114D>

manual initiation switch

C B.1

required

With one or both manual initiation switches of one or more EFIC Function(s) inoperable in both actuation channels, one actuation channel for each Function must be restored to OPERABLE status within 1 hour. With the channel restored, the second channel must be placed in the tripped condition within 72 hours (Required Action A.1). With the channel in the tripped condition, the single-failure criterion is met and the operator can still initiate one actuation channel given a single failure in the other channel. The Completion Time allotted to restore the channel allows the operator to take all the appropriate actions for the failed channel and still ensures that the risk involved in operating with the failed channel is acceptable.

trains

train

per

appropriate

Compliance with these actions ensures

or B.1, as applicable

14

RAI 3.3.12-01

D

C.1 and C.2

the

and the associated

If Required Action A.1 or Required Action B.1 cannot be met within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit 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 MODES from full power conditions in an orderly manner and without challenging unit systems.

is not met for any EFW Initiation Function

edit

11

<INSERT B3.3-114A>

11

(continued)

<INSERT B 3.3-114A>

E.1, E.2.1, and E.2.2

3.3.11-02

If the Required Actions and associated Completion Times are not met for the Main Steam Line Isolation Function, the unit must be placed in a MODE or condition in which the requirement does not apply. This is initiated by placing the unit in MODE 3 within 6 hours and, either reducing SG pressure to less than 750 psig, or closing and deactivating all associated valves, i.e., the valves which EFIC would close if it were to actuate while OPERABLE . The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

3.3.12-01

<INSERT B 3.3-114B>

B.1

With both required manual initiation switches of one or more EFIC Function(s) inoperable in one train, one manual initiation switch must be restored to OPERABLE status within 72 hours. The effect for both required switches being inoperable simultaneously is the same as for the associated EFIC components for a single train being inoperable. Therefore, the 72-hour Completion Time is appropriate since it is consistent with the Completion Times of the associated system train. The trip bus associated with the remaining inoperable manual initiation switch must be placed in the tripped condition within 72 hours (Required Action A.1). With the affected trip bus in the tripped condition, the single failure criterion is met. The Completion Time allotted to restore a trip bus or place the trip bus in the tripped condition allows the operator to take all appropriate actions for the failed manual initiation switches and still ensure that the risk involved in operating with the failed manual initiation switches is acceptable.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.12.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. However, for MFW and Main Steam Line Isolation, the test need not include actuation of the end device. This is due to the risk of a unit transient caused by the closure of valves associated with MFW and Main Steam Line Isolation or actuating EFW during testing at power. The Frequency of 31 days is based on operating experience that demonstrates the rarity of more than one channel failing within the same 31 day interval.

REFERENCES

1. IEEE-279-1971, April 1972.
2. 10 CFR 50.36.

B 3.3 INSTRUMENTATION

B 3.3.13 Emergency Feedwater Initiation and Control (EFIC) Logic

BASES

BACKGROUND

Main Steam Line and Main Feedwater (MFW) Isolation

The four emergency feedwater initiation and control (EFIC) channels sensing a steam generator (SG) low outlet pressure condition input their initiate commands to the trip logic modules. Figure [ ], FSAR, Chapter [7] (Ref. 1), illustrates the Main Steam Line and MFW Isolation Logics. The trip logic modules are physically located in the "A" and "B" EFIC channel cabinets. Channel "A" actuation logic initiates when instrumentation channel "A" or "B" initiates and channel "C" or "D" initiates, which in simplified logic is:

"A" actuation = (A and C) or (A and D) or (B and C) or (B and D)

Channel "B" actuation logic initiates when instrumentation channel "A" or "C" initiates and channel "B" or "D" initiates, which in simplified logic is:

"B" actuation = (A and B) or (A and D) or (C and B) or (C and D)

Each of the four Functions (SG A Main Feedwater Isolation, SG B Main Feedwater Isolation, SG A Main Steam Line Isolation, and SG B Main Steam Line Isolation) has a channel "A" and a channel "B" of automatic actuation logic.

Both channels "A" and "B" of the SG A Main Feedwater Isolation automatic actuation logic send closure signals to the SG A main feedwater pump suction valve, the three SG A block valves, and the MFW pump discharge cross connect valve. In addition, the instrumentation trips MFW pump "A."

Both channels "A" and "B" of the SG A Main Steam Line Isolation automatic actuation logic send closure signals to both of the SG A Main Steam Isolation valves.

SG B MFW and Main Steam Line Isolation automatic actuation logics respond similarly for the SG B valves and MFW pump "B."

(continued)

<INSERT B 3.3-116A>

Train "A" of the SG A Main Steam Line Isolation automatic actuation logic sends closure signals to the SG A MFW isolation valves. Similarly, Train "B" of the SG B Main Steam Line Isolation automatic actuation logic sends closure signals to the SG B MFW isolation valves.

BASES

BACKGROUND (continued)

Emergency Feedwater (EFW) Actuation

The four EFIC instrumentation channels for each of the parameters being sensed input their initiate commands to the trip logic modules. Figure [ ], FSAR, Chapter [7] (Ref. 1), illustrates the EFW initiation logic. These trip logic modules are physically located in the "A" and "B" EFIC channel cabinets.

EFW Actuation functions are the same logic combinations as MFW and Main Steam Line Isolation. EFW initiation also occurs on high pressure injection (HPI) initiation. Both trains of HPI initiation are input into each EFW initiate logic channel.

EFIC automatically initiates the EFW System when any of the following conditions exist:

a. All four reactor coolant pumps are tripped;

b. Both MFW pumps are tripped and reactor power is > 20% RTP with the nuclear instrumentation Reactor Protection System not in shutdown bypass;

c. Low level in either once through SG;

d. Low pressure in either SG; or

e. HPI Actuation on both A and B Engineered Safety Feature Actuation System channels.

Vector Valve Enable Logic

The EFW module logic is responsible for sending open or close signals to the EFW control and isolation valves. Figure [ ], FSAR, Chapter [7] (Ref. 1), illustrates the vector valve logic. The vector module logic outputs are in a neutral state (neither commanding open nor close) until a signal is received from the Vector Valve Enable Logic. The Vector Valve Enable Logic monitors the channel A and B EFW Actuation logics. When an EFW Actuation occurs, the vector enable logic enables the vector logic to generate open or close signals to the EFW valves depending on the relative values of SG pressures.

(continued)

<INSERT B 3.3-117A>

Engineered Safeguards Actuation System (ESAS) actuation and on Diverse Reactor Overpressure Protection System (DROPS) actuation.

<INSERT B 3.3-117B>

The EFIC System is also responsible for sending open or close signals to the EFW control and isolation valves. SAR Section 7.1.4 (Ref. 1), describes the EFIC vector logic. The vector logic outputs are in a neutral state (neither commanding open nor close) until an enable signal is received from either train "A" or "B" of EFW Initiation. The EFIC Logic monitors the channel A and B EFW Initiation logics. When an EFW Initiation occurs, the vector logic is enabled to generate open or close signals to the EFW isolation valves and close signals to the EFW control valves depending on the relative values of SG pressures. The level control module provides input to the flow controllers which control the position of the EFW control valves.

The Applicable Safety Analysis discussion for the Main Steam Line Isolation and EFW Initiation Functions is discussed in the Bases for LCO 3.3.11, "EFIC Instrumentation."

BASES (continued)

APPLICABLE SAFETY ANALYSES

Automatic isolation of MFW and main steam line was assumed in the safety analyses to mitigate the consequences of main steam line or MFW line ruptures. The FSAR analyses for steam line breaks (SLBs) was generated before the development and installation of the safety grade EFIC System, which currently performs these automatic safety functions. The FSAR analysis, for example, assumes main steam line isolation through turbine stop valve closure based on an integrated control system signal. This same function is provided by the EFIC System by a safety grade signal that closes the Main Steam Line Isolation valves. The analyses are bounding, and the use of the EFIC System is consistent with the licensing position to take credit for safety grade systems to mitigate the consequences of an accident.

Similarly, vector valve control was not credited in the FSAR SLB analysis. Operator action was credited with isolating EFW to the affected SG within the first 60 seconds. This function would be automatically performed by EFIC. Therefore, the FSAR analysis remains conservative relative to the inclusion of the vector valve logic.

Automatic initiation of EFW is credited in the loss of main feedwater analysis. The automatic actuation was based on the SG low level function of EFIC, although EFIC would initiate EFW based on the loss of both MFW pumps as well.

The EFIC logic satisfies Criterion 3 of the NRC Policy Statement. (9)

LCO

Two channels (trains) each of MFW and Main Steam Line Isolation, Vector Valve Enable, and EFW Actuation (Initiation) logics shall be OPERABLE. There are only two channels of automatic actuation logic per Function. Therefore, violation of this LCO could result in a complete loss of the automatic Function assuming a single failure of the other channel (train). (15) (1) (15) (9)

<INSERT B 3.3-118A>

APPLICABILITY

The MFW and Main Steam Line Isolation automatic actuation logics shall be OPERABLE in MODES 1, 2, and 3 because SG inventory can be at a high energy level and can contribute significantly to the peak containment pressure during a (11)

<INSERT B 3.3-118B>

(continued)

<INSERT B 3.3-118A>

To be considered OPERABLE, the Main Steam Line Isolation logic must send closure signals to the associated SG main steam and MFW isolation valves when the appropriate combinations of instrument channels indicate low SG pressure.

To be considered OPERABLE, the EFW Initiation logic must send initiation signals to the EFW System when the appropriate combinations of instrument channels indicate any of the following conditions exist:

a. All four reactor coolant pumps are tripped;
b. Both MFW pumps are tripped and reactor power is > 10% RTP;
c. Low level in either SG;
d. Low pressure in either SG; or
e. Actuation of ESAS channel 3 or 4.

<INSERT B 3.3-118B>

The EFIC Logic shall be OPERABLE when the associated EFIC Instrumentation Main Steam Line Isolation or EFW Initiation Function is required to be OPERABLE in accordance with Table 3.3.11-1. Each Function, i.e., Main Steam Line Isolation and EFW Initiation, has its own requirements that are based on the specific accidents and conditions for which it is designed to mitigate the consequences. See Bases for LCO 3.3.11, "EFIC Instrumentation," for additional discussion of each Function.

BASES

APPLICABILITY (continued)

secondary side line break. In MODES 4, 5, and 6, the energy level is low and the secondary side feedwater flow rate is low or nonexistent.

The EFW automatic actuation and vector enable logics shall be OPERABLE in MODES 1, 2, and 3 because the SGs are being used for heat removal from the primary system. During these MODES, the core power and heat removal requirements are the greatest, and if the normal source of feedwater is lost, EFW must be initiated rapidly to minimize the overheating of the primary system.

For portions of MODE 4 and for all of MODES 5 and 6, the primary system temperatures are too low to allow the SGs to effectively remove energy.

ACTIONS

If a channel is found inoperable, then all affected logic Functions provided by that channel must be declared inoperable and the LCO Condition entered for the particular protection function affected.

For this LCO, a Note has been added to the ACTIONS indicating that separate Condition entry is allowed for each EFIC logic Function.

A.1

Condition A applies when one or more EFIC logic Functions in a single channel are inoperable (i.e., channel A could be inoperable for all four EFIC logic Functions and Condition A would still be applicable) with all Functions in the other channel OPERABLE. This Condition is equivalent to failure of one EFW, Main Steam Line Isolation, and MFW Isolation train.

With one automatic actuation logic channel of one or more EFIC Functions inoperable, the associated EFIC train must be restored to OPERABLE status. Since there are only two automatic actuation logic channels per EFIC Function, the condition of one channel inoperable is analogous to having one train of a two train Engineered Safety Feature (ESF) System inoperable. The system safety function can be accomplished; however, a single failure cannot be taken.

(continued)

BASES

ACTIONS

A.1 (continued)

Therefore, the failed channel(s) must be restored to OPERABLE status to re-establish the system's single-failure tolerance.

Condition A can be thought of as equivalent to failure of a single train of a two train safety system (e.g., the safety function can be accomplished, but a single failure cannot be taken). Thus, the Completion Time of 72 hours has been chosen to be consistent with Completion Times for restoring one inoperable ESF System train.

The EFIC System has not been analyzed for failure of one train of one Function and the opposite train of the same Function. In this condition, the potential for system interactions that disable heat removal capability on EFW has not been evaluated. Consequently, any combination of failures in both channels A and B is not covered by Condition A and must be addressed by entry into LCO 3.0.3.

B.1 and B.2

If Required Action A.1 cannot be met within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit 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 MODES from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.13.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. This test verifies MFW and Main Steam Line Isolation and EFW initiation automatic actuation logics are functional. This test simulates the required inputs to the logic circuit and verifies successful operation of the logic circuit and verifies successful operation of the automatic actuation logic. The test need not include actuation of the end device. This is due to the risk of a unit transient caused by the closure of valves associated

train
the same
both
trains
and its associated
are not met for the EFW Initiation Function
INSERT B3.3-120A
trains
15
edit
edit
15
edit
11
11
15
1
edit

(continued)

<INSERT B 3.3-120A>

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

3.3.11-02

If the Required Actions and associated Completion Times are not met for the Main Steam Line Isolation Function, the unit must be placed in a MODE or condition in which the requirement does not apply. This is initiated by placing the unit in MODE 3 within 6 hours and, either reducing SG pressure to less than 750 psig, or closing and deactivating all associated valves, i.e., the valves which EFIC would close if it were to actuate while OPERABLE . The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.13.1 (continued)

with MFW and Main Steam Line Isolation or actuation of EFW during testing at power. The Frequency of 31 days is based on operating experience, which has demonstrated the rarity of more than one channel failing within the same 31 day interval. — 1

with regard to Channel OPERABILITY

REFERENCES

1. FSAR, Chapter 7. edit

B 3.3 INSTRUMENTATION

B 3.3.14 Emergency Feedwater Initiation and Control (EFIC) Emergency Feedwater (EFW) Vector Valve Logic

BASES

BACKGROUND

The function of the EFW vector valve logic is to determine whether EFW should not be fed to one or the other steam generator. This is to preclude the continued addition of EFW to a depressurized once through steam generator (SG) and, thus, minimize the overcooling effects of a steam leak. Each vector logic may isolate EFW to one SG or the other, never both.

There are four sets of vector valve logic; one in each channel of EFIC. Each set of vector valve logic receives SG pressure information from bistables located in the input logic of the same EFIC channel. The pressure information received is:

a. SG "A" pressure less than 600 psig;

b. SG "B" pressure less than 600 psig;

c. SG "A" pressure 125 psid greater than SG "B" pressure; and

d. SG "B" pressure 125 psid greater than SG "A" pressure.

Each vector valve logic also receives a vector/control enable signal from both EFIC Channel A and Channel B when EFW is actuated.

The vector valve logic develops signals for open and close control of SG "A" and "B" EFW valves.

The vector valve logic outputs are in a neutral state with the valves fully open until enabled by the control/vector enable from the Channel A or B trip logics. When enabled, the vector valve logic can issue close commands to the EFW control valves and open or close commands to the EFW isolation valves per the selected channel assignments.

(continued)

<INSERT B 3.3-122A>

These values (i.e., 600 psig and 100 psid) do contain an allowance for instrument error.

BASES

BACKGROUND (continued)

The valve open/close commands are determined by the relative values of steam generator pressures as follows:

PRESSURE STATUS	SG VALVES "A"	SG VALVES "B"
If SG "A" & SG "B" > 600 psig	Open	Open
If SG "A" > 600 psig & SG "B" < 600 psig	Open	Close
If SG "A" < 600 psig & SG "B" > 600 psig	Close	Open
If SG "A" & SG "B" < 600 psig		
AND		
• SG "A" & SG "B" within 125 psid	Open	Open
• SG "A" 125 psid > SG "B"	Open	Close
• SG "A" 125 psid > SG "A"	Close	Open

APPLICABLE SAFETY ANALYSES

Automatic isolation of main feedwater (MFW) and main steam line was assumed in the safety analyses to mitigate the consequences of main steam line or MFW line ruptures. The FSAR analysis for steam line breaks (SLBs) was generated before the development and installation of the safety grade EFIC System, which currently performs these automatic safety functions. The FSAR analysis, for example, assumes main steam line isolation through turbine stop valve closure based on an integrated control system signal. This same function is provided by the EFIC System by a safety grade signal that closes the main steam line isolation valves. The analyses are bounding, and the use of the EFIC System is consistent with the licensing position to take credit for safety grade systems to mitigate the consequences of an accident.

Similarly, vector logic valve control was not credited in the FSAR SLB analysis. Operator action was credited with isolating EFW to the affected SG within the first

(continued)

The Applicable Safety Analysis discussion for the EFIC Vector Logic is discussed in the Bases for LCO 3.3.11, "EFIC Instrumentation." (9)

 (9)

BASES

APPLICABLE SAFETY ANALYSES (continued)

60 seconds. This function would be automatically performed by EFIC. Therefore, the FSAR analysis remains conservative relative to the inclusion of the vector valve logic.

EFW vector valve logic response time is included in the required response time for each EFW actuation initiation function instrumentation and is not specified separately.

The EFIC—EFW—vector valve logic satisfies Criterion 3 of the NRC Policy Statement. (9)

LCO

Four channels of the EFIC EFW vector valve logic module are required to be OPERABLE. The necessity for four channels is discussed in the BASES for ACTIONS. The 600 psig and 125 (100) psid setpoints were chosen as discussed in Specification B 3.3.11, "EFIC System Instrumentation." The feed only good generator verification study assumed a differential pressure vector value of 150 psid. The A 125 (100) psid setpoint conservatively assumes a 25 psi (50 psi (25 psi per pressure channel)) margin for instrument error. Failure to meet this LCO results in not being able to meet the single-failure criterion. (9) (9 edit)

<INSERT B3.3-124A>

APPLICABILITY <INSERT B3.3-124B>

EFIC—EFW—vector valve logic is required in MODES 1, 2, and 3 because the SGs are relied on in these MODES for required RCS heat removal. In MODES 4, 5, and 6, heat removal requirements are reduced and may be provided by the Decay Heat Removal System. Therefore, vector valve logic is not required to be OPERABLE in these MODES. (11)

ACTIONS

A.1

The function of the EFIC EFW control/isolation valves and the (EFIC) vector valve logic is to meet the single-failure criterion while maintaining the capability to: (9)

a. Provide EFW on demand; and

b. Isolate an SG when required.

(continued)

<INSERT B 3.3-124A>

These values (i.e., 600 psig and 100 psid) do contain an allowance for instrument error.

<INSERT B 3.3-124B>

The EFIC Vector Logic shall be OPERABLE when the associated EFIC Instrumentation EFW Vector Valve Control Function is required to be OPERABLE in accordance with Table 3.3.11-1. The EFW Vector Valve Control Function is required to be OPERABLE in MODES 1 and 2, and in MODE 3 with SG pressure ≥ 750 psig because the SG inventory can contribute significantly to the reactor building peak pressure with a secondary side break. Both the normal feedwater and the EFW must be able to be isolated on each SG to limit overcooling of the primary and to limit mass and energy releases to the reactor building. Once the SG pressures have decreased below 750 psig, the energy level is low and the secondary side feedwater flow rate is low or nonexistent. Also, the primary system temperatures are typically too low to allow the SGs to effectively remove energy, or are sufficiently low to allow for operator action. Therefore, EFIC Vector Logic is not required to be OPERABLE in MODE 3 below 750 psig nor in MODES 4, 5, and 6.

H9

BASES

ACTIONS

A.1 (continued)

These conflicting requirements result in the necessity for two valves in series, in parallel with two valves in series, and a four channel valve command system.

With one channel inoperable, the system cannot meet the single-failure criterion and still meet the dual functional criteria previously described. Therefore, when one vector valve logic channel is inoperable, the channel must be restored to OPERABLE status within 72 hours. This is analogous to having one EFW train inoperable; wherein a 72 hour Completion Time is provided by the Required Actions of LCO 3.7.4, "EFW System." As such, the Completion Time of 72 hours is based on engineering judgment. edit edit. (5)

B.1 and B.2

If Required Action A.1 cannot be met within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit 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 unit conditions from full power conditions in an orderly manner and without challenging unit systems. H11

SG pressure must be reduced to < 750 psig

SURVEILLANCE REQUIREMENTS

SR 3.3.14.1

SR 3.3.14.1 is the performance of a CHANNEL FUNCTIONAL TEST every 31 days. This test demonstrates that the EFIC EFW vector valve logic performs its function as desired. The Frequency is based on operating experience that demonstrates the rarity of more than one channel failing within the same 31 day interval. edit

with respect to channel OPERABILITY

REFERENCES

None.

3.3 INSTRUMENTATION

3.3.8 Diesel Generator (DG) Loss of Power Start (LOPS)

LCO 3.3.8 Two loss of voltage Function relays and two degraded voltage Function relays DG LOPS instrumentation per DG shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one or more relays for one or more DGs inoperable.	A.1 Restore relay(s) to OPERABLE status.	1 hour
B. Required Action and associated Completion Time not met.	B.1 Declare affected DG(s) inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.8.1	Perform CHANNEL CHECK.	7 days

SURVEILLANCE		FREQUENCY
SR 3.3.8.2	------------------------------NOTE------------------------------ When DG LOPS instrumentation is placed in an inoperable status solely for performance of this Surveillance, entry into associated Conditions and Required Actions may be delayed up to 4 hours for the loss of voltage Function, provided the one remaining relay monitoring the Function for the bus is OPERABLE. --- Perform CHANNEL CALIBRATION with setpoint as follows: a. Degraded voltage $\geq$ 423.2 V and $\leq$ 436.0 V with a time delay of 8 seconds $\pm$ 1 second; and b. Loss of voltage $\geq$ 1600 V and $\leq$ 3000 V with a time delay of $\geq$ 0.30 seconds and $\leq$ 0.98 seconds.	18 months

3.3 INSTRUMENTATION

3.3.15 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.15 The PAM instrumentation for each Function in Table 3.3.15-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

-----NOTES-----

1. LCO 3.0.4 is not applicable.
2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action to prepare and submit a Special Report.	Immediately
C. -----NOTE----- Not applicable to hydrogen monitor channels. ----- One or more Functions with two required channels inoperable.	C.1 Restore one channel to OPERABLE status.	7 days
D. Two required hydrogen monitor channels inoperable.	D.1 Restore one required hydrogen monitor channel to OPERABLE status.	72 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required Action and associated Completion Time of Condition C or D not met.	E.1 Enter the Condition referenced in Table 3.3.15-1 for the channel.	Immediately
F. As required by Required Action E.1 and referenced in Table 3.3.15-1.	F.1 Be in MODE 3. <u>AND</u> F.2 Be in MODE 4.	6 hours 12 hours
G. As required by Required Action E.1 and referenced in Table 3.3.15-1.	G.1 Initiate action to prepare and submit a Special Report.	Immediately

SURVEILLANCE REQUIREMENTS

--NOTE--
These SRs apply to each PAM instrumentation Function in Table 3.3.15-1.

SURVEILLANCE		FREQUENCY
SR 3.3.15.1	Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days
SR 3.3.15.2	------------------------------NOTE------------------------------ Neutron detectors are excluded from CHANNEL CALIBRATION. --- Perform CHANNEL CALIBRATION.	 18 months

Table 3.3.15-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

	FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION E.1
1.	Wide Range Neutron Flux	2	F
2.	RCS Hot Leg Temperature	2	F
3.	RCS Hot Leg Level	2	G
4.	RCS Pressure (Wide Range)	2	F
5.	Reactor Vessel Water Level	2	G
6.	Reactor Building Water Level (Wide Range)	2	F
7.	Reactor Building Pressure (Wide Range)	2	F
8.	Penetration Flow Path Automatic Reactor Building Isolation Valve Position	2 per penetration flow path[(a)(b)]	F
9.	Reactor Building Area Radiation (High Range)	2	G
10.	Reactor Building Hydrogen Concentration	2	F
11.	Pressurizer Level	2	F
12.	a. SG "A" Water Level - Low Range	2	F
	b. SG "B" Water Level - Low Range	2	F
	c. SG "A" Water Level - High Range	2	F
	d. SG "B" Water Level - High Range	2	F
13.	a. SG "A" Pressure	2	F
	b. SG "B" Pressure	2	F
14.	Condensate Storage Tank Level	2	F
15	Borated Water Storage Tank Level	2	F
16.	Core Exit Temperature (CETs per quadrant)	2	F
17.	a. Emergency Feedwater Flow to SG "A"	2	F
	b. Emergency Feedwater Flow to SG "B"	2	F
18.	High Pressure Injection Flow	2	F
19.	Low Pressure Injection Flow	2	F
20.	Reactor Building Spray Flow	2	F

(a) Not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

3.3 INSTRUMENTATION

3.3.16 Control Room Isolation - High Radiation

LCO 3.3.16 Two channels of Control Room Isolation - High Radiation shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One channel inoperable in MODE 1, 2, 3, or 4.	A.1 Place one OPERABLE Control Room Emergency Ventilation System (CREVS) train in the emergency recirculation mode.	7 days
B. Two channels inoperable in MODE 1, 2, 3, or 4.	B.1 Place one OPERABLE CREVS train in the emergency recirculation mode.	1 hour
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	C.2 Be in MODE 5.	36 hours
D. One or two channels inoperable during movement of irradiated fuel.	D.1 Place one OPERABLE CREVS train in emergency recirculation mode.	Immediately
	<u>OR</u>	
	D.2 Suspend movement of irradiated fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.16.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.16.2	-------------------------------NOTE------------------------------- When the Control Room Isolation - High Radiation instrumentation is placed in an inoperable status solely for performance of this Surveillance, entry into associated Conditions and Required Actions may be delayed for up to 3 hours. --- Perform CHANNEL FUNCTIONAL TEST.	31 days
SR 3.3.16.3	Perform CHANNEL CALIBRATION.	18 months

B 3.3 INSTRUMENTATION

B 3.3.8 Diesel Generator (DG) Loss of Power Start (LOPS)

BASES

BACKGROUND

The DGs provide a source of emergency power when offsite power is either unavailable or is insufficiently stable to allow operation of safety related loads. Undervoltage protection will generate a LOPS in the event a loss of voltage or degraded voltage condition occurs on unit vital buses. There are two LOPS Functions for each 4.16 kV vital bus.

Two undervoltage relays with inverse voltage time characteristics are provided on each 4.16 kV Class 1E bus for the purpose of detecting a loss of bus voltage. The relay settings are based on a maximum setting, which is below the lowest allowed motor terminal momentary voltage of 75% of motor voltage rating of 4000 V. The settings are adjusted to include channel uncertainties and calibration tolerances. Upon loss of power to either of these relays, in approximately 1.0 second, load shedding and starting of the associated DG are initiated. Isolation of the safety related buses is delayed approximately 2.0 seconds to allow an automatic transfer to offsite power. The safety related bus is isolated only if the transfer is unsuccessful.

Two definite time undervoltage relays are provided on each safety related 480 V load center bus with a coincident trip logic (2 out of 2) for the purpose of detecting a sustained undervoltage condition. The undervoltage relays on the 480 V bus are based on long term motor voltage requirements plus the maximum feeder voltage drop allowance resulting in a nominal setting of 92% of the motor rated voltage of 460 V. The settings are adjusted to include channel uncertainties and calibration tolerances. Upon voltage degradation to 92% of 460 V and after a delay of 8 seconds, both relays must operate to isolate the associated safety related 4.16 kV bus from offsite power, and start and connect the associated DG. The relays are delayed 8.0 seconds to prevent spurious operation of the relays when large motors start on the safety related 4.16 kV and 480 V buses. The LOPS is further described in SAR, Section 8.3.1 (Ref. 1).

<u>Trip Setpoints</u>

The trip setpoints used in the relays are consistent with the analytical limits presented in SAR, Section 8.3.1 (Ref. 1). The selection of these trip setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. A channel is inoperable if its actuation trip setpoint is not within its required range.

A complete loss of offsite power will result in approximately a 1 second delay in LOPS actuation. The DG starts and is available to accept loads within a 15 second

time interval on actuation by the Engineered Safeguards Actuation System (ESAS) or LOPS. Emergency power is established within the maximum time delay assumed for each event analyzed in the accident analysis in which a loss of offsite power is assumed (Ref. 2).

The DG LOPS protection channels conform to the single failure criteria of IEEE-279-1971 as discussed in Ref. 1.

APPLICABLE SAFETY ANALYSES

The DG LOPS is required for the Engineered Safeguards (ES) to function in any accident which assumes a loss of offsite power.

Accident analyses credit the loading of the DG, based on the loss of offsite power, during a loss of coolant accident (LOCA). The actual DG start has historically been associated with the ESAS actuation. The diesel loading has been included in the assumed delay time associated with each safety system component requiring DG supplied power following a loss of offsite power. The analysis assumes a nonmechanistic DG loading, which does not explicitly account for each individual component of the loss of power detection and subsequent actions. The total assumed actuation time for the limiting systems, high pressure injection, and low pressure injection includes contributions from the DG Start, DG loading, and safety injection system component actuation. The response of the DG to a loss of power must be demonstrated to fall within this analysis response time when including the contributions of all portions of the delay.

The required channels of LOPS, in conjunction with the ES systems powered from the DGs, provide unit protection for the analyzed accidents in which a loss of offsite power is assumed.

The delay times assumed in the safety analysis for the ES equipment include the 15 second DG start delay and, if applicable, the appropriate sequencing delay. The assumed response times for ESAS actuated equipment in LCO 3.3.5, "Engineered Safeguards Actuation System (ESAS) Instrumentation," include the appropriate DG loading and sequencing delay.

In MODE 1, the DG LOPS channels satisfy Criterion 3 of 10 CFR 50.36 (Ref. 3). There are no specific safety analyses for operation in MODES 2, 3, and 4. However, industry operating experience has identified DG LOPS as significant to public health and safety during these operating conditions. Therefore, in MODES 2, 3 and 4, the DG LOPS channels satisfy Criterion 4 of 10 CFR 50.36.

LCO

The LCO for the DG LOPS requires that two relays per DG (DG1 and DG2) of the loss of voltage instrumentation Function shall be OPERABLE and two relays per DG of the degraded voltage instrumentation Function shall be OPERABLE to

ensure that the automatic 4.16 kV bus isolation capability and automatic start of the DG is available when needed. The degraded voltage relays may be bypassed for ≤ 30 seconds during reactor coolant pump start to prevent such starts from initiating spurious DG LOPS, separation of the ES busses from offsite power, and subsequent loading of the DG. Therefore, the automatic bypass and associated alarms are required functions for OPERABILITY of the DG LOPS instrumentation.

Loss of either DG LOPS function could result in the delay of safety systems initiation when required. This could lead to unacceptable consequences during accidents.

The Allowable Values must be met for each Function to be considered OPERABLE. Trip setpoints are specified in the specifications. The setpoints are selected to ensure that the setpoint measured by CHANNEL FUNCTIONAL TESTS does not exceed the Allowable Value if the relay is performing as required. Each Allowable Value is more conservative than any analytical limit assumed in the transient and accident analysis and the trip setpoint is equal to or more conservative to the Allowable Value, accounting for instrument uncertainties appropriate to the trip function. Guidance used to calculate the uncertainties associated with the relay settings is contained in the ANO-1 Design Guide, IDG-001, "Instrument Loop Error Analysis and Setpoint Methodology Manual" (Ref. 4).

The LOPS relay settings are based on the short term starting voltage protection as well as long term running voltage protection. The 4.16 kV undervoltage relay setpoints are based on a maximum setting, which is below the lowest allowed motor terminal momentary voltage of 75% of motor rated voltage of 4000 V. The 480 V undervoltage relay setpoint is based on long term motor voltage requirements plus the maximum feeder voltage drop allowance resulting in a nominal 92% setting of the motor rated voltage of 460 V. The setpoints for both the 4.16 kV and the 480 V relays include adjustments for channel uncertainties and calibration tolerances.

APPLICABILITY

The DG LOPS actuation Function shall be OPERABLE in MODES 1, 2, 3, and 4 because ES Functions are required to be OPERABLE in these MODES. Automatic actuation is not required in MODES 5 or 6 since there is no automatic protective function on a loss of power or degraded power to the vital bus.

ACTIONS

A Note has been added to the ACTIONS indicating that separate Condition entry is allowed for each Function.

If a relay's trip setpoint is found nonconservative with respect to the Allowable Value, or the relay is found inoperable, then the function that the relay provides must be declared inoperable and the LCO Condition entered for the particular

protection function affected. Since the required relay Functions are specified on a per DG basis, the Condition may be entered separately for each DG.

A.1

With one or more relays in one or more Functions for one or more DGs inoperable, Required Action A.1 requires the inoperable relay(s) to be restored to OPERABLE status within 1 hour. With a relay of a Function inoperable, the logic is not capable of providing an automatic DG LOPS signal for valid conditions for the associated DG. The 1 hour Completion Time is reasonable to evaluate and to take action by correcting the degraded condition in an orderly manner and takes into account the low probability of an event requiring LOPS occurring during this interval.

B.1

Condition B applies if the Required Action and associated Completion Time of Condition A are not met.

Required Action B.1 ensures that Required Actions for affected diesel generator inoperabilities are initiated. Depending on the DG(s) affected, the appropriate Actions specified in LCO 3.8.1, "AC Sources - Operating," are required immediately.

SURVEILLANCE REQUIREMENTS

SR 3.3.8.1

Performance of the CHANNEL CHECK once every 7 days provides reasonable assurance for prompt identification of a gross failure of instrumentation. CHANNEL CHECK will detect gross channel failure; therefore, it is key in verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

The Frequency is based on operating experience that demonstrates channel failure is rare. Since the probability of random failure in any 7 day period is low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of this instrumentation.

SR 3.3.8.2

The Note allows channel bypass for testing of the loss of voltage Function without entering the associated Conditions and Required Actions, although during this time period it cannot actuate a diesel start. This allowance is based on the assumption that 4 hours is the average time required to perform channel Surveillance. The 4 hour testing allowance does not significantly reduce the probability that the DG will start when necessary. It is not acceptable to remove channels from service for

more than 4 hours to perform required Surveillance testing without declaring the channel inoperable.

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The setpoints and the response to a loss of voltage and a degraded voltage test shall include a single point verification that the trip occurs within the required delay time. CHANNEL CALIBRATION shall verify that setpoints are within the required ranges.

The Frequency is based on the reliability of the components, on operating experience which demonstrates channel failure is rare, and on consistency with the typical industry refueling cycle, and is justified by the assumption of at least an 18 month calibration interval in the determination of equipment drift.

REFERENCES

1. SAR, Section 8.3.1.
2. SAR, Chapter 6 and 14.
3. 10 CFR 50.36.
4. ANO-1 Design Guide, IDG-001, "Instrument Loop Error Analysis and Setpoint Methodology Manual."

B 3.3 INSTRUMENTATION

B 3.3.15 Post Accident Monitoring (PAM) Instrumentation

BASES

BACKGROUND

The primary purpose of the PAM instrumentation is to display unit variables that provide information required by the control room operators during accident situations. This information provides the necessary support for the operator to monitor and take the manual actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for Design Basis Accidents (DBAs).

The OPERABILITY of the accident monitoring instrumentation ensures that there is sufficient information available on selected unit parameters to monitor and to assess unit status and behavior following an accident.

The availability of accident monitoring instrumentation is important so that responses to corrective actions can be observed, and so that the need for and magnitude of further actions can be determined. These essential instruments are identified in SAR Table 7-11A (Ref. 1) addressing the recommendations of Regulatory Guide 1.97 (Ref. 2) as required by Supplement 1 to NUREG-0737 (Ref. 3).

The instrument channels required to be OPERABLE by this LCO equate to two classes of parameters identified during unit specific implementation of Regulatory Guide 1.97 as Type A and Category I variables.

Type A variables are specified because they provide the primary information that permits the control room operator to take specific manually controlled actions that are required when no automatic control is provided and that are required for safety systems to accomplish their safety functions for DBAs.
Category I variables are the key variables deemed risk significant because they are needed to:

- Determine whether systems important to safety are performing their intended functions;
- Provide information to the operators that will enable them to determine the potential for causing a gross breach of the barriers to radioactivity release; and
- Provide information regarding the release of radioactive materials to allow for early indication of the need to initiate action necessary to protect the public and to estimate the magnitude of any impending threat.

These key variables are also identified in SAR Table 7-11A (Ref. 1).

The specific instrument Functions listed in Table 3.3.15-1 are discussed in the LCO Bases Section.

APPLICABLE SAFETY ANALYSES

The PAM instrumentation ensures the availability of information so that the control room operating staff can:

Perform the diagnosis specified in the abnormal and emergency operating procedures. These variables include preplanned actions for the primary success path of DBAs (e.g., loss of coolant accident (LOCA);

- Take the specified, preplanned, manually controlled actions, for which no automatic control is provided, which are required for safety systems to accomplish their safety functions;
- Determine whether systems important to safety are performing their intended functions;
- Determine the potential for causing a gross breach of the barriers to radioactivity release;
- Determine if a gross breach of a barrier has occurred; and
- Initiate action necessary to protect the public and estimate the magnitude of any impending threat.

SAR Section 7.3.4 (Ref. 4) documents the results of the Regulatory Guide 1.97 analysis process which identified Type A and Category I non-Type A variables.

In MODE 1, PAM instrumentation that meets the definition of Type A in Regulatory Guide 1.97 satisfies Criterion 3 of 10 CFR 50.36 (Ref. 5). In MODES 2 and 3, Category I, non-type A, instrumentation must be retained in Technical Specifications because it is intended to assist operators in minimizing the consequences of accidents. Therefore, Category I, non-Type A variables are important for reducing public risk, and satisfy Criterion 4 of 10 CFR 50.36 (Ref. 5).

LCO

LCO 3.3.15 requires two OPERABLE channels for all but one Function to ensure no single failure prevents the operators from being presented with the information necessary to determine the status of the unit and to bring the unit to, and maintain it in, a safe condition following that accident. Furthermore, provision of two channels allows a CHANNEL CHECK during the post accident phase to confirm the validity of displayed information. When a channel includes more than one qualified control room indication, such as both an indicator and a recorder, or an indicator and

Safety Parameter Display System (SPDS) readout, etc., only one indication is required for channel OPERABILITY.

The exception to the two channel requirement is reactor building isolation valve position. In this case, the important information is the status of the reactor building penetrations. The LCO requires one position indicator for each automatic reactor building isolation valve. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve and prior knowledge of the passive valve or via system boundary status. If a normally active reactor building isolation valve is known to be closed and deactivated, position indication is not needed to determine status. Therefore, the position indication for valves in this state is not required to be OPERABLE (See Table 3.3.15-1, Note (a)).

Each of the specified instrument Functions listed in Table 3.3.15-1 are discussed below:

1. <u>Wide Range Neutron Flux</u>

   Wide Range Neutron Flux indication is a Type B, Category I variable provided to verify reactor shutdown. The Wide Range Neutron Flux channels consist of two channels of qualified fission chamber based instrumentation (Gamma-Metrics) with readout on one recorder and on the SPDS. The channels provide indication over a range of 10^{-8} to 100% full power (Ref. 1).

2. <u>Reactor Coolant System (RCS) Hot Leg Temperature</u>

   RCS Hot Leg Temperature instrumentation is a Type A Category I variable provided for verification of core cooling and long term surveillance including determining when to secure reactor coolant pumps following a LOCA. Reactor outlet temperature inputs are provided by two fast response resistance elements and associated transmitters in each loop. The two channels provide readout on one indicator and one recorder and on the SPDS. The channels provide indication over a range of 50°F to 700°F.

3. <u>RCS Hot Leg Level</u>

   RCS Hot Leg Level instrumentation is a Type B, Category I variable provided to support operator diagnosis of inadequate core cooling and tracking reactor coolant inventory. Each channel monitors level from one (1) wide range and any two (2) of four (4) narrow range transmitters per hot leg. Channel OPERABILITY requires a minimum of one wide range and any two of the narrow range transmitters in the same channel OPERABLE. In addition, reference leg temperature inputs and core exit thermocouple average temperature are used for density compensation of the level. The system is designed to infer the water level in the hot legs during no-flow conditions. The channels provide readout on two indicators and on the SPDS. The channels provide indication over a unit elevation range of 368 feet 6 inches to 417 feet 6 inches.

4. RCS Pressure (Wide Range)

RCS Pressure (Wide Range) instrumentation is provided for verification of core cooling and RCS integrity long term surveillance.

Wide range RCS loop pressure is measured by pressure transmitters with a span of 0 psig to 3000 psig. The pressure transmitters are located inside the RB. Redundant monitoring capability is provided by two channels of instrumentation. This control room display, consisting of one indicator and one recorder, and the SPDS is the primary indication used by the operator during an accident. Therefore, the accident monitoring specification deals specifically with this portion of the instrument string.

RCS Pressure is a Type A, Category I variable because the operator uses this indication to monitor the cooldown of the RCS following a steam generator (SG) tube rupture or small break LOCA. Operator actions to maintain a controlled cooldown, such as adjusting SG pressure or level, would use this indication. In addition, high pressure injection (HPI) flow is throttled based on RCS Pressure and subcooled margin.

5. Reactor Vessel Water Level

Reactor Vessel Water Level instrumentation is a Type B, Category I variable and is provided for verification and long term surveillance of core cooling. The reactor vessel level monitoring system provides an indication of the liquid level above the fuel.

The level range extends from the top of the vessel dome down to the top of the fuel alignment plate. The response time is short enough to track the level during small break LOCA events. The resolution is sufficient to show the initial level drop, the key locations near the hot leg elevation, and the lowest levels just above the fuel. This provides the operator with adequate indication to track the progression of the accident and to detect the consequences of its mitigating actions or the functionality of automatic equipment.

The Reactor Vessel Water Level channels consist of two redundant Radcal Level Instruments (RLIs) (each containing nine (9) axially distributed level sensors and one reactor vessel head temperature thermocouple to detect reactor coolant inventory above the core), and a data acquisition system with readout on two indicators. When Reactor Coolant Pumps are running, all except the dome sensors are interlocked to read "invalid" due to flow induced variables that may offset the sensor outputs. Channel OPERABILITY requires a minimum of three sensors in the upper plenum region and two sensors in the dome region OPERABLE. Readout for this parameter is also provided on the SPDS.

6. Reactor Building Water Level (Wide Range)

Reactor Building Water Level (Wide Range) instrumentation is a Type B, Category I variable and is provided for verification of net positive suction head (NPSH) for the recirculation phase. The Reactor Building Water Level instrumentation consists of two channels with readout on two indicators and one recorder and on the SPDS. The channels provide water level indication over a range of 0 to 144 inches.

7. Reactor Building Pressure (Wide Range)

Reactor Building Pressure (Wide Range) instrumentation is a Type B, Category I variable and is provided for verification of RCS and reactor building OPERABILITY. Reactor Building Pressure instrumentation consists of two channels with readout on two indicators and one recorder and on the SPDS. The channels provide pressure indication over a range of 0 to 210 psia (-15 to 195 psig).

8. Automatic Reactor Building Isolation Valve Position

Automatic Reactor Building Isolation Valve Position is a Type B, Category I variable and is provided for verification of the isolation status of the reactor building penetration. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each automatic isolation valve in a reactor building penetration flow path, i.e., two total channels of position indication for a penetration flow path with two automatic valves. For reactor building penetrations with only one automatic valve having control room indication, Note (b) requires a single channel of valve position indication to be OPERABLE. This is sufficient to verify the isolation status of each isolable penetration via indicated status of the automatic valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration flow path is isolated, position indication for the isolation valve(s) in the associated penetration flow path is not needed to determine status. Therefore, the position indication for valves in an isolated penetration flow path is not required to be OPERABLE. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each inoperable penetration flow path.

The isolation valve position PAM instrumentation consists of Class 1E position switches for each automatic reactor building isolation valve. These switches provide "closed -not closed" indication via indicating lights in the control room.

9. Reactor Building Area Radiation (High Range)

Reactor Building Area Radiation (High Range) instrumentation is a Type E, Category I variable and is provided to monitor the potential for significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans. The Reactor Building Area Radiation instrumentation consists of two channels with readout on two

indicators and one recorder and on the SPDS. The channels provide high radiation indication over a range of 1 to 10^8 R/hour gamma; however, the required range is only 1 to 10^7 R/hour gamma.

10. Reactor Building Hydrogen Concentration

Reactor Building Hydrogen Concentration instrumentation is a Type A, Category I variable and is provided to detect high hydrogen concentration conditions that represent a potential for a reactor building breach and the need to initiate hydrogen control measures such as hydrogen purge. This variable is also important in verifying the adequacy of mitigating actions. The Reactor Building Hydrogen Concentration instrumentation consists of two channels with readout on two indicators and one recorder and on the SPDS. The channels provide hydrogen concentration indication over a range of 0 to 10% volume.

11. Pressurizer Level

Pressurizer Level instrumentation is a Type D, Category I variable and is used in combination with other system parameters to determine whether to terminate safety injection (SI), if still in progress, or to reinitiate SI if it has been stopped. Knowledge of pressurizer water level is also used to verify the unit conditions necessary to establish natural circulation in the RCS and to verify that the unit is maintained in a safe shutdown condition. The Pressurizer Level instrumentation consists of two channels with readout on one indicator and one recorder and on the SPDS. The channels provide level indication over a range of 87 to 407 inches (bottom to top).

12. Steam Generator Water Level

Steam Generator Water Level instrumentation is a Type A, Category I variable provided to monitor operation of RCS heat removal via the SG and to determine the affected SG for isolation following a SGTR event . The indication of SG level is provided by the low range and high range level instrumentation, covering a span of 6 inches to 500 inches above the lower tubesheet. The measured differential pressure is displayed in inches of water.

The Steam Generator Water Level instrumentation consists of two channels (A and B) for each steam generator for the low range and two channels for each steam generator for the high range with readout on four dual indicators (one SG channel with both ranges per indicator) and on the SPDS. The Low Range channels provide level indication over a range of 6 to 156 inches of water and the High Range channels provide level indication over a range of 102 to 500 inches of water. Each range of water level instrumentation for each steam generator is considered a separate Function of PAM Instrumentation. Two additional channels (C and D) also monitor SG water level for EFIC but these channels are not required as PAM instrumentation.

SG high range level indication is used by the operator to manually raise and control SG level to establish reflux boiling (boiler condenser) heat transfer.

Operator action is initiated on a loss of subcooled margin. Feedwater flow is increased until the indicated level reaches the reflux boiling (boiler condenser) setpoint.

13. Steam Generator Pressure

Steam Generator Pressure instrumentation is a Type A, Category I variable provided to support operator diagnosis of a design basis steam generator tube rupture to identify and isolate the affected SG. In addition, SG pressure is a key parameter used by the operator to evaluate primary-to-secondary heat transfer. For example, the operator may use this indication to control the primary system cooldown following a steam line break accident or a small break loss of coolant accident (LOCA).

Steam generator pressure measurement is provided by two pressure transmitters per SG. The channels provide readout on two indicators (one per SG) and two dual pen recorders (one per SG) and on the SPDS. The channels provide pressure indication over a range from 0 to 1200 psig. The pressure instrumentation for each steam generator is considered a separate Function of PAM Instrumentation.

14. Condensate Storage Tank (QCST) Level

QCST Level instrumentation is a Type A, Category I variable and is provided to ensure a readily available, condensate quality water supply for EFW. Inventory is monitored by a 0 to 30 feet level indication. QCST Level is displayed on one control room indicator and one recorder, and on the SPDS.

QCST Level is the primary indication used by the operator to identify loss of QCST volume and replenish the QCST or align suction of the EFW pumps to the safety related source, i.e., service water.

15. Borated Water Storage Tank Level

Borated Water Storage Tank (BWST) Level instrumentation is a Type A, Category I variable provided to support action for long term cooling requirements, i.e., to determine when to initiate the switch-over of the core cooling pump suction from the BWST to sump recirculation. BWST Level measurement is provided by two channels with readout on two indicators and one recorder and on the SPDS. The level transmitters are calibrated over a range of 0 to 45 feet. The "0" reference level is the level instrument tap, which is approximately 5 inches above the bottom of the tank.

16. Core Exit Temperature

Core Exit Temperature is a Type C, Category I variable and is provided for verification and long term surveillance of core cooling. Twenty-four (24) qualified core exit thermocouples (CETs) are provided with six (6) located in each core quadrant. Two CETs are required in each core quadrant and

readout is provided on two indicators and on the SPDS. The channels provide core exit temperature indication over a range of 50 to 2300°F. This Function is specified on a "CETs per quadrant" basis. Therefore, each quadrant of required CETs is considered a separate Function for Condition entry.

17. Emergency Feedwater Flow

EFW Flow instrumentation is a Type D, Category I variable and is provided to monitor operation of RCS heat removal via the SGs. One channel is provided for each flow path of an EFW pump to each SG, i.e., each pump feeds both SGs so there are four flow paths. The channels provide indication of EFW Flow to each SG over a range of 0 to 900 gpm. Each transmitter provides an input to a control room indicator (four indicators total) and to the SPDS. Flow measurement to each steam generator is considered a separate Function of PAM Instrumentation.

EFW Flow is the primary indication used by the operator to verify that the EFW System is delivering flow to the correct SG.

18. High Pressure Injection Flow

See the discussion for Function 19 below.

19. Low Pressure Injection Flow

High and Low Pressure Injection Flow instrumentation is a Type A, Category I variable provided to support action for long term cooling requirements.

HPI flow may be throttled based on RCS pressure, subcooled margin and pressurizer level, and to balance flow rates between the injection lines. LPI flow information is used to determine when it is acceptable to terminate HPI. High and Low Pressure Injection Flow measurement is provided by two channels each with readout on two indicating recorders for high pressure injection (HPI), and with readout on two indicators and one recorder for low pressure injection (LPI) and on the SPDS. Each HPI channel includes four instruments (one per flow path) which provide flow indication over a range from 0 to 200 gpm, and the LPI channels provide flow indication over a range from 0 to 4500 gpm.

20. Reactor Building Spray Flow

Reactor Building Spray Flow instrumentation is a Type A, Category I variable provided to support action for long term reactor building cooling requirements (e.g., maintain NPSH) and iodine removal. Reactor Building Spray Flow measurement is provided by two channels with readout on two indicators and one recorder and on the SPDS. The channels provide flow indication over a range from 0 to 2000 gpm.

APPLICABILITY

The PAM instrumentation LCO is applicable in MODES 1, 2, and 3. These variables are related to the diagnosis and preplanned actions required for safe shutdown and to determine that safety systems are performing their intended function when required. In MODES 4, 5, and 6, unit conditions are such that the likelihood of an event occurring that would require PAM instrumentation is low; therefore, the PAM instrumentation is not required to be OPERABLE in these MODES.

ACTIONS

The ACTIONS are modified by two Notes. Note 1 is added to the ACTIONS to exclude the MODE change restriction of LCO 3.0.4. This exception allows entry into an applicable MODE while relying on the ACTIONS even though the ACTIONS may eventually require a unit shutdown. This exception is acceptable due to the passive function of the instruments, the operator's ability to respond to an accident utilizing alternate instruments and methods, and the low probability of an event requiring these instruments.

Note 2 is added to the ACTIONS to clarify the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed in Table 3.3.15-1. The Completion Time(s) of the inoperable channels of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function. This Note is also applicable for Table 3.3.15-1 items 12a, 12b, 12c, 12d, 13a, 13b, 17a and 17b, each of which is considered a separate Function.

<u>A.1</u>

When one or more Functions have one required channel inoperable, the inoperable channel must be restored to OPERABLE status within 30 days. The 30 day Completion Time is based on operating experience. This takes into account the remaining OPERABLE channel, the passive nature of the instrument (no critical automatic action is assumed to occur from these instruments), and the low probability of an event requiring PAM instrumentation during this interval.

<u>B.1</u>

Required Action B.1 specifies initiation of actions to prepare and submit a Special Report to the NRC. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. The Special Report is to be submitted in accordance with 10 CFR 50.4 within 30 days of entering Condition B. This action is appropriate in lieu of a shutdown requirement since alternative actions are identified before loss of functional capability and given the likelihood of unit conditions that would require information provided by this

instrumentation. The Completion Time of "Immediately" for Required Action B.1 identifies the start of the "clock" for submittal of the Special Report. Condition B is modified by a Note requiring Required Action B.1 to be completed whenever the Condition is entered. The Note ensures the requirement to prepare and submit the report is completed. Restoration alone per Required Action A.1 after the initial Completion Time of 30 days does not alleviate the need to report the extended inoperability to the NRC.

C.1

When one or more Functions have two required channels inoperable (i.e., two channels inoperable in the same Function), one channel in the Function should be restored to OPERABLE status within 7 days. This Condition does not apply to the hydrogen monitor channels. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrumentation action operation and the availability of alternative means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance of qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the probability that the PAM Function will be unavailable should an accident occur.

D.1

When two required hydrogen monitor channels are inoperable, Required Action D.1 requires one channel to be restored to OPERABLE status. This action restores the monitoring capability of the hydrogen monitor. The 72 hour Completion Time is based on the relatively low probability of an event requiring hydrogen monitoring. Continuous operation with two required channels inoperable is not acceptable because alternate indications are not available.

E.1

Required Action E.1 directs entry into the appropriate Condition referenced in Table 3.3.15-1. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met the Required Action and associated Completion Time of Condition C or D, as applicable, Condition E is entered for that channel and provides for transfer to the appropriate subsequent Condition.

F.1

If the Required Action and associated Completion Time of Conditions C or D are not met and Table 3.3.15-1 directs entry into Condition F, the unit must be brought to a MODE in which the requirements of this LCO do not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and MODE 4 within

12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

G.1

If the Required Action and associated Completion Time of Conditions C or D are not met and Table 3.3.15-1 directs entry into Condition E, alternate means of monitoring the parameter should be applied and the Required Action is not to shut down the unit but rather to initiate actions to prepare and submit a Special Report to the NRC. These alternate means may be temporarily installed if the normal PAM channel cannot be restored to OPERABLE status within the allotted time. The report provided to the NRC should discuss the alternate means used, describe the degree to which the alternate means are equivalent to the installed PAM channels, justify the areas in which they are not equivalent, and provide a schedule for restoring the normal PAM channels. The Special Report is to be submitted in accordance with 10 CFR 50.4 within 30 days of entering Condition F.

Both the RCS Hot Leg Level and the Reactor Vessel Level are methods of monitoring for inadequate core cooling.

The alternate means of monitoring the Reactor Building Area Radiation (High Range) consist of a combination of installed area radiation monitors and portable instrumentation.

The Completion Time of "Immediately" for Required Action G.1 identifies the start of the "clock" for submittal of the Special Report. Condition G is modified by a Note requiring Required Action G.1 to be completed whenever the Condition is entered. The Note ensures the requirement to prepare and submit the report is completed. Restoration alone per Required Action C.1 or Required Action D.1 after the initial Completion Time of 7 days, or 72 hours, respectively, does not alleviate the need to report the extended inoperability to the NRC.

SURVEILLANCE REQUIREMENTS

As noted at the beginning of the SRs, the SRs apply to each PAM instrumentation Function in Table 3.3.15-1.

SR 3.3.15.1

Performance of the CHANNEL CHECK once every 31 days for each required instrumentation channel that is normally energized provides reasonable assurance for prompt identification of a gross failure of instrumentation. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel with a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same

value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure; therefore, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION. The high radiation instrumentation should be compared with similar unit instruments located throughout the unit. For the reactor building hi-range radiation monitor, the CHANNEL CHECK should also note the detector's response to the keep alive source.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit. If the channels are within the criteria, it is an indication that the channels are OPERABLE. If the channels are normally off scale during times when surveillance is required, the CHANNEL CHECK will only verify that they are off scale in the same direction. Offscale low current loop channels are, where practical, verified to be reading at the bottom of the range and not failed downscale.

The Frequency is based on unit operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal but more frequent checks of channels during normal operational use of the displays associated with this LCO's required channels.

SR 3.3.15.2

A CHANNEL CALIBRATION is performed every 18 months. CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. This test verifies the channel responds to measured parameters within the necessary range and accuracy.

The SR is modified by a Note excluding neutron detectors from CHANNEL CALIBRATION. It is not necessary to test the detectors because generating a meaningful test signal is difficult, and there is no adjustment that can be made to the detectors. Furthermore, adjustment of the detectors is unnecessary because they are passive devices, with minimal drift. Finally, the detectors are of simple construction, and any failures in the detectors will be apparent as change in channel output.

For the Reactor Building Area Radiation instrumentation, a CHANNEL CALIBRATION may consist of an electronic calibration of the channel, not including the detector, for range decades above 10 R/hr, and a one point calibration check of the detector below 10 R/hr with a gamma source.

For the Reactor Building Hydrogen Concentration instrumentation, the calibration includes proper consideration of moisture effect.

Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION of the resistance temperature detector (RTD) sensors is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element.

Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION of the Core Exit thermocouple sensors is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element.

The Frequency is based on operating experience and consistency with the typical industry refueling cycle and is justified by the assumption of at least an 18 month calibration interval in the determination of the magnitude of equipment drift.

REFERENCES

1. SAR, Table 7-11A.
2. Regulatory Guide 1.97.
3. NUREG-0737, 1979.
4. SAR, Section 7.3.4.
5. 10 CFR 50.36.

B 3.3 INSTRUMENTATION

B 3.3.16 Control Room Isolation - High Radiation

BASES

BACKGROUND

The principal function of the Control Room Isolation - High Radiation is to provide an enclosed environment from which the unit can be operated following an uncontrolled release of radioactivity. The high radiation isolation function provides assurance that under the required conditions, an isolation signal will be initiated to provide isolation and shutdown the unit's normal control room ventilation supply fan.

The control room isolation signal is provided by two independent radiation monitoring systems; one associated with each unit. The Unit 1 radiation monitor is in the Unit 1 control room normal supply duct. The Unit 2 radiation monitor is in the Unit 2 control room normal supply duct. If a radioactivity concentration significantly above normal background level is detected, the unit monitor will initiate a shutdown of the unit's normal duty supply fans, place both unit's ventilation dampers in their recirculation mode, and start the unit's Control Room Emergency Ventilation System (CREVS) supply fan.

The trip setpoints are chosen sufficiently below hazardous radiation levels to minimize operator exposure during an accident and sufficiently above normally experienced background levels to minimize spurious actuation. The habitability systems functional design bases are provided in the ANO Unit 2 SAR, Section 6.4 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The control room must be maintained habitable during post accident operations and recovery. The CREVS is a shared system which provides a filtered makeup air source for the common control room habitability envelope from which the unit can be operated following an uncontrolled release of radioactivity. Upon receipt of a high radiation signal, the associated normal ventilation supply fans are shutdown, the control room isolation dampers are closed to isolate both normal outside air intakes, and the associated CREVS train emergency filtration function is initiated. Operator action is necessary to shut down one train of CREVS (if both actuate) in order to prevent operator doses greater than identified by the habitability analysis. Operator action is also necessary to verify that at least one door between the Unit 1 and Unit 2 control rooms is open to provide appropriate pressurization and recirculation.

In MODES 1, 2, 3, and 4, the radiation monitor isolation of the control room habitability envelope and actuation of the CREVS provides a habitable environment

for the operators following a design basis accident or any event with a significant release of radioactivity.

During movement of irradiated fuel assemblies, the radiation monitor isolation of the control room habitability envelope and actuation of the CREVS provides a habitable environment for the operators following a fuel handling accident.

The Control Room Isolation-High Radiation satisfies Criterion 3 of 10 CFR 50.36 (Ref. 2).

LCO

The LCO requires that instrumentation necessary to initiate the CREVS is OPERABLE. Two channels of Control Room Isolation-High Radiation are required to be OPERABLE to provide actuation capability from high radiation either entering the control room habitability envelope via the Unit 1 normal supply duct (2RITS-8001) or entering the control room habitability envelope via the Unit 2 normal supply duct (2RITS-8750-1).

Trip setpoints are specified in the unit specific procedures. The setpoints are selected to ensure the as-found setpoint measured by the CHANNEL FUNCTIONAL TEST does not exceed the Allowable Value if the bistable is performing as required. The trip setpoint for this parameter does not include additional allowances for instrument uncertainties. Therefore, the trip setpoint and Allowable Value are the same.

APPLICABILITY

The control room isolation capability on high radiation shall be OPERABLE in MODES 1, 2, 3, 4, and during movement of irradiated fuel assemblies in any MODE. If a radioactive release were to occur during any of these conditions, the control room would have to remain habitable to ensure continued reactor control capability from the control room.

ACTIONS

A.1

Condition A applies to inoperability of one channel of the Control Room Isolation - High Radiation function in MODE 1, 2, 3, or 4.

With one channel of Control Room Isolation-High Radiation function inoperable, one channel remains OPERABLE to provide an automatic actuation function. Since the probability of an event which would be detected by only one of the radiation monitors is low, operation of the unit may continue for up to 7 days. If the CREVS

actuation instrumentation is not returned to OPERABLE status, the unit ventilation system must be placed, within the 7 days, in a state equivalent to that which occurs after the high radiation actuation has occurred with one OPERABLE train of the CREVS in the emergency recirculation mode of operation. Reactor operation may then continue indefinitely in this state. The 7 day Completion Time is sufficient to restore most causes of inoperable actuation instrumentation.

B.1

Condition B applies to inoperability of both channels of the Control Room Isolation-High Radiation function in MODE 1, 2, 3, or 4.

With both channels of Control Room Isolation - High Radiation inoperable, the ventilation system must be placed in a condition that does not require the isolation to occur, i.e., in a state equivalent to that which occurs after the high radiation isolation has occurred with one OPERABLE train of the CREVS in operation. Reactor operation can continue indefinitely in this state. The 1 hour Completion Time is a sufficient amount of time in which to take the Required Action.

C.1 and C.2

If the CREVS cannot be placed into the emergency recirculation mode while in MODE 1, 2, 3, or 4, actions must be taken to minimize the chances of an accident that could lead to radiation releases. The unit must be placed in at least MODE 3 within 6 hours, with a subsequent cooldown to MODE 5 within 36 hours. This places the reactor in a low energy state that allows greater time for operator action if habitation of the control room is precluded. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

D.1 and D.2

Required Action D.1 is the same as discussed earlier for Condition A, except for Completion Time. If the CREVS cannot be placed into recirculation mode while moving irradiated fuel assemblies, then Required Action D.2 suspends actions that could lead to an accident that could release radioactivity resulting from a fuel handling accident.

Required Action D.2 places the irradiated fuel in a safe and stable configuration in which it is less likely to experience an accident that could result in a release of radioactivity. The irradiated fuel must be maintained in these conditions until the automatic isolation capability is returned to operation or when manual action places one train of the CREVS into the emergency recirculation mode. The Completion Time of "Immediately" is consistent with the urgency of the situation and accounts for the high radiation function, which provides the only automatic Control Room Isolation function capable of responding to radiation release due to a fuel handling

accident. The Completion Time does not preclude placing any fuel assembly into a safe position before ceasing any such movement.

Note that in certain circumstances, such as fuel handling in the fuel handling area during power operation, both Condition A or B and Condition D may apply in the event of channel failure(s).

SURVEILLANCE REQUIREMENTS

SR 3.3.16.1

Performance of a CHANNEL CHECK for the Control Room Isolation - High Radiation actuation instrumentation once every 12 hours provides reasonable assurance for prompt identification of a gross failure of instrumentation. Performance of the CHANNEL CHECK helps ensure that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Acceptance criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties. If a channel is outside the criteria, it may be an indication that the transmitter or the signal processing equipment has drifted outside its limit. If the channels are within the criteria, it is an indication that the channels are OPERABLE. The Frequency is based on operating experience that demonstrates channel failure is rare.

SR 3.3.16.2

A Note allows a channel to be inoperable for up to 3 hours for surveillance testing without entering the associated Conditions and Required Actions, although during this time period it cannot actuate a control room isolation. This is based on the average time required to perform channel surveillance. It is not acceptable to remove channels from service for more than 3 hours to perform required surveillance testing without declaring the channel inoperable.

SR 3.3.16.2 is the performance of a CHANNEL FUNCTIONAL TEST once every 31 days to ensure that the channels can perform their intended functions. This test verifies the capability of the instrumentation to provide the automatic Control Room Isolation. Any setpoint adjustment shall be consistent with the setpoint requirements.

The 31 day Frequency is based on operating experience which indicates that the instrumentation usually passes the CHANNEL FUNCTIONAL TEST when performed on a monthly basis.

SR 3.3.16.3

This SR requires the performance of a CHANNEL CALIBRATION to ensure that the instrument channel remains operational with the correct setpoint.

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations to ensure that the channel remains operational between successive tests. CHANNEL CALIBRATION must be performed consistent with the setpoint requirements.

The Frequency is based on the assumption of at least an 18 month calibration interval in the determination of the magnitude of equipment drift and is consistent with the typical refueling cycle.

REFERENCES

1. ANO-2 SAR, Section 6.4.

2. 10 CFR 50.36.

CTS DISCUSSION OF CHANGES

ITS Section 3.3D: Instrumentation - MISC.

Note: ITS Section 3.3D package includes the following ITS:

ITS 3.3.8	Diesel Generator (DG) Loss of Power Start (LOPS)
ITS 3.3.15	Post Accident Monitoring (PAM) Instrumentation
ITS 3.3.16	Control Room Isolation - High Radiation

and addresses the following NUREG-1430 RSTS:

RSTS 3.3.8	Diesel Generator (DG) Loss of Power Start (LOPS)
RSTS 3.3.15	Reactor Building (RB) Purge Isolation - High Radiation
RSTS 3.3.16	Control Room Isolation - High Radiation
RSTS 3.3.17	Post Accident Monitoring (PAM) Instrumentation
RSTS 3.3.18	Remote Shutdown System

ADMINISTRATIVE

A1 The designated change represents a non-technical, non-intent change to the Arkansas Nuclear One, Unit 1 Current Technical Specifications (CTS) made to make the ANO-1 Improved Technical Specifications (ITS) consistent with the B&W Standard Technical Specification (RSTS), NUREG 1430, Revision 1. This change does not alter the requirements of the CTS or RSTS. Examples of this type of change include: wording preference; convention adoption; editorial, numbering and formatting changes; and hierarchy structure.

A2 The ANO-1 CTS Bases will be administratively deleted in their entirety in favor of the NUREG-1430 Bases. The CTS Bases will be reviewed for technical content that will be identified for retention in the ITS Bases.

A3 CTS 3.5.1.1 and 3.5.1.2 represent information on the proper action when the number of channels is less than required by CTS Table 3.5.1-1. For example, CTS 3.5.1 does not clearly specify that the number of channels identified in Table 3.5.1-1, Column 1, are required to be OPERABLE, and CTS 3.5.1.2 provides limitations for inoperable channels. Similarly, CTS Specifications 4.1.a, and 4.1.b contain information on the proper application of CTS Table 4.1-1. These Specifications and the format of the referenced Tables are replaced with the appropriate ITS 3.3.15 and ITS 3.3.16 requirements. The CTS markup for these Specifications and Tables does not attempt to depict all of the changes required to adopt the ITS format. Rather, the appropriate specific Discussion of Change (DOC) is indicated along with the appropriate CTS versus ITS cross reference. Therefore, this change in format is considered administrative.

CTS DISCUSSION OF CHANGES

A4 Surveillance frequencies in CTS Table 4.1-1 have been replaced with those from NUREG-1430. The CTS and corresponding ITS Frequencies are as follows:

CTS	ITS
S - Each shift	12 hours
W - Weekly	7 days
M - Monthly	31 days
D - Daily	24 hours
T/W - Twice per week	96 hours
Q - Quarterly	92 days
P - Prior to each startup if not done previous week	Not Used
B/M - Every 2 months	Not Used
R - Once every 18 months	18 months
PC - Prior to going Critical if not done within previous 31 days	Not Used
NA - Not Applicable	Not Used
SA - SA Twice per Year	184 days

(Note: Not all Frequencies are applicable to this package.)

A5 The CHANNEL FUNCTIONAL TEST requirements for the CTS Degraded Voltage Monitoring Functions in CTS Table 4.1-1, item 37, are omitted as a specific line item in the ITS. However, this results in no change in requirements since the CHANNEL FUNCTIONAL TEST is required as part of the CHANNEL CALIBRATION which is on the same Frequency, 18 months. This change is consistent with NUREG-1430.

A6 ITS 3.3.15 ACTIONS Note 2 is incorporated . The inclusion of ITS 3.3.15 brings together all the Post Accident Monitor (PAM) Functions into one Specification. As separate items in the CTS, each Function had separate Actions and was considered separately. In ITS, the addition of ACTIONS Note 2 retains this separate consideration for each Function. This is an administrative change only, and is necessary due to the different format utilized for ITS. This change is consistent with NUREG-1430.

A7 The term Minimum Degree of Redundancy as presented in CTS, i.e., Table 3.5.1-1 Column 4, will not be retained in ITS. Omission of this term is not considered to result in any changes in requirements since the intent of this column is consistent with application of Table 3.5.1-1 Column 3, "Minimum Channels Operable," which is retained (although the format is changed per DOC A3). Removal of this term and its usage from the CTS does not represent any actual change in requirements, only a change in presentation.

A8 A Note is incorporated into the ITS that is not in the CTS. The ITS 3.3.8 ACTIONS Note provides for separate entry into the ACTIONS for each Function. This is consistent with the CTS in that each CTS function was also considered separately (see Table 3.5.1-1, items 8a and 8b). Separate ACTIONS is therefore consistent with the CTS and the NUREG, and the addition of the Note is for clarity in application only.

A9 Specific Applicability requirements are included for ITS 3.3.8. These are included consistent with the CTS requirements which are not explicitly identified, but considered to be MODES 1, 2, 3, and 4 since the Actions provided by CTS Table 3.5.1-1, Note 14, require the unit to be placed in cold shutdown (ITS MODE 5) when the DG LOPS function is not OPERABLE. There are no additional restrictions once the unit is in cold shutdown or refueling. Further, events occurring in these MODES are slowly evolving events which provide time for operator action to start the DG when required, and such starts are not required by the ANO-1 safety analyses.

A10 The Applicability of the Degraded Voltage Monitoring (DG LOPS) Specifications in CTS Table 3.5.1-1, Other #8, as applied at ANO-1 is above Cold Shutdown. Due to the way requirements are presented in CTS Table 3.5.1-1, the Applicability is often not specifically stated. In the case of Degraded Voltage Monitoring instrumentation, it is considered to be required above Cold Shutdown which is consistent with the CTS Applicability for OPERABILITY of the DGs. This is consistent with CTS Table 3.5.1-1, Note 14, which requires the unit to be placed in cold shutdown (ITS MODE 5) when the DG LOPS function is not OPERABLE. There are no additional restrictions once the unit is in cold shutdown or refueling. Events occurring in MODES 5 & 6 are slowly evolving events which provide time for operator action to start the DG when required, and such starts are not required by the ANO-1 safety analyses.

A11 Not used.

A12 Not used.

A13 Not used.

A14 CTS 4.1.c is omitted since it duplicates requirements provided in the regulations, i.e., 10CFR Part 50, Appendix B, criteria XI, XVI, & XVII. Such duplication is unnecessary and results in additional administrative burden to revise the duplicate TS when these regulations are revised. Since removal of the duplication results in no actual change in the requirements, removal of the duplicative information is considered an administrative change. Further, changes to the requirements are controlled by the NRC. This change is consistent with NUREG-1430.

A15 This page is not yet approved as provided in this package. Therefore, this markup is dependent on the expected NRC approval of the August 6, 1998, (Ref. 1CAN089801) license amendment request (LAR) related to the sodium hydroxide tank limits.

CTS DISCUSSION OF CHANGES

TECHNICAL CHANGE -- MORE RESTRICTIVE

M1 The CTS 3.5.1-1, Note 14, Actions for inoperable channels in the Degraded Voltage Monitoring function are revised consistent with ITS 3.3.8 ACTIONS. CTS Note 14 allows 72 hours for restoration or place the unit in hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours. The ITS provides 1 hour for restoration of the inoperable channel(s) and then requires that the affected DGs be declared inoperable and the applicable Conditions entered. If the inoperable channels affect both DGs, the applicable Condition of LCO 3.8.1 will be Condition E and will allow only 2 hours for restoration of at least one of the inoperable instrument channels. This is more restrictive than CTS, but is appropriate since the affected automatic start function of both DGs is lost. This change is consistent with NUREG-1430.

M2 The CTS is revised to add a CHANNEL CHECK of the hydrogen concentration instrument channel every 31 days for each required instrument channel that is normally energized. There is no such requirement in the CTS. The Frequency of ITS 3.3.15.1 for PAM Function 10 is based on unit operating experience that demonstrates channel failure is rare, and on the use of less formal but more frequent checks of channels during normal operational use of the displays associated with the required channels. This change is consistent with NUREG-1430.

M3 An explicit Applicability is incorporated for ITS Table 3.3.15-1, PAM Functions which do not have an Applicability identified in CTS. For all PAM Functions identified in CTS Table 3.5.1-1, CTS 3.5.1.1 indicates that "startup and operation are not permitted" unless the minimum channels are OPERABLE. These were identified in the Section 1.0 conversion package as being equivalent to ITS MODES 1 & 2. Since ITS PAM Function 9 will be Applicable in MODES 1, 2, and 3, this is a more restrictive change consistent with NUREG-1430.

M4 Additional appropriate Conditions are included for the control room isolation on high radiation. ITS 3.3.16 Condition C is included to provide an appropriate default condition if Condition A or B are not met without reverting to LCO 3.0.3. Condition D is included to provide an appropriate condition if the LCO is not met during movement of irradiated fuel assemblies in MODES 5 or 6. The additional Conditions are consistent with NUREG-1430. This is considered a more restrictive change since CTS 3.5.1.17 and CTS Table 3.5.1-1 do not provide these Actions, and less time is provided to take the ACTIONS than if CTS LCO 3.0.3 were entered.

M5 CTS Table 3.5.1-1, Note 18 provides the Actions for inoperability of one channel of control room isolation on high radiation. After 7 days of inoperability of one channel, this Note allows an additional 6 hours to initiate and maintain operation of the CREVS. This additional 6 hours is not included in ITS 3.3.16, Condition A. This time period is excessive for initiation of CREVS; further, most problems can be restored within the initial 7 days. If the isolation instrumentation is not restored, the actuation of CREVS can easily be implemented within the initial 7 days. This change is consistent with NUREG-1430.

M6 CTS 3.3.1 provides an Applicability for the Borated Water Storage Tank (BWST) Level instrumentation that is associated with the containment integrity requirements of CTS 3.6.1 which is dependent on reactor coolant pressure (≥ 300 psig), reactor coolant temperature (≥ 200°F), and reactor fuel in the core. The proposed Applicability for the PAM instrumentation, including the BWST Level Function, is MODES 1, 2, and 3 with no dependence on reactor coolant pressure. Since CTS requirements for this Function would not be applicable in MODE 3 with the reactor coolant < 300 psig, the proposed Applicability is more restrictive than CTS. An Applicability which includes all of MODES 1, 2, and 3 is appropriate since the unit condition are such in other MODES that the likelihood of an event occurring which would require PAM instrumentation is low.

M7 Additional Functions are incorporated in order to include all Type A and Category 1 post accident monitors (PAMs). The addition of these Functions includes the associated LCO, Applicability, ACTIONS, Table entries, SURVEILLANCES, and Notes for each of the following PAM Functions:

1. Wide Range Neutron Flux
2. RCS Hot Leg Temperature
8. Automatic Reactor Building Isolation Valve Position
12c. Steam Generator (SG) "A" Water Level - High Range
12d. SG "B" Water Level - High Range
14. Condensate Storage Tank Level
20. Reactor Building Spray Flow

RCS Pressure is incorporated into the ITS as a specific Type A, Category 1 PAM, Function #4. Although the RCS pressure instrumentation is included in Table 3.5.1-1, ESAS items 1a and 2a, and in Table 4.1-1, items 15a and 17a, these requirements are intended for the automatic actuation functions of the instrumentation. The display functions are not required for the automatic actuation channels to perform their required functions, and as such, are not definitively included in the CTS. The addition of this ITS PAM Function includes the associated LCO, Applicability, ACTIONS and Surveillances.

M7 (continued)

SG "A" and "B" Water Level - Low Range are incorporated into the ITS as specific Type A, Category 1 PAMs, Functions #12a and 12b. Although the SG water level instrumentation is included in Table 3.5.1-1, EFIC item 1b, and in Table 4.1-1, item 53b, these requirements are intended for the automatic actuation functions of the instrumentation. The display functions are not required for the automatic actuation channels to perform their required functions, and as such, are not definitively included in the CTS. The addition of this ITS PAM Function includes the associated LCO, Applicability, ACTIONS and Surveillances.

SG "A" and "B" Pressure are incorporated into the ITS as specific Type A, Category 1 PAMs, Functions #13a and 13b. Although the SG pressure instrumentation is included in Table 3.5.1-1, EFIC item 1c, and in Table 4.1-1, item 53c, these requirements are intended for the automatic actuation functions of the instrumentation. The display functions are not required for the automatic actuation channels to perform their required functions, and as such, are not definitively included in the CTS. The addition of this ITS PAM Function includes the associated LCO, Applicability, ACTIONS and Surveillances.

High Pressure Injection (HPI) Flow and Low Pressure Injection (LPI) Flow are incorporated into the ITS as specific Type A, Category 1 PAMs, Functions #18 and 19. HPI Flow and LPI Flow instrumentation are included in Table 4.1-1, item 29. However, these requirements are for calibration of the instrumentation only. The associated requirements, including the associated LCO, Applicability, ACTIONS, Notes, and SR 3.3.15.1 are not included in the CTS. SR 3.3.15.1 requires a CHANNEL CHECK of this instrument channel every 31 days for each required instrument channel that is normally energized. The Frequency is based on unit operating experience that demonstrates channel failure is rare, and on the use of less formal but more frequent checks of channels during normal operational use of the displays associated with the required channels.

All Type A variables, as identified in SAR Table 7-11A, are included in the ITS because they provide the primary information that permits the control room operator to take specific manually controlled actions that are required when no automatic control is provided and that are required for safety systems to accomplish their safety functions for Design Basis Accidents (DBAs). Additionally, Category I variables are the key variables deemed risk significant because they are needed to: a) determine whether systems important to safety are performing their intended functions; b) provide information to the operators that will enable them to determine the potential for causing a gross breach of the barriers to radioactivity release; and c) provide information regarding the release of radioactive materials to allow for early indication of the need to initiate action necessary to protect the public and to estimate the magnitude of any impending threat. Since these PAM Functions are not in the CTS requirements, their addition represents a more restrictive change. This change is consistent with NUREG-1430.

M8 An explicit Applicability is incorporated for ITS Table 3.3.15-1, PAM Functions which do not have an Applicability identified in CTS. For all PAM Functions identified in CTS Table 3.5.1-1, CTS 3.5.1.1 indicates that "startup and operation are not permitted" unless the minimum channels are OPERABLE. These were identified in the Section 1.0 conversion package as being equivalent to ITS MODES 1 & 2. For ITS PAM Functions 11 and 17, CTS Table 3.5.1-1, Note 10 provides a final Action to place the unit in Hot Shutdown. For ITS PAM Functions 3 and 5, CTS Table 3.5.1-1, Notes 28 and 29 provide final Actions to place the unit in Hot Shutdown. For ITS PAM Function 16, CTS Table 3.5.1-1, Note 22 provides a final Action to place the unit in Hot Shutdown. Also, for ITS PAM Functions 6 and 7, CTS Table 3.5.1-1, Note 21 provides a final Action to place the unit in Hot Shutdown. Finally, for ITS PAM Function 10, CTS 3.14.4 provides a final Action to place the unit in Hot Shutdown.

Since the instrument channels are not restored to OPERABILITY, these Actions are interpreted as requirements to place the unit in a MODE in which the equipment is no longer required. Since the CTS hot shutdown is approximately equivalent to ITS MODE 3, the CTS Applicability is taken as the equivalent of ITS MODES 1 & 2. ITS 3.3.15 is proposed to be Applicable in MODES 1, 2, and 3. Therefore, this change is more restrictive.

M9 The number of required channels for the Emergency Feedwater (EFW) flow PAM, i.e., CTS Table 3.5.1-1, item OTHER #3, column 3, is increased from 1 to 2 per SG. One of the four flow monitors is included in the four flow EFW flow paths, i.e., each pump has a flow path to each SG. Since the combination of steam line break and single failure cannot be predicted, all four flow monitors should be available to assure the necessary information is available to the operator in a post accident environment. This change is consistent with NUREG-1430.

M10 The CTS Actions (Table 3.5.1-1, Note 10) for the Pressurizer Level (ITS 3.3.15 PAM #11) and EFW Flow (ITS 3.3.15 PAM #17) Functions and the CTS Action (Table 3.5.1-1, Note 22) for the Core Exit Thermocouples (ITS 3.3.15 PAM #16) Function allow 30 days for restoration of inoperable instrument channels and then required the unit to be in hot shutdown (i.e., subcritical) within 12 hours. The allowed 30 days was independent of the number of channels inoperable in the Function.

The CTS Actions (Table 3.5.1-1, Note 21) for the Containment Water Level - Wide Range (ITS 3.3.15 PAM #6) and Containment Pressure - High Range (ITS 3.3.15 PAM #7) Functions allowed 30 days for restoration of inoperable instrument channels (unless containment entry was required for restoration) and then required the unit to be in hot shutdown (i.e., subcritical) within 72 hours. If containment entry was required for restoration, operation was permitted until the next refueling outage. The allowed 30 days was independent of the number of channels inoperable in the Function; however, if both channels were inoperable for 30 days, the time to place the unit in hot shutdown (i.e., subcritical) was reduced to 12 hours.

M10 (continued)

CTS 3.3.6 for the Borated Water Storage Tank level instrument channel (ITS 3.3.15 PAM #15) Functions allow 7 days for restoration of inoperable instrument channels and then require the unit to be in hot shutdown (i.e., subcritical) within 36 hours and in cold shutdown within an additional 72 hours.

ITS 3.3.15 allows 30 days for one inoperable channel (RA A.1), but is proposed to allow only 7 days (new RA C.1) for both required channels inoperable. At the end of the 30 days, if the required channel has not been restored to OPERABLE status, a Special Report is required to be prepared and submitted (new RA B.1). Additionally, with both required channels inoperable for more than 7 days, the ACTIONS are modified to require the unit to be placed in ITS MODE 3 (i.e., subcritical) in 6 hours (new RA F.1), and in ITS MODE 4 in 12 hours (new RA F.2). The shorter Completion Times are consistent with the time required to achieve these MODES in an orderly manner and without challenging unit systems, and ultimately placing the unit in MODE 4 is consistent with the new MODES of Applicability.

M11 CTS 3.14.4 for the hydrogen concentration monitor (ITS 3.3.15, PAM #10) Function allows 30 days for restoration of one inoperable instrument channel and then requires the unit to be in hot shutdown within 6 hours. The ITS provides a 72 hour Completion Time for two inoperable instrument channels prior to requiring a shutdown (see DOC L9). However, with both required channels inoperable for more than 72 hours, the ACTIONS also require the unit to be shutdown consistent with the new MODES of Applicability (see DOC M8). Therefore, with both required channels inoperable for more than 72 hours, Required Action F.1 requires the unit to be placed in ITS MODE 3 in 6 hours, and new Required Action F.2 requires the unit to be in ITS MODE 4 in 12 hours. The Completion Times are consistent with the time required to achieve these MODES in an orderly manner and without challenging unit systems. Ultimately placing the unit in MODE 4 is consistent with the new MODES of Applicability, but more restrictive than CTS 3.14.4. This change is consistent with NUREG-1430.

3.3.8-02

M12 CTS Table 3.5.1-1, Item 8 on page 45d indicates that only one channel of degraded voltage relaying is required to be OPERABLE. However, as discussed in the note at the bottom of the page, each 480 V Bus requires both channels of relaying to actuate in order to begin the DG LOPS sequence. The requirements for both the loss of voltage and degraded voltage functions have been relocated to ITS 3.3.8. The aforementioned degraded voltage relays have subsequently been revised to require that both relays on each 480 V bus be OPERABLE. This change is consistent with NUREG-1430 for the ANO-1 DG LOPS configuration, but is more restrictive than CTS Table 3.5.1-1. In addition, wording has been modified to reference "relays" instead of "channels." The use of "function" and "channel" terms in the same specification had created some confusion. Since each channel refers to it's associated degraded voltage relay, using the term "relay" in place of "channel" is acceptable.

CTS DISCUSSION OF CHANGES

TECHNICAL CHANGE -- LESS RESTRICTIVE

L1 CTS Table 3.5.1-1, item OTHER #8, requires operability of the Degraded Voltage Monitoring (DG LOPS) Systems. The "Required Actions," for this Function when it is inoperable are provided in CTS Table 3.5.1-1, Note 14. These requirements have been replaced with those presented in ITS 3.3.8, ACTIONS. The CTS allows for a 72 hour outage time after which the unit must be placed in at least Hot Shutdown within the next 6 hours and Cold Shutdown within the following 30 hours. The ITS will require that, after one hour, the applicable Condition(s) and Required Action(s), for the associated DG made inoperable, be entered. This change will allow a loss of the DG LOPS function to exist for up to 7 days provided the Required Actions of ITS 3.8.1 are met for the inoperable DG. After 7 days, the unit will be required to enter MODE 3 within 12 hours and MODE 5 within 36 hours. This change emphasizes the support/supported equipment relationship between the LOPS instrumentation and the DGs and ensures that the supported equipment (DG) Conditions and Required Actions are entered after a short (1 hour) delay. This change to the allowable time that these functions can be inoperable is being made to adopt requirements consistent with NUREG-1430.

L2 The Degraded Voltage Monitoring (DG LOPS) surveillance requirements of CTS Table 4.1-1 Item 37 have been replaced by ITS SR 3.3.8.1 and SR 3.3.8.2. These new requirements are consistent with the CTS requirements with the exception of the NOTE in SR 3.3.8.2. This NOTE allows for a delay, of up to 4 hours, in the entry into associated Conditions and Required Actions, when DG LOPS instrumentation is inoperable solely for performance of SR 3.3.8.2. This delay is acceptable only if the remaining channel, monitoring the bus, is OPERABLE. Adoption of the Note in SR 3.3.8.2 provides sufficient time to perform the required testing while not significantly reducing the probability that the DG will start when necessary.

L3 CTS 3.3.1 provides an Applicability for the Borated Water Storage Tank (BWST) Level instrumentation that is associated with the containment integrity requirements of CTS 3.6.1 which is dependent on reactor coolant pressure ($\geq$ 300 psig), reactor coolant temperature ($\geq$ 200°F), and reactor fuel in the core. The proposed Applicability for the PAM instrumentation, including the BWST Level Function, is ITS MODES 1, 2, and 3, which include reactor coolant temperatures $\geq$ 280°F with no dependence on reactor coolant pressure. Since CTS requirements for this Function would be applicable in MODE 4 with the reactor coolant $\geq$ 300 psig, the proposed Applicability is less restrictive than CTS. An Applicability which includes only ITS MODES 1, 2, and 3 is appropriate since the unit conditions are such in other MODES that the likelihood of an event occurring which would require PAM instrumentation is low.

L4 ITS 3.3.15, ACTIONS Note 1 is incorporated to exclude the MODE change restrictions of LCO 3.0.4 for the PAMs. This exception allows entry into an applicable MODE while relying on the ACTIONS even though the ACTIONS may eventually require a unit shutdown. This exception is acceptable due to the passive function of the instruments, the operator's ability to respond to an accident utilizing alternate instruments and methods, and the low probability of an event requiring these instruments. This change is consistent with NUREG-1430.

L5 The CTS Actions (Table 3.5.1-1, Note 10) for the Pressurizer Level (ITS 3.3.15 PAM #11) and EFW Flow (ITS 3.3.15 PAM #17) Functions and the CTS Action (Table 3.5.1-1, Note 22) for the Core Exit Thermocouples (ITS 3.3.15 PAM #16) Function allowed 30 days for restoration of inoperable instrument channels and then required the unit to be in hot shutdown within 12 hours. The allowed 30 days was independent of the number of channels inoperable in the Function. The ITS allows 30 days for one inoperable channel (RA A.1), but at the end of the this time, if the required channel has not been restored to OPERABLE status, ITS requires that a Special Report be prepared and submitted (new RA B.1) rather than the unit shutdown. The allowance for submitting a Special Report instead of requiring a shutdown is based on the inoperability of only one of the two channels of instrumentation. Although continued operation beyond 30 days with one channel of PAM instrumentation of any of the above functions appears to lack redundancy, the requirements of the Special Report include a discussion of compensatory measures that will be established during operation with one of the PAM channels operable. Such compensatory measures may include increased frequency of monitoring the operable channel, ongoing efforts to restore the inoperable channel, a plan of action should the remaining channel be rendered inoperable, and alternate indication that may assist the operator in the event the remaining channel is lost. Pump differential pressure and steam generator level response are examples of alternate indications of EFW Flow. Reactor coolant hot and cold leg temperature indications and the response of excore neutron flux monitors can provide insight to the condition of the reactor core when the Core Exit Thermocouples may be unavailable. Flow and mass balances can aid operators in determining pressurizer level response in addition to the installed Reactor Vessel Level Monitors and Hot Leg Level System. The Special Report requirement also provides the NRC staff an opportunity to review proposed compensatory measures and respond accordingly. Since operating experience suggests the loss of both PAM channels for a given indicator is not likely and based on the compensatory measures that are developed and submitted in Special Report to the NRC, continued operation with one inoperable PAM channel for the above indicators is acceptable. This change is consistent with the safety function of the equipment and with NUREG-1430.

3.3.15-01

L6 The CTS Actions (Table 3.5.1-1, Note 20) for the Containment High Range Radiation Monitoring (ITS 3.3.15 PAM #11) allow 7 days for restoration of a single inoperable instrument channel and then requires submittal of a Special Report within 30 days of the event. ITS 3.3.15, Condition A allows 30 days for restoration of a single channel and then requires a Special Report. Note that the CTS phrase "of the event" is moved to the Bases and interpreted as "expiration of the Completion Time for restoration" and "entry into the Condition requiring the Special Report." Extending the allotted Completion time to 30 days is acceptable since, based on operating experience, there is a low likelihood that the other channel will fail. In addition, the CHRRMs are used to aid in core damage assessment and the potential offsite release consequences, for which several other means exist to support these functions. Examples of other inputs into the core damage assessment include the Core Exit Thermocouples, various other reactor coolant temperature indicators, reactor coolant level systems and monitors, neutron flux indicator responses, reactor coolant pressures, sampling of the reactor coolant, etc. The known condition of the reactor core along with on-site and off-site radiation monitoring can provide sufficient information for input into off-site dose consequence determinations. The requirement to submit a Special Report thereafter provides a formal method of presenting alternate indications and systems that will be relied upon during subsequent channel inoperability and provide a listing of compensatory measures that will be established to support continued operation. The Special Report provides the NRC with sufficient information in a short period of time to enable a review of the compensatory measures and alternate indicators and respond accordingly, should they so desire.

3.3.15-01

CTS also allows 72 hours for restoration with two inoperable channels in the Function. At the end of the 72 hours, alternate monitoring methods are required to be implemented. The ITS Completion Time for restoration with two channels inoperable is 7 days. If the required channel has not been restored to OPERABLE status, ITS requires a Special Report be prepared and submitted. However, alternate monitoring is a part of the expected response to the Conditions as indicated in the Bases (see DOC LA1). Examples of alternate monitoring are presented above. The Special Report, as discussed above, provides the NRC opportunity to review what alternate indications have been established and what compensatory measures will be in place during continued operation with both channels of the CHRRMs inoperable. The report will also include the assumed failure mode and the ongoing actions planned to return the inoperable channels to an OPERABLE status. Since operating experience indicates that the likelihood of both PAM channels of a function simultaneously being inoperable is low, and due to the availability of several alternate monitoring methods, the development of compensatory actions, and the requirement to submit a Special Report describing efforts being taken, this change is acceptable. This change is consistent with NUREG-1430.

3.3.15-01

3.3.15-01

L7 The CTS Actions (Table 3.5.1-1, Note 21) for the Containment Water Level - Wide Range (PAM #6) and Containment Pressure - High Range (PAM #7) Functions allow 30 days for restoration of inoperable instrument channels (unless containment entry was required for restoration) and then required the unit to be in hot shutdown within 72 hours. If containment entry was required for restoration, operation was permitted until the next refueling outage. The allowed 30 days was independent of the number of channels inoperable in the Function. However, if both channels were inoperable for 30 days, the time to place the unit in hot shutdown was reduced to 12 hours. ITS 3.3.15, Condition A allows 30 days for restoration of a single channel and then requires only a Special Report (regardless of the need for containment entry). The allowance for submitting a Special Report instead of requiring a shutdown is based on the inoperability of only one of the two channels of instrumentation. Although continued operation beyond 30 days with one channel of PAM instrumentation of any of the above functions appears to lack redundancy, the requirements of the Special Report include a discussion of compensatory measures that will be established during operation with one of the PAM channels operable. Such compensatory measures may include increased frequency of monitoring the remaining channel, ongoing efforts to restore the inoperable channel, a plan of action should the remaining channel be rendered inoperable, and alternate indication that may assist the operator in the event the remaining channel is lost. Containment Narrow Range pressure indicators and the known condition of the reactor coolant system provide indication of the state of the containment atmosphere and may also be used to assess the state of the containment sump. Narrow Range Containment Sump level along with the suction pressure indications of the emergency core cooling pumps (once recirculation mode is entered), are alternate means of determining the containment building water level. The Special Report requirement also provides the NRC staff an opportunity to review proposed compensatory measures and respond accordingly. Since operating experience suggests the loss of both PAM channels for a given indicator is not likely and based on the compensatory measures that are developed and submitted in Special Report to the NRC, continued operation with one inoperable PAM channel for the above indicators is acceptable. This change is consistent with NUREG-1430. (Note: Default Required Actions for two channels inoperable are addressed in DOC M10.)

L8 The CTS Actions (Table 3.5.1-1, Notes 28 and 29) for the Reactor Vessel Level Monitoring System (ITS 3.3.15 PAM #5) and the Hot Leg Level Measurement System (ITS 3.3.15 PAM #3) allow, if repairs are feasible, 7 days for restoration of a single inoperable instrument channel and 48 hours for restoration of two inoperable instrument channels. The unit is then required to be in hot shutdown within 12 hours. If repairs are not feasible, operation is permitted until the next refueling outage with the required submittal of a Special Report within 30 days of the failure. ITS Condition A allows 30 days for restoration of a single channel, and ITS Condition C allows 7 days for restoration of one of two inoperable instrument channels. ITS Conditions B and G then require a Special Report regardless of the feasibility of repairs. Note that the CTS phrase "of the failure" is moved to the Bases and revised to "entry into the Condition requiring the Special Report."

L8 (continued)

3.3.15-01

Extending the allotted Completion time to 30 days is acceptable since, based on operating experience, there is a low likelihood that the remaining channel will fail. In addition, the level monitors are used to aid in core damage assessment, for which several other means exist to support this function. Examples of other inputs into the core damage assessment include the Core Exit Thermocouples, various other reactor coolant temperature indicators, pressurizer level, neutron flux indicator responses, reactor coolant pressures, sampling of the reactor coolant, etc. The requirement to submit a Special Report thereafter provides a formal method of presenting alternate indications and systems that will be relied upon during subsequent channel inoperability and provide a listing of compensatory measures that will be established to support continued operation. The Special Report provides the NRC with sufficient information in a short period of time to enable a review of the compensatory measures and alternate indicators and respond accordingly, should they so desire.

3.3.15-01

As stated previously, the ITS Completion Time for restoration with two channels inoperable is 7 days or a Special Report be prepared and submitted. Examples of alternate monitoring are presented above. The Special Report, as discussed above, provides the NRC opportunity to review what alternate indications have been established and what compensatory measures will be in place during continued operation with both channels of the above function(s) inoperable. The report will also include the assumed failure mode and the ongoing action plan to return the inoperable channels to an OPERABLE status. Since operating experience indicates that the likelihood of both PAM channels of a function simultaneously being inoperable is low, and due to the availability of several alternate monitoring methods, the development of compensatory actions, and the requirement to submit a Special Report describing efforts being taken, this change is acceptable. This change is consistent with NUREG-1430.

L9 CTS 3.14.4 for the hydrogen concentration monitor (ITS 3.3.15 PAM #10) Function allows 30 days for restoration of one inoperable instrument channel and then requires the unit to be in hot shutdown within 6 hours. The ITS adds Required Actions B.1, D.1 and F.1. ITS Required Action A.1 allows 30 days for one inoperable channel, but at the end of the 30 days, if the required channel has not been restored to OPERABLE status, the added ITS Required Action B.1 requires only that a Special Report be prepared and submitted. In addition, ITS Required Action D.1 provides a 72 hour Completion Time for two inoperable instrument channels prior to requiring a shutdown. With both required channels inoperable for more than 72 hours, ITS Required Action F.1 & F.2 require the unit to be shutdown consistent with the new MODES of Applicability (see DOC M8). Since no allowance was provided in CTS for both channels inoperable, this change is less restrictive than CTS.

L9 (continued)

3.3.15-01

Extending the allotted Completion time to 30 days when one monitor is inoperable is acceptable since, based on operating experience, there is a low likelihood that the other channel will fail. In addition, the hydrogen monitors are used to aid in core damage assessment and the potential offsite release consequences, for which several other means exist to support these functions. Examples of other inputs into the core damage assessment include the Core Exit Thermocouples, various other reactor coolant temperature indicators, reactor coolant level systems and monitors, neutron flux indicator responses, reactor coolant pressures, sampling of the reactor coolant, etc. The known condition of the reactor core along with on-site and off-site radiation monitoring and the containment high range radiation monitors can provide sufficient information for input into off-site dose consequence determinations. In addition, industry experience and studies have indicated that a hydrogen buildup is not expected post-LOCA as was the assumed case during the Three Mile Island accident era. The requirement to submit a Special Report thereafter provides a formal method of presenting alternate indications and systems that will be relied upon during subsequent channel inoperability and provide a listing of compensatory measures that will be established to support continued operation. The Special Report provides the NRC with sufficient information in a short period of time to enable a review of the compensatory measures and alternate indicators and respond accordingly, should they so desire.

3.3.15-01

ITS also allows 72 hours for restoration with two inoperable channels, followed by a required shutdown if at least one channel cannot be restored in this period. Operating experience has indicated that there is a low likelihood that both channels of any PAM function would be failed simultaneously. The examples of alternate monitoring presented above also provide a margin to safety during the 72-hour allotted period. Since operating experience indicates that the likelihood of both PAM channels of a function simultaneously being inoperable is low and due to the availability of several alternate monitoring methods, the 72-hour allowance supporting a restoration period for conditions where both hydrogen monitors are inoperable is acceptable. This change is consistent with NUREG-1430.

L10 The CTS requirements (CTS Table 4.1-1, items 15a, 17a, 26, 34, 46, 51, 53b, 53c, 57, 58, 59, 61, 63, and 64) for a CHANNEL CHECK of this instrument channel are revised to require such a check every 31 days and then only for each required instrument channel that is normally energized (ITS ST 3.3.15.1). CTS requires the check regardless of the normal energization state. Therefore, this change is less restrictive than CTS. The Frequency is based on unit operating experience that demonstrates channel failure is rare, and on the use of less formal but more frequent checks of channels during normal operational use of the displays associated with the required channels. This change is consistent with NUREG-1430.

L10 (continued)

SG "A" and "B" Water Level - Low Range are incorporated into the ITS as specific Type A, Category 1 PAMs, Functions #12a and 12b. Although the SG water level instrumentation is included in Table 3.5.1-1, EFIC item 1b, and in Table 4.1-1, item 53b, these CTS requirements are intended for the automatic actuation functions of the instrumentation. The display functions are not required for the automatic actuation channels to perform their required functions, and as such, are not definitively included in the CTS. However, since the CHANNEL CHECK Frequency for these instruments PAM Function is less than identified in the CTS for these instruments, the use of this Frequency is considered a less restrictive change. This change is consistent with NUREG-1430.

Similarly, SG "A" and "B" Pressure are incorporated into the ITS as specific Type A, Category 1 PAMs, Functions #13a and 13b. Although the SG pressure instrumentation is included in Table 3.5.1-1, EFIC item 1c, and in Table 4.1-1, item 53c, these CTS requirements are intended for the automatic actuation functions of the instrumentation. The display functions are not required for the automatic actuation channels to perform their required functions, and as such, are not definitively included in the CTS. However, since the CHANNEL CHECK Frequency for these instruments PAM Function is less than identified in the CTS for these instruments, the use of this Frequency is considered a less restrictive change. This change is consistent with NUREG-1430.

L11 CTS 3.3.6 and 3.3.7 for the Borated Water Storage Tank (BWST) level instrumentation (ITS 3.3.15 PAM #15) Function allows 7 days for restoration of one inoperable instrument channel and then requires the unit to be in hot shutdown within 36 hours and in cold shutdown within an additional 72 hours. The ITS allows 30 days for one inoperable channel (RA A.1), but at the end of the 30 days, if the required channel has not been restored to OPERABLE status, ITS requires only that a Special Report be prepared and submitted (RA B.1). In addition, the ITS provides a 7 day Completion Time for two inoperable instrument channels (RA C.1) prior to requiring a shutdown. Additionally, with both required channels inoperable for more than 7 days, the ACTIONS also require the unit to be shutdown consistent with the new MODES of Applicability (RAs F.1 & F.2). Since no allowance was provided in CTS for both channels inoperable, this change is less restrictive than CTS.

3.3.15-01

Extending the Completion time to 30 days is acceptable since, based on operating experience, there is a low likelihood that the remaining channel will fail. In addition, other means exist to support trending of BWST level. One example is the use of emergency core cooling pump suction pressures. A decrease in static suction pressure would indicate a decrease in BWST level. Calculations can be performed to determine the proportionality of this relationship. The requirement to submit a Special Report thereafter provides a formal method of presenting alternate indications and systems that will be relied upon during subsequent channel inoperability and provide a listing of compensatory measures that will be established to support continued operation. The Special Report provides the NRC with sufficient information in a short period of time to enable a review of the compensatory measures and alternate indicators established.

L11 (continued)

3.3.15-01

ITS also allows 7 days for restoration with two inoperable channels of BWST level. A shutdown is required if at least one channel is not restored by the end of the 7-day period. The availability of alternate monitoring, including that presented above, provides additional margin to safety during periods when both channels of BWST level may be inoperable simultaneously. In addition, compensatory measures would be established to aid operators in their response to unforeseen transients during this 7-day period. Since operating experience indicates that the likelihood of both PAM channels of BWST level simultaneously being inoperable is low, and due to the availability of alternate monitoring methods and the development of compensatory actions, allowing 7 days to restore at least one of the required BWST level channels to OPERABLE status is acceptable. This change is consistent with NUREG-1430.

L12 CTS Table 4.1-1, item 57, requires a monthly functional test of this instrument channel which is not included in ITS. Such a test is typically required when the instrumentation provides a safety related automatic actuation function. This instrument channel provides information only, and as such, a CHANNEL FUNCTIONAL TEST is not appropriate, nor required. This change is also consistent with NUREG-1430.

L13 CTS Table 4.1-1, item 28.b, requires a monthly functional test of the control room area radiation monitor instrument channel. The CTS also includes a Note which requires that the test include a check of the self-checking feature on each detector. This check is not included in ITS requirements. The self checking feature is not required to adequately test the monitor, nor is the self checking feature required for the monitor to perform its required safety function. Therefore, this checking requirement is deleted. This change is also consistent with NUREG-1430.

CTS Table 4.1-1, item 28.b, is modified to include the NUREG-1430 SR 3.3.16.2 Note which provides a three (3) hour time period with the monitor inoperable to conduct the CHANNEL FUNCTIONAL TEST without entering the associated Conditions and Required Actions. This allowance is based on an industry average time frame for conducting the test and the need to conduct the test during conditions for which the monitor is normally required to be OPERABLE. This change is also consistent with NUREG-1430.

L14 CTS Table 3.5.1-1, item 17, Note (Action) 30, and CTS 6.12.5.m require that a Special Report be submitted when the main steam line radiation monitors are inoperable for more than 7 days. This report is proposed to be eliminated. These monitors provide a normal operations function of radiological effluent release monitoring and a post accident monitor (PAM) function. Since the PAM function is neither Type A nor Category 1, neither of these functions met the 10 CFR 50.36 criteria for retention in the ITS. The radiological effluent release monitoring function is relocated to the ODCM, and the PAM function is relocated to the SAR (see DOC LA2). These administrative controls will continue to contain the associated corrective actions but the Special Report is an unnecessary use of licensee and regulator resources since it does not provide a significant corresponding benefit. Further, similar Special Reports are not required of other post accident monitors which are not Type A or Category 1 variables. As before, any deficiency which is reportable under other reporting criteria will continue to be reported in accordance with the regulations. This change is consistent with NUREG-1430 and the regulations.

L15 CTS Table 3.5.1-1, Other Safety Related Systems, items 4, 5, 6, and 7, associated Notes (Actions) 10, 11 (and 9), and 12, and CTS Table 4.1-1, items 22, 27, 28a, 28b, 40, 47, 48, 49, and 50 provide requirements for monitoring instrumentation which perform no safety related actuation functions. These monitors provide information to the operator under accident conditions, but these parameters are not considered as either Regulatory Guide 1.97 Type A or Category 1 parameters. Therefore, these monitors are omitted from the Technical Specifications. All Type A variables, as identified in the SAR Table 7-11A, are included in the ITS because they provide the primary information that permits the control room operator to take specific manually controlled actions that are required when no automatic control is provided and that are required for safety systems to accomplish their safety functions for Design Basis Accidents (DBAs). Additionally, all Category I variables are the key variables deemed risk significant because they are needed to: a) determine whether systems important to safety are performing their intended functions; b) provide information to the operators that will enable them to determine the potential for causing a gross breach of the barriers to radioactivity release; and c) provide information regarding the release of radioactive materials to allow for early indication of the need to initiate action necessary to protect the public and to estimate the magnitude of any impending threat. Since these PAM functions are neither Type A nor Category 1, none of these functions met the 10 CFR 50.36 criteria for retention in the ITS. The functions to be removed from the Technical Specification requirements are already identified in the SAR, along with all other PAMs, and administrative controls will provide the same response for degraded and nonconforming conditions which are currently provided for other PAMs which are not required by the Technical Specifications. These administrative controls will provide a level of maintenance and corrective actions commensurate with the importance to safety of these instruments. This change is consistent with NUREG-1430.

LESS RESTRICTIVE -- ADMINISTRATIVE DELETION OF REQUIREMENTS

LA1 This information has been moved to the Bases. This information provides details of design or process which are not directly pertinent to the actual requirement, i.e., Definition, Limiting Condition for Operation or Surveillance Requirement, but rather describe an acceptable method of compliance. Since these details are not necessary to adequately describe the actual regulatory requirement, they can be moved to a licensee controlled document without a significant impact on safety. Placing these details in controlled documents provides adequate assurance that they will be maintained. The Bases will be controlled by the Bases Control Process in Chapter 5 of the proposed Technical Specifications. This change is consistent with NUREG-1430.

CTS Location	New Location
3.5.1.12	Bases 3.3.15, LCO
Table 3.5.1-1, Columns 1 and 2 for the following parameters:	
ESAS #1a & 2a	Bases 3.3.15, LCO
EFIC #1b & 1c	Bases 3.3.15, LCO
OTHER #2 & #3	Bases 3.3.15, LCO
OTHER #8a (with Note *)	Bases 3.3.8, BACKGROUND
OTHER #10, 11, & 12	Bases 3.3.15, LCO
OTHER #13	Bases 3.3.15, LCO
OTHER #15 & 16	Bases 3.3.15, LCO
OTHER #18	Bases 3.3.16, BACKGROUND
Table 3.5.1-1, Note 13	Bases 3.3.8, LCO
Table 3.5.1-1, Note 20	Bases 3.3.15, ACTIONS
Table 3.5.1-1, Note 28.b	Bases 3.3.15, ACTIONS
Table 3.5.1-1, Note 29.b	Bases 3.3.15, ACTIONS
4.12.2	Bases 3.3.15, SR 3.3.15.2
6.12.5.b, k, & l	Bases 3.3.15, ACTIONS

3.3.8-02

LA2 CTS 3.5.1.14, CTS Table 3.5.1-1, item 17, with Note (Action) 30, and CTS Table 4.1-1, item 28c, require the OPERABILITY of main steam line radiation monitors, and provide corresponding actions and Surveillance Requirements for these monitors. These monitors provide a normal operations function of radiological effluent release monitoring and a post accident monitor (PAM) function. Since the PAM function is neither Type A nor Category 1, neither of these functions met the 10 CFR 50.36 criteria for retention in the ITS. The radiological effluent release monitoring function is relocated to the ODCM (in accordance with Generic Letter 89-01), and the PAM function is relocated to the SAR (except as discussed in DOC L14). This information provides details of these functions which are not directly pertinent to the safety analysis, but rather describe equipment used to implement not-safety analysis functions. Since these functions are not pertinent to the fulfillment of the safety analysis, they can be moved to a licensee controlled document without a significant impact on safety. Placing these items in controlled documents provides adequate assurance that they will be maintained. The ODCM will be controlled by the ODCM Control Process in Chapter 5 of the proposed Technical Specifications. The SAR will be controlled by 10 CFR 50.59 and 50.71. This change is consistent with NUREG-1430.

3.3 EMERGENCY CORE COOLING. REACTOR BUILDING EMERGENCY COOLING AND REACTO BUILDING SPRAY SYSTEMS

Applicability

Applies to the emergency core cooling, reactor building emergency cooling and reactor building spray systems.

Objectivity

To define the conditions necessary to assure immediate availability of the emergency core cooling, reactor building emergency cooling and reactor buildi spray systems.

A1

Specification

3.3.1 The following equipment shall be operable ~~whenever containment integrity is established as required by Specification 3.6.1:~~ in MODES 1, 2, & 3; M6 & LATER L3

3.3.15 #15 Appl. — &LATER (3.5, 3.6, 3.7)

(A) One reactor building spray pump and its associated spray noz header. — LATER

<LATER> (3.6) (B) One train of reactor building emergency cooling.

<LATER> (3.7) (C) Two out of three service water pumps shall be operable, powe from independent essential buses, to provide redundant and independent flow paths. — LATER

<LATER> (3.5) (D) Two engineered safety feature actuated Low Pressure Injectio (LPI) pumps shall be operable. — LATER

<LATER> (3.7) (E) Both low pressure injection coolers and their cooling water supplies shall be operable. — LATER

Table 3.3.15-1, #15 (F) Two Borated Water Storage Tank (BWST) level instrument channels shall be operable.

<LATER> (3.5) (G) The borated water storage tank shall contain a level of 40.2 ± 1.8 ft. (387,400 ± 17,300 gallons) of water having a concentration of 2470 ± 200 ppm boron at a temperature not less than 40F. The manual valve on the discharge line from the borated water storage tank shall be locked open. — LATER

(H) The four reactor building emergency sump isolation valves to the LPI system shall be either manually or remote-manually operable.

⟨LATER⟩ (3.5, 3.6, 3.7) — systems which will not remove more than one train of each system from service. Maintenance shall not be performed on components which would make the affected system train inoperable for more than 24 consecutive hours. Prior to initiating maintenance on any component of a train in any system, the redundant component of that system shall be demonstrated to be operable within 24 hours prior to the maintenance. — LATER

M10 + LATER

3.3.15 PAM #15 RA F.1/F.2 & ⟨LATER⟩ (3.5, 3.6, 3.7)

3.3.6 If the conditions of Specifications 3.3.1, 3.3.2, 3.3.3, 3.3.4 and 3.3.5 cannot be met except as noted in 3.3.7 below, reactor shutdown shall be initiated and the reactor shall be in hot shutdown condition within 36 (6) hours, and, if not corrected, in cold shutdown condition within an additional 72 (12) hours. MODE 4 MODE 3 — A1

3.3.7 Exceptions to 3.3.6 shall be as follows: — M10

3.3.15 PAM #15 RA A.1

(A) If the conditions of Specification 3.3.1(F) cannot be met, reactor operation is permissible only during the succeeding seven (30) days unless such components are sooner made operable, provided that during such seven days the other BWST level instrument channel shall be operable. — L11 — A1

⟨LATER⟩ (3.5) — (B) If the conditions of Specification 3.3.3(D) cannot be met, reactor operation is permissible only during the succeeding seven days unless such components are sooner made operable, provided that during such seven days the other CFT instrument channel (pressure of level) shall be operable. — LATER

⟨LATER⟩ (3.6) — LATER

(C) If the conditions of Specification 3.3.4(A) cannot be met because one train of the required reactor building emergency cooling is inoperable but both reactor building spray systems are operable, restore the inoperable train of cooling to operable status within 7 days or be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours.

(D) If the conditions of Specification 3.3.4(A) cannot be met because two trains of the required reactor building emergency cooling are inoperable but both reactor building spray systems are operable, restore at least one train of cooling to operable status within 72 hours or be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours. Restore both above required cooling trains to operable status within 7 days of initial loss or be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours.

⟨Add 3.3.15 RA B.1 & RA C.1 for PAM #15⟩ — L11

⟨LATER⟩ (3.6)

(E) If the conditions of Specification 3.3.4(A) cannot be met because one train of the required reactor building emergency cooling is inoperable and one reactor building spray system is inoperable, restore the inoperable spray system to operable status within 72 hours or be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours. Restore the inoperable reactor building emergency cooling train to operable status within 7 days of initial loss or be in at least hot shutdown within the next 6 hours and in cold shutdown within the following 30 hours. — LATER

Bases (A2)

The requirements of Specification 3.3.1 assure that below 350°F, adequate long term core cooling is provided. Two low pressure injection pumps are specified. However, only one is necessary to supply emergency coolant to the reactor in the event of a loss-of-coolant accident.

The post-accident reactor building emergency cooling and long-term pressure reduction may be accomplished by two spray units or by a combination of one cooling train and one spray unit. Post-accident iodine removal may be accomplished by one of the two spray system strings. The specified requirements assure that the required post-accident components are available for both reactor building emergency cooling and iodine removal. Specification 3.3.1 assures that the required equipment is operable.

A train consists of two coolers and their associated fans which have sufficient capacity to meet post accident heat removal requirements. Conservatively each reactor building emergency cooling train consists of two fans powered from the same emergency bus and their associated coils, but other combinations may be justified by an engineering evaluation.

The borated water storage tank is used for three purposes:

(A) As a supply of borated water for accident conditions.

(B) As an alternate supply of borated water for reaching cold shutdown.[2]

(C) As a supply of borated water for flooding the fuel transfer canal during refueling operation.[3]

370,100 gallons of borated water are supplied for emergency core cooling and reactor building spray in the event of a loss-of-coolant accident. This amount fulfills requirements for emergency core cooling. Approximately 16,000 gallons of borated water are required to reach cold shutdown. The original nominal borated water storage tank capacity of 380,000 gallons is based on refueling volume requirements. Heaters maintain the borated water supply at a temperature to prevent crystallization and local freezing of the boric acid. The minimum required BWST boron concentration of 2270 ppm assures that the core will be maintained at least 1 percent Δk/k subcritical at 70°F without any control rods in the core.

A2

Specification 3.3.2 assures that above 350°F two high pressure injection pumps are also available to provide injection water as the energy of the reactor coolant system is increased.

Specification 3.3.3 assures that above 800 psig both core flooding tanks are operational. Since their design pressure is 600 ± 25 psig, they are not brought into the operational state until 800 psig to prevent spurious injection of borated water. Both core flooding tanks are specified as a single core flood tank has insufficient inventory to reflood the core.(1)

Specification 3.3.4 assures that prior to going critical the redundant train of reactor building emergency cooling and spray train are operable.

The spray system utilizes common suction lines with the low pressure injection system. If a single train of equipment is removed from either system, the other train must be assured to be operable in each system.

The volume specified by 3.3.4.B is the safety analysis volume and does not contain allowances for instrument uncertainty. 9,000 gallons corresponds to a level of approximately 26 feet at a temperature of 77°F and a NaOH concentration of 5.0 wt%. No maximum volume is specified as the value used as the maximum volume in the safety analysis bounds the physical size of the NaOH tank. Additional allowances for instrument uncertainties, as determined in Reference 6, are incorporated in the operating procedures associated with the level instrumentation used in the control room.

When the reactor is critical, maintenance is allowed per Specification 3.3.5. Operability of the specified components shall be based on the results of testing as required by Technical Specification 4.5. The maintenance period of up to 24 hours is acceptable if the operability of equipment redundant to that removed from service is demonstrated within 24 hours prior to removal. Exceptions to Specification 3.3.6 permit continued operation for seven days if one of two BWST level instrument channels is operable or if either the pressure or level instrument channel in the CFT instrument channel is operable.

In the event that the need for emergency core cooling should occur, functioning of one train (one high pressure injection pump, one low pressure injection pump, and both core flooding tanks) will protect the core and in the event of a main coolant loop severance, limit the peak clad temperature to less than 2200°F and the metal-water reaction to that representing less than 1 percent of the clad.

The service water system consists of two independent but interconnected, full capacity, 100% redundant systems, to ensure continuous heat removal.(4)

One service water pump is required for normal operation. The normal operating requirements are greater than the emergency requirements following a loss-of-coolant accident.

A15

REFERENCES

(1) FSAR, Section 14.2.5

(2) FSAR, Section 3.2

(3) FSAR, Section 9.5.2

(4) FSAR, Section 9.3.1

(5) FSAR, Section 6.3

(6) ANO Calculation 91-E-0019-01

A2

3.3.15
3.3.16

3.5 INSTRUMENTATION SYSTEMS

3.5.1 Operational Safety Instrumentation

Applicability

Applies to unit instrumentation and control systems.

Objectives

To delineate the conditions of the unit instrumentation and safety circuits necessary to assure reactor safety.

Specifications

(A1)

3.5.1.1 Startup and operation are not permitted unless the requirements Table 3.5.1-1, columns 3 and 4 are met.

3.5.1.2 In the event the number of protection channels operable falls be the limit given under Table 3.5.1-1, Columns 3 and 4, operation shall be limited as specified in Column 5.

(A3) & Later

& <Later> (3.3A, 3.3B, 3.3C, 3.4B)

3.5.1.3 For on-line testing or in the event of a protection instrument c channel failure, a key operated channel bypass switch associatec with each reactor protection channel may be used to lock the channel trip relay in the untripped state as indicated by a ligh Only one channel shall be locked in the untripped state or contain inoperable functions in the untripped state at any one time. In the event more than one protection channel contains inoperable functions in the untripped state, or a protection channel or function becomes inoperable concurrent with another protection channel locked in the untripped state, within 1 hour implement the actions required by Table 3.5.1-1 Note 6. Only or channel bypass key shall be accessible for use in the control rc While operating with an inoperable function unbypassed in the untripped state, the remaining RPS key operated channel bypass switches shall be tagged to prevent their operation.

<LATER> (3.3A) — LATER

3.5.1.4 The key operated shutdown bypass switch associated with each rea protection channel shall not be used during reactor power opera except during channel testing.

(R) TRM

3.5.1.5 During startup when the intermediate range instruments come on scale, the overlap between the intermediate range and the source range instrumentation shall not be less than one decade. If the overlap is less than one decade, the flux level shall be mainta: in the source range until the one decade overlap is achieved.

3.5.1.6 In the event that one of the trip devices in either of the sour: supplying power to the control rod drive mechanisms fails in the untripped state, the power supplied to the rod drive mechanisms through the failed trip device shall be manually removed within minutes following detection. The condition will be corrected ar the remaining trip devices shall be tested within eight hours following detection. If the condition is not corrected and the remaining trip devices are not tested within the eight-hour per: the reactor shall be placed in the hot shutdown condition withi: additional four hours.

<LATER> (3.3A) — LATER

3.3.8
3.3.15

3.5.1.7 The Decay Heat Removal System isolation valve closure setpoints shall be equal to or less than 340 psig for one valve and equal to or less than 400 psig for the second valve in the suction line. The relief valve setting for the DHR system shall be equal to or less than 450 psig. — LATER

<LATER> (3.4B)

3.5.1.8 The degraded voltage monitoring relay settings shall be as follows:

SR 3.3.8.2

ANO-359

a. The 4.16 KV emergency bus undervoltage relay setpoints shall be ≥1600 VAC but ≤3000 VAC with a time delay setpoint of ≥0.30 seconds and ≤0.98 seconds.

b. The 480 V emergency bus undervoltage relay setpoints shall be ≥423.2 VAC but ≤436.0 VAC with a time delay setpoint of 8 seconds ±1 second.

3.5.1.9 The following Reactor Trip circuitry shall be operable as indicated: — LATER

<LATER> (3.3A)

1. Reactor trip upon loss of Main Feedwater shall be operable (as determined by Specification 4.1.a and item 35 of Table 4.1-1) at greater than 5% reactor power. (May be bypassed up to 10% reactor power.)

2. Reactor trip upon Turbine Trip shall be operable (as determined by Specification 4.1.a and item 41 of Table 4.1-1) at greater than 5% reactor power. (May be bypassed up to 45% reactor power.)

3. If the requirements of Specifications 3.5.1.9.1 or 3.5.1.9.2 cannot be met, restore the inoperable trip within 12 hours or bring the plant to a hot shutdown condition.

3.5.1.10 Deleted — A1

3.5.1.11 For on-line testing of the Emergency Feedwater Initiation and Control (EFIC) system channels during power operation only one channel shall be locked into "maintenance bypass" at any one time. If one channel of the NI/RPS is in maintenance bypass, only the corresponding channel of EFIC may be bypassed. — LATER

<LATER> (3.3C)

3.5.1.12 The Containment High Range Radiation Monitoring instrumentation shall be operable with a minimum measurement range from 1 to 10^7 R/hr. — LA1 Bases

Table 3.3.15-1 PAM #9

ANO-359

3.3.16 LCO
3.3.16 Appl.

3.5.1.13 Two control room ventilation radiation monitoring channels shall be operable whenever the reactor coolant system is ~~above the cold shutdown condition~~ in MODES 1, 2, 3, or 4 or during ~~handling~~ movement of irradiated fuel assemblies. — A1

3.5.1.14 ~~The Main Steam Line Radiation Monitoring Instrumentation shall be operable with a minimum measurement range from 10^{-1} to 10^{4} mR/hr, whenever the reactor is above the cold shutdown condition.~~ — LA2 ODCM SAR

<LATER> (3.3C)

3.5.1.15 ~~Initiate functions of the EFIC system which are bypassed at cold shutdown conditions shall have the following minimum operability conditions:~~

~~a. "low steam generator pressure" initiate shall be operable when the main steam pressure exceeds 750 psig.~~

~~b. "loss of 4 RC pumps" initiate shall be operable when neutron flux exceeds 10% power.~~

~~c. "main feedwater pumps tripped" initiate shall be operable when neutron flux exceeds 10% power.~~ — LATER

<LATER> (3.3c & 3.7)

3.5.1.16 ~~The automatic steam generator isolation system within EFIC shall be operable when main steam pressure is greater than 750 psig.~~ — LATER

<Add 3.3.16 Condition C> — M4

<Add 3.3.16 Condition D> — M4

<Add 3.3.16.2 Note> — L13

3.3.8
3.3.15
3.3.16

A2

Bases

Every reasonable effort will be made to maintain all safety instrumentatio in operation. A startup is not permitted unless the requirements of Table 3.5.1-1, Columns 3 and 4, are met.

Operation at rated power is permitted as long as the systems have at least the redundancy requirements of Column 4 (Table 3.5.1-1). This is in agreement with redundancy and single failure criteria of IEEE 279 as described in FSAR, Section 7.

There are four reactor protection channels. Normal trip logic is two-out-of-four. Required trip logic for the power range instrumentation channels is two-out-of-three. Minimum trip logic on other instrumentation channels is one-out-of-two.

The four reactor protection channels were provided with key operated bypass switches to allow on-line testing or maintenance on only one channel at a time during power operation. Each channel is provided with alarm and lights to indicate when that channel is bypassed. There will be one reactor protection system channel bypass switch key permitted in the control room. Upon the discovery of inoperable functions in any one reactor protection channel, the effect of the failure on the reactor protection syst and other interconnected systems is evaluated. The affected reactor protect channel may be placed in channel bypass, remain in operation in a degraded condition, or placed in the tripped condition as determined by operating conditions and management judgment. This action allows placing the plant in the safest condition possible considering the extent of the failure, plant conditions, and guidance from plant management. Should the failure in the reactor protection channel prohibit the proper operation of another system, the appropriate actions for the affected system are implemented. Administra controls are established to preclude placing a reactor protection channel in channel bypass when any other reactor protection channel contains an inopera function in the untripped state.

Each reactor protection channel key operated shutdown bypass switch is provided with alarm and lights to indicate when the shutdown bypass switch is being used.

R
TRM

The source range and intermediate range nuclear flux instrumentation scales overlap by one decade. This decade overlap will be achieved at 10^{-10} amps o the intermediate range scale.

The ESAS employs three independent and identical analog channels, which supply trip signals to two independent, identical digital subsystems. In order to actuate the safeguards systems, two out of three analog channels must trip. This will cause both digital subsystems to trip. Tripping of either digital subsystem will actuate all safeguards systems associated with that digital subsystem.

A2

Because only one digital subsystem is necessary to actuate the safeguards systems and these systems are capable of tripping even when they are being tested, a single failure in a digital subsystem cannot prevent protective action.

3.3.8
3.3.15
3.3.16
(A2)

Removal of a module required for protection from a RPS channel will cause that channel to trip, unless that channel has been bypassed, so that only one channel of the other three must trip to cause a reactor trip. Thus, sufficient redundancy has been built into the system to cover this situation.

Removal of a module required for protective action from an analog ESAS channel will cause that channel to trip, so that only one of the other two must trip to actuate the safeguards systems. Removal of a module required for protective action from a digital ESAS subsystem will not cause that subsystem to trip. The fact that a module has been removed will be continuously annunciated to the operator. The redundant digital subsystem is still sufficient to indicate complete ESAS action.

The testing schemes of the RPS, the ESAS, and the EFIC enables complete system testing while the reactor is operating. Each channel is capable of being tested independently so that operation of individual channels may be evaluated.

The EFIC is designed to allow testing during power operation. One channel may be placed in key locked "maintenance bypass" prior to testing. This will bypass only one channel of EFW initiate logic. An interlock feature prevents bypassing more than one channel at a time. In addition, since the EFIC receives signals from the NI/RPS, the maintenance bypass from the NI/RPS is interlocked with the EFIC. If one channel of the NI/RPS is in maintenance bypass, only the corresponding channel of EFIC may be bypassed. Prior to placing a channel of EFIC in maintenance bypass, any NI/RPS channel containing inoperable functions in the untripped state is evaluated for its effect on EFIC. Only the EFIC channel corresponding to the NI/RPS channel containing the inoperable function may be placed in maintenance bypass unles it can be shown that the failure in the NI/RPS channel has no effect on EFIC actuation, actions are taken to ensure EFIC actuation when required, or the appropriate actions of Table 3.5.1-1 are implemented. The EFIC can be teste from its input terminals to the actuated device controllers. A test of the EFIC trip logic will actuate one of two relays in the controllers. Activati of both relays is required in order to actuate the controllers. The two relays are tested individually to prevent automatic actuation of the compone The EFIC trip logic is two (one-out-of-two).

Reactor trips on loss of all main feedwater and on turbine trips will sense the start of a loss of OTSG heat sink and actuate earlier than other trip signals. This early actuation will provide a lower peak RC pressure during the initial over pressurization following a loss of feedwater or turbine trip event. The LOFW trip may be bypassed up to 10% to allow sufficient margin for bringing the MFW pumps into use at approximately 7%. The Turbine Trip may be bypassed up to 45% based on BAW-1893, "Basis for Raising Arming Threshold for Anticipatory Reactor Trip on Turbine Trip," October 1985 and the NRC Safety Evaluation Report for BAW-1893 issued from Mr. D. M. Crutchfield to Mr. J. H. Taylor via letter dated April 25, 1986.

The Automatic Closure and Isolation System (ACI) is designed to close the Decay Heat Removal System (DHRS) return line isolation valves when the Reactor Coolant System (RCS) pressure exceeds a selected fraction of the DHRS design pressure or when core flooding system isolation valves are opened. The ACI is designed to permit manual operation of the DHRS return line isolation valves when permissive conditions exist. In addition, the ACI is designed to disallow manual operation of the valves when permissive conditions do not exist.

3.3.8
3.3.15
3.3.16

Power is normally supplied to the control rod drive mechanisms from two separate parallel 480 volt sources. Redundant trip devices are employed in each of these sources. If any one of these trip devices fails in the untripped state, on-line repairs to the failed device, when practical, will be made and the remaining trip devices will be tested. Four hours is ample time to test the remaining trip devices and, in many cases, make on-line repairs.

A2

The 4.16 KV bus undervoltage relay settings are based on a maximum setting, which is below the lowest allowed motor terminal momentary voltage of 75% of motor voltage rating of 4000 V. The settings are further reduced to include channel uncertainties and calibration tolerances. The 480V bus undervoltage relay settings are based on long term motor voltage requirements plus the maximum feeder voltage drop allowance resulting in a nominal 92% setting of motor rated voltage of 460 V. These settings are also adjusted to include channel uncertainties and calibration tolerances.

AND-359

The OPERABILITY of the accident monitoring instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess these variables during and following an accident. This capability is consistent with the recommendation of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident," December 1975 and NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations."

The subcooled margin monitors (SMM), and core-exit thermocouples (CET), Reactor Vessel Level Monitoring System (RVLMS) and Hot Leg Level Measurement System (HLLMS) are a result of the Inadequate Core Cooling (ICC) instrumentation required by Item II.F.2 NUREG-0737. The function of the ICC instrumentation is to increase the ability of the plant operators to diagnose the approach to and recovery from ICC. Additionally, they aid in tracking reactor coolant inventory. These instruments are included in the Technical Specifications at the request of NRC Generic Letter 83-37 and are not required by the accident analysis, nor to bring the plant to cold shutdown conditions. The Reactor Vessel Level Monitor is provided as a means of indicating level in the reactor vessel during accident conditions. The channel operability of the RVLMS is defined as a minimum of three sensors in the upper plenum region and two sensors in the dome region operable. When Reactor Coolant Pumps are running, all except the dome sensors are interlocked to read "invalid" due to flow induced variables that may offset the sensor outputs. The channel operability of the HLLMS is defined as a minimum of one wide range and any two of the narrow range transmitters in the same channel operable. If the equipment is inaccessible due to health and industrial safety concerns (for example, high radiation area, low oxygen content of the containment atmosphere) or due to physical location of the fault (for example, probe failure in the reactor vessel), then operation may continue until the next scheduled refueling outage and a report filed.

AND-359

3.3.8
3.3.15
3.3.16

The principal function of the Control Room Isolation-High Radiation is to provide an enclosed environment from which the unit can be operated following an uncontrolled release of radioactivity. Due to the unique arrangement of the shared control room envelope, one control room isolation channel receives a high radiation signal from the ANO-1 control room ventilation intake duct monitor and the redundant channel receives a high radiation signal from the ANO-2 control room ventilation intake duct monitor. With no channel of the control room radiation monitoring system operable, the CREVS must be placed in a condition that does not require the isolation to occur (i.e., one operable train of CREVS is placed in the emergency recirculation mode of operation). Reactor operation may continue indefinitely in this state.

To support loss of main feedwater analyses, steam line/feedwater line break analyses, SBLOCA analyses, and NUREG-0737 requirements, the EFIC system is designed to automatically initiate EFW when: (A2)

1. all four RC pumps are tripped
2. both main feedwater pumps are tripped
3. the level of either steam generator is low
4. either steam generator pressure is low
5. ESAS ECCS actuation (high RB pressure or low RCS pressure)

The EFIC system is also designed to isolate the affected steam generator on a steam line/feedwater line break and supply EFW to the intact generator according to the following logic:

- If both SG's are above 600 psig, supply EFW to both SG's.
- If one SG is below 600 psig, supply EFW to the other SG.
- If both SG's are below 600 psig, but the pressure difference between the two SG's exceeds 100 psig, supply EFW only to the SG with the higher pressure.
- If both SG's are below 600 psig and the pressure difference is less than 100 psig, supply EFW to both SG's.

At cold shutdown conditions all EFIC initiate and isolate functions are bypassed except low steam generator level initiate. The bypassed functions will be automatically reset at the values or plant conditions identified in Specification 3.5.1.15. "Loss of 4 RC pumps" initiate and "low steam generator pressure" initiate are the only shutdown bypasses to be manually initiated during cooldown. If reset is not done manually, they will automatically reset. Main feedwater pump trip bypass is automatically removed above 10% power.

REFERENCE

FSAR, Section 7.1

Table 3.5.1-1 (Cont'd)

ENGINEERED SAFEGUARDS ACTUATION SYSTEM

Functional Unit	1 No. of channels	2 No. of channels for system trip	3 Min. operable channels	4 Min. degree of redundancy	5 Operator action if conditions of column 3 or 4 cannot be met
1. Highpressure injection system (Note 8)					
a. Reactor coolant pressure instrument channels	3	2	3 (Note 6)	1	Notes 1, 5
b. Reactor building 4 psig instrument channels	3	2	3 (Note 6)	1	Notes 1, 5
c. Manual trip pushbutton	2	1	2	1	Notes 1, 5
2. Low pressure injection system (Note 8)					
a. Reactor coolant pressure instrument channels	3	2	3 (Note 6)	1	Notes 1, 5
b. Reactor building 4 psig instrument channels	3	2	3 (Note 6)	1	Notes 1, 5
c. Manual trip pushbutton	2	1	2	1	Notes 1, 5
3. Reactor building isolation and reactor building cooling system (Note 8)					
a. Reactor building 4 psig instrument channel	3	2	3 (Note 6)	1	Notes 1, 5
b. Manual trip pushbutton	2	1	2	1	Notes 1, 5

LA1 Bases

A3

A7

M7 & LATER

LATER

Table 3.3.15-1 PAM #4 & <LATER> (3.3B)

<LATER> (3.3B)

LA1 Bases

A3

A7

M7 & LATER

LATER

Table 3.3.15-1 PAM #4 & <Later> (3.3B)

<LATER> (3.3B)

45

3.3.15

Amendment No. 91

45b

Table 3.5.1-1 (Cont'd)

EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM (Cont'd)

Functional Unit	1 No. of channels	2 No. of channels for system trip	3 Min. operable channels	4 Min. degree of redundancy	5 Operator action if conditions of column 3 or 4 cannot be met
b. Low Level SG A or B	4/SG	2/SG	2/SG	1	Note 1
c. Low Pressure, SG A or B	4/SG	2/SG	2/SG	1	Note 1, 19
d. Loss of Both MFW Pumps and PWR > 10%	4	2	2	1	Note 1
e. Loss of 4 RC Pumps	4	2	2	1	Note 1, 15
f. ESAS Actuation Logic Tripped	2	1	2	1	Note 1
2. SG-A Main Steam Line Isolation					
a. Manual	2	1	2	1	Note 1
b. Low SG A Pressure	4	2	2	1	Note 1, 19
3. SG-B Main Steam Line Isolation					
a. Manual	2	1	2	1	Note 1
b. Low SG B Pressure	4	2	2	1	Note 1, 19

LA1 Bases

A3

A7

M7 & LATER

LATER

Table 3.3.15-1 #12 & <LATER> (3.3C)

Table 3.3.15-1 #13 & <LATER> (3.3C)

<LATER> (3.3C)

3.3.15

Table 3.5.1-1 (Cont'd)

OTHER SAFETY RELATED SYSTEMS
(Cont'd)

Functional Unit	1 No. of channels	2 No. of channels for system trip	3 Min. operable channels	4 Min. degree of redundancy	5 Operator action if conditions of column 3 or 4 cannot be met
2. Pressurizer level channels	2	N/A	2	1	Note 10
3. Emergency Feedwater flow channels	2/S.G.	N/A	2/SG	0	Note 10
4. RCS subcooling margin monitors	2	N/A	1	0	Note 10
5. Electromatic relief valve flow monitor	2	N/A	1	0	Note 11
6. Electromatic relief block valve position indicator	1	N/A	1	0	Note 12
7. Pressurizer code safety valve flow monitors	2/valve	N/A	1/valve	0	Note 10
8. Degraded Voltage Monitoring					
a. 4.16 KV Emergency Bus Undervoltage	2/Bus	1/Bus	2/Bus	0	Note 14
b. 460 V Emergency Bus Undervoltage	*1/Bus	1/Bus	1/Bus	0	Notes 13, 14
9. Deleted					
10. Containment High Range Radiation Monitoring	2	N/A	2	0	Note 20
11. Containment Pressure - High Range	2	N/A	2	0	Note 21
12. Containment Water Level - Wide Range	2	N/A	2	0	Note 21

*Two undervoltage relays per bus are used with a coincident trip logic (2-out-of-2)

LA1 Bases; A3; A7; A1; M9; L15; A10; M12; A7; A1; LA1 Bases; A1; Reactor Building; A1; LA1 Bases; A3; A1; A7; LA1 Bases; Table 3.3.15-1 #11; Table 3.3.15-1 #17; 3.3.8 LCO; Table 3.3.15-1 #9; Table 3.3.15-1 #7; Table 3.3.15-1 #6; RAI 3.3.8-02; 3.3.8 3.3.15

Table 3.5.1-1 (cont'd)

OTHER SAFETY RELATED SYSTEMS
(Cont'd)

	Functional Unit	1 No. of channels	2 No. of Channels for system trip	3 Min. operable channels	4 Min. degree of redundancy	5 Operator action if conditions of column 3 or 4 cannot be met	
Table 3.3.15-1 PAM #16	13. In core Thermocouples (core-exit thermocouples)	6/core quadrant	N/A	2/core quadrant	0	Note 22	A1
3.3.16 LCO	14. Control Room Radiation Monitors	2	1	2	1	Note 17, 18	LA1 Bases; A3; A7
Table 3.3.15-1 PAM #5	15. Reactor Vessel Level Monitoring System	2	N/A	2	0	Note 28, 29	A1
Table 3.3.15-1 PAM #3	16. Hot Leg Level Measurement System (HLLMS)	2	N/A	2	0	Note 28, 29	
	17. Main Steam Line Radiation Monitors	1/steam line	N/A	1/steam line	0	Note 30	LA2 ODCM SAR

LA1 BASES
A3
A7

3.3.15
3.3.16

(A3)

TABLE 3.5.1-1 (Cont'd)

<LATER> (3.3A/B/C, 3.4B) Notes:

1. Initiate a shutdown using normal operating instructions and place the reactor in the hot shutdown condition within 12 hours if the requirements of Columns 3 and 4 are not met. — LATER

2. When 2 of 4 power range instrument channels are greater than 10% rated power, hot shutdown is not required. — LATER

<LATER> (3.3A)

3. When 1 of 2 intermediate range instrument channels is greater than 10-10 amps, hot shutdown is not required.

4. For channel testing, calibration, or maintenance, the minimum number of operable channels may be two and a degree of redundancy of one for a maximum of four hours, after which Note 1 applies.

<LATER> (3.3B & 3.4B)

5. If the requirements of Columns 3 or 4 cannot be met within an additional 48 hours, place the reactor in the cold shutdown condition within 24 hours. — LATER

<LATER> (3.3A, B, C)

6. The minimum number of operable channels may be reduced to 2, provided that the system is reduced to 1 out of 2 coincidence by tripping the remaining channel. Otherwise, the actions required by Column 5 shall apply. — LATER

<LATER> (3.3A)

7. These channels initiate control rod withdrawal inhibits not reactor trips at -10% rated power. Above 10% rated power, those inhibits are bypassed. — LATER

<LATER> (3.3B)

8. If any one component of a digital subsystem is inoperable, the entire digital subsystem is considered inoperable. Hence, the associated safety features are inoperable and Specification 3.3 applies. — LATER

9. The minimum number of operable channels may be reduced to one and the minimum degree of redundancy to zero for a maximum of 24 hours, after which Note 1 applies. — (L15)

3.3.15 PAMS 11 & 17 RA A.1

10. With the number of operable channels less than required, either restore the inoperable channel to operable status within 30 days, or be in hot shutdown within 12 hours. — (L5) (L15) (M10)

11. With the number of operable channels less than required, isolate the electromatic relief valve within 4 hours, otherwise Note 9 applies. — (L15)

<Add 3.3.15 RA B.1, RA C.1, RA F.1 & F.2 for PAMs #11 & #17> — (L5) (M10)

3.3.15

45e

Amendment No. ~~50~~, ~~60~~, ~~91~~, 174

(A3)

TABLE 3.5.1-1 (Cont'd)

12. With the number of operable channels less than required, either return the indicator to operable status within 24 hours, or verify the block valve closed and power removed within an additional 24 hours. If the block valve cannot be verified closed within the additional 24 hours, de-energize the electromatic relief valve power supply within the following 12 hours. (L15)

3.3.8 RA A.1
13. Channels may be bypassed for not greater than 30 seconds during reactor coolant pump starts. If the automatic bypass circuit or its alarm circuit is inoperable, the undervoltage protection shall be restored within 1 hour, otherwise, Note 14 applies. (LA1 Bases)

3.3.8 RA A.1 + <LATER> (3.8)
14. With the number of channels less than required, restore the inoperable channels to operable status within 72 hours or be in HOT SHUTDOWN within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. (L1) + LATER (M1)

<LATER> (3.3A + 3.3C)
15. This trip function may be bypassed at up to 10% reactor power. LATER

<LATER> (3.3A)
16. This trip function may be bypassed at up to 45% reactor power. LATER

3.3.16 RA B.1
17. With no channel operable, within 1 hour initiate and maintain operation of the control room emergency ventilation system in the recirculation mode of operation.

3.3.16 RA A.1
18. With one channel inoperable, restore the inoperable channel to operable status within 7 days or within the next 6 hours initiate and maintain operation of the control room emergency ventilation system in the recirculation mode of operation. (M5)

<LATER> (3.3c)
19. This function may be bypassed below 750 psig OTSG pressure. Bypass is automatically removed when pressure exceeds 750 psig. LATER

3.3.15 PAM #9 RA A.1/B.1 RA C.1/G.1
20. With one channel inoperable, (1) either restore the inoperable channel to operable status within 7 (30) days, or (2) prepare and submit a Special Report to the Commission pursuant to Specification 6.12.5 within 30 days following the event outlining the action taken, the cause of the inoperability, and the plans and schedule for restoring the system to operable status. With both channels inoperable, initiate alternate methods of monitoring the containment radiation level within 72 hours (7 days) in addition to the actions described above. (L6) (LA1 Bases) (L6)

3.3.15 PAM #6 & #7 RA A.1 RA C.1 RA F.1
21. With one channel inoperable, restore the inoperable channel to operable status within 30 days or be in hot shutdown within 72 hours unless containment entry is required. If containment entry is required, the inoperable channel must be restored by the next refueling outage. If both channels are inoperable, restore the inoperable channels within 30 days or be in HOT SHUTDOWN within 12 hours (M10) (L7)

<Add 3.3.15 RA B.1 + F.2 for PAMs #6 & #7>

3.3.8 3.3.15 3.3.16

A13

Table 3.5.1-1 (cont'd)

Notes:

3.3.15 PAM#16 RA A.1 RA C.1 RA F.1

22. With the number of operable channels less than two (2) per core quadrant restore the inoperable channel to operable status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours. L5 M10

<Add 3.3.15 RA B.1 & RA F.2 for PAM#16> L5

<Add 3.3.8 Appl> A9

<Add 3.3.8 ACTIONS Note> A8

<Add 3.3.8 RA B.1> L1 M1

Amendment No. 116

45f1

3.3.8
3.3.15

(A3)

Table 3.5.1-1 (cont'd)

3.3.15 PAM's #3 & #5 28. With the number of OPERABLE channels one less than the minimum number of channels required to be OPERABLE: (30) L8

RA A.1 a. If repairs are feasible, restore the inoperable channel to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours.

RA B.1 b. If repair is not feasible without shutting down, operation may continue and a special report pursuant to specification 6.12.5 shall be submitted to the NRC within 30 days following the failure; describing the action taken, the cause of the inoperability, and the plans and schedules for restoring the channel to OPERABLE status during the next scheduled refueling outage. LA1 Bases

3.3.15 PAMs #3 & #5 29. With the number of OPERABLE channels two less than the minimum channels required to be OPERABLE: 7days L8

RA C.1 a. If repairs are feasible, restore at least one inoperable channel to OPERABLE status within 48 hours or be in at least HOT SHUTDOWN within the next 12 hours.

RA G.1 b. If repair is not feasible without shutting down, operation may continue and a special report pursuant to specification 6.12.5 shall be submitted to the NRC within 30 days following the failure; describing the action taken, the cause of the inoperability, and the plans and schedules for restoring the channels to OPERABLE status during the next scheduled refueling outage. LA1 Bases

LA2 ODCM SAR

30. With the number of OPERABLE Channels less than required by the Minimum Channels OPERABLE requirements, initiate the preplanned alternate method of monitoring the appropriate parameter(s), within 72 hours, and: 1) either restore the inoperable Channel(s) to OPERABLE status within 7 days of the event, or 2) prepare and submit a Special Report to the Commission pursuant to Specification 6.12.5 within 14 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to OPERABLE status. L14

3.3.15

3.7 Auxiliary Electrical Systems 3.3.8

Applicability

Applies to the auxiliary electrical power systems.

Objectives

To specify conditions of operation for plant station power necessary to ensure safe reactor operation and combined availability of the engineered safety features.

Specifications

3.7.1 The reactor shall not be heated or maintained above 200°F unless the following conditions are met (except as permitted by Paragraph 3.7.2):

A. Any one of the following combinations of power sources operable:

1. Startup Transformer No. 1 and Startup Transformer No. 2.

2. Startup Transformer No. 2 and Unit Auxiliary Transformer provided that the latter one is connected to the 22KV line from the switchyard rather than to the generator bus.

<LATER> (3.8) — LATER

B. All 4160 V switchgear, 480 V load centers, 480 V motor control centers and 120 V AC distribution panels in both of the ESAS distribution systems are operable and are being powered from either one of the two startup transformers or the unit auxiliary transformer.

C. Both diesel generator sets are operable each with:

1. a separate day tank containing a minimum of 160 gallons of fuel,

2. a separate emergency storage tank containing a minimum of 138 inches (20,000 gallons) of fuel,

3. a separate fuel transfer pump, and

4. a separate starting air compressor.

D. DELETED

E. DELETED

ANO-329

3.3.8 F. The off-site power undervoltage and protective relaying interlocks associated with required startup transformer power sources shall be operable per Table 3.5.1-1.

<LATER> (3.8) G. The selective load-shed features associated with Startup Transformer No. 2 shall be operable if selected for auto transfer. — LATER

3.14 HYDROGEN RECOMBINERS

<LATER> (3.6) — LATER

Applicability

Applies to the operating status of the hydrogen recombiner systems.

Objective

To ensure that the hydrogen recombiner systems will perform within acceptable levels of efficiency and reliability.

Specification

3.14.1 Two independent hydrogen recombiner systems shall be operable whenever reactor building integrity is required.

3.14.2 Within one hydrogen recombiner system inoperable, restore the inoperable system to operable status within 30 days or the reactor shall be placed in the hot shutdown condition within the next 6 hours.

Table 3.3.15-1, #10 — 3.14.3 Hydrogen concentration instruments shall be operable.

3.3.15, #10 RA A.1 — 3.14.4 With one of two hydrogen concentration instruments inoperable restore the inoperable analyzer to OPERABLE status within 30 days ~~or be in at least hot shutdown within the next 6 hours.~~ — L9

Bases

The hydrogen recombiner systems are designed to operate as necessary to limit the hydrogen concentration in the reactor building following a Loss of Coolant Accident.

The system is composed of two redundant 100% capacity Internal Electrical Hydrogen Recombiners, manufactured by Westinghouse. — A2

<Add 3.3.15 RA B.1, RA D.1, & RA F.1 for PAM 10> — L9

<Add 3.3.15 RA F.2 for PAM 10> — M11

<INSERT CTS 66eA>

<Insert CTS 66eA>

Add 3.3.15, ACTIONS Note 1 (L4)

Add 3.3.15, ACTIONS Note 2 (A6)

3.3.15-02

Add 3.3.15, Required Action E.1 for all PAM Functions (A1)

Add 3.3.15, SURVEILLANCES Note for all PAM Functions

Add PAM Functions 1, 2, 8, 12b, 12d, 14 & 20 including all associated LCO, Applicability, ACTIONS, SURVEILLANCES, Notes and Table entries: (M7)

1. Wide Range Neutron Flux
2. RCS Hot Leg Temperature
8. Automatic Reactor Building Isolation Valve Position
12b. SG "A" Water Level - High Range
12d. SG "B" Water Level - High Range
14. Condensate Storage Tank Level
20. Reactor Building Spray Flow

Add PAM Functions 4, 12a, 12c, & 13 including all associated Applicability, ACTIONS, Notes and Table entries: (M7)

4. RCS Pressure (Wide Range)
12a. SG "A" Water Level - Low Range
12c. SG "B" Water Level - Low Range
13a. SG "A" Pressure
13b. SG "B" Pressure

Add PAM Functions 18 & 19 including all associated LCO, Applicability, ACTIONS, Notes, Table entries, and SR 3.3.15.1: (M7)

18. High Pressure Injection Flow
19. Low Pressure Injection Flow

Add 3.3.15, Applicability for PAM Functions 3 & 5 (M8)

Add 3.3.15, Applicability for PAM Functions 6 & 7

Add 3.3.15, Applicability for PAM Function 10

Add 3.3.15, Applicability for PAM Functions 11 & 17

Add 3.3.15, Applicability for PAM Function 16

Add 3.3.15, Applicability for PAM Function 9 (M3)

3.3.8
3.3.15
3.3.16

SURVEILLANCE REQUIREMENTS (Continued)

4.0.5 (Continued)

b. Surveillance intervals specified in Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda for the inservice inspection and testing activities required by the ASME Boiler and Pressure Vessel Code and applicable Addenda shall be applicable as follows in these Technical Specifications: — LATER

LATER (5.0)

ASME Boiler and Pressure Vessel Code and applicable Addenda terminology for inservice inspection and testing activities	Required frequencies for performing inservice inspection and testing activities
Weekly	At least once per 7 days
Monthly	At least once per 31 days
Quarterly or every 3 months	At least once per 92 days
Semiannually or every 6 months	At least once per 184 days
Yearly or annually	At least once per 366 days

c. The provisions of Specification 4.0.2 are applicable to the above required frequencies for performing inservice inspection and test activities.

d. Performance of the above inservice inspection and testing activit shall be in addition to other specified Surveillance Requirements

e. Nothing in the ASME Boiler and Pressure Vessel Code shall be construed to supersede the requiremetns of any Technical Specification.

4.1 OPERATIONAL SAFETY ITEMS (A1)

Applicability

Applies to items directly related to safety limits and limiting conditions fo operation.

Objective

To specify the minimum frequency and type of surveillance to be applied to unit equipment and conditions.

Specification

a. The minimum frequency and type of surveillance required for react protective system and engineered safeguards system instrumentatio when the reactor is critical shall be as stated in Table 4.1-1. (A3) R TRM

3.3.8
3.3.15
3.3.16

OPERATIONAL SAFETY ITEMS (Continued)

4.1 (Continued)

b. Equipment and sampling test shall be performed as detailed in Table 4.1-2 and 4.1-3.

c. Discrepancies noted during surveillance testing will be corrected and recorded.

d. A power distribution map shall be made to verify the expected power distribution at periodic intervals at least every 10 effective full power days using the incore instrumentation detector system.

<LATER> (3.3A, 3.3B, 3.3C)

<LATER> (3.2)

A3 & R TRM

A14

LATER

BASES

A2

4.0.1 through 4.0.5 Establish the general requirements applicable to Surveillance Requirements. These requirements are based on the Surveillance Requirements stated in the Code of Federal Regulations, 10CFR 50.36(c)(3):

"Surveillance Requirements are requirements relating to test, calibration, or inspection to ensure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions of operation will be met."

4.0.1 Establishes the requirement that surveillances must be performed during the operational modes or other conditions for which the requirements of the Limiting Conditions for Operation apply unless otherwise stated in an individual Surveillance Requirement. The purpose of this specification is to ensure that surveillances are performed to verify the operational status of systems and components and that parameters are within specified limits to ensure safe operation of the facility when the plant is in a mode or other specified condition for which the associated Limiting Conditions for Operation are applicable. Surveillance Requirements do not have to be performed when the facility is in an operational mode for which the requirements of the associated Limiting Condition for Operation do not apply unless otherwise specified.

3.3.8
3.3.15
3.3.16

BASES (continued)

Under the terms of this specification, the more restrictive requirements of the Technical Specifications take precedence over the ASME Boiler and Pressure Vessel Code and applicable Addenda. The requirements of Specification 4.0.4 to perform surveillance activities before entry into an operational mode or other specified condition takes precedence over the ASME Boiler and Pressure Vessel Code provision which allows pumps and valves to be tested up to one week after return to normal operation. The Technical Specification definition of OPERABLE does not allow a grace period before a component, that is not capable of performing its specified function, is declared inoperable and takes precedence over the ASME Boiler and Pressure Vessel Code provision which allows a valve to be incapable of performing its specified function for up to 24 hours before being declared inoperable. A2

4.1 Bases

Check

Failures such as blown instrument fuses, defective indicators, faulted amplifiers which result in "upscale" or "downscale" indication can be easily recognized by simple observation of the functioning of an instrument or system. Furthermore, such failures are, in many cases, revealed by alarm or annunciator action. Comparison of output and/or state of independent channels measuring the same variable supplements this type of built-in surveillance. Based on experience in operation of both conventional and nuclear plant systems, when the plant is in operation, the minimum checking frequency stated is deemed adequate for reactor system instrumentation. A2 & R TRM

Calibration

Calibration shall be performed to assure the presentation and acquisition of accurate information. The nuclear flux (power range) channels shall be calibrated at least twice weekly (during steady state operating conditions) against a heat balance standard to compensate for instrumentation drift. During nonsteady state operation, the nuclear flux channels shall be calibrated daily to compensate for instrumentation drift and changing rod patterns and core physics parameters. A2

3.3.8
3.3.15
3.3.16

Other channels are subject only to "drift" errors induced within the instrumentation itself and, consequently, can tolerate longer intervals between calibrations. Process system instrumentation errors induced by drift can be expected to remain within acceptable tolerances if recalibration is performed once every 18 months.

Substantial calibration shifts within a channel (essentially a channel failure) will be revealed during routine checking and testing procedures.

Thus, minimum calibration frequencies for the nuclear flux (power range) channels, and once every 18 months for the process system channels is considered acceptable.

Testing

On-line testing of reactor protective channel and EFIC channels is required once every 4 weeks on a rotational or staggered basis. The rotation scheme is designed to reduce the probability of an undetected failure existing within the system and to minimize the likelihood of the same systematic test errors being introduced into each redundant channel.

All reactor protective channels will be tested before startup if the individual channel rotational frequency has been discontinued or if outage activities could potentially have affected the operability of one or more channels. A rotation will then be established to test the first Channel one week after startup, the second Channel two weeks after startup, the third Channel three weeks after startup, and the fourth Channel four weeks after startup. (A2)

The established reactor protective system instrumentation and EFIC test cycle is continued with one channel's instrumentation tested each week. Upon detection of a failure that prevents trip action, all instrumentation associated with the protective channels will be tested after which the rotational test cycle is started again. If actuation of a safety channel occurs, assurance will be required that actuation was within the limiting safety system setting.

The protective channels coincidence logic and control rod drive trip breakers are trip tested every quarter. The trip test checks all logic combinations and is to be performed on a rotational basis. The logic and breakers of the four protective channels shall be trip tested prior to startup and their individual channels trip tested on a cyclic basis. Discovery of a failure requires the testing of all channel logic and breakers, after which the trip test cycle is started again.

3.3.8
3.3.15
3.3.16

A2

& R
TRM

The equipment testing and system sampling frequencies specified in Table 4.1-2 and Table 4.1-3 are considered adequate to maintain the status of the equipment and systems to assure safe operation.

REFERENCE

FSAR Section 7.1.2.3.4

A3

Table 4.1-1 (Cont.)

Channel Description	Check	Test	Calibrate	Remarks
13. High Reactor Building Pressure Channel	S	M	R	
14. High Pressure Injection Logic Channel	NA	M	NA	
15. High Pressure Injection Analog Channels				
a. Reactor Coolant Pressure Channel	S (M) SR 3.3.15.1	M(1)	R SR 3.3.15.2	(1) Including test of shutdown bypass function (ECCS bypass function).
b. Reactor Building 4 psig Channel	S	M	R	
16. Low Pressure Injection Logic Channel	NA	M	NA	
17. Low Pressure Injection Analog Channels				
a. Reactor Coolant Pressure Channel	S (M) SR 3.3.15.1	M(1)	R SR 3.3.15.2	(1) Including test of shutdown bypass function (ECCS bypass function).
b. Reactor Building 4 psig Channel	S	M	R	
18. Reactor Building Emergency Cooling and Isolation System Logic Channel	NA	M	NA	
19. Reactor Building Emergency Cooling and Isolation System Analog Channels				
a. Reactor Building 4 psig Channels	S	M	R	

Handwritten annotations: <LATER> (3.3A); <LATER> (3.3B); 3.3.15 PAM #4 & Later (3.3B); LATER; L10; M7 & LATER

3.3.15

A3

Table 4.1-1 (Cont'd)

	Channel Description	Check	Test	Calibrate	Remarks	
<LATER> (3.3B)	20. Reactor Building Spray System System Logic Channels	NA	M(1)	NA	(1) Including RB spray pump, spray valves, and chem. add. valve logic channels.	LATER
	21. Reactor Building Spray System Analog Channels					
	a. Reactor Building Pressure Channels	NA	M	R		L15
	22. Pressurizer Temperature Channels	S	NA	R		
<LATER> (3.1)	23. Control Rod Absolute Position	S(1)	NA	R	(1) Compare with Relative Position Indicator.	LATER
	24. Control Rod Relative Position	S(1)	NA	R	(1) Check with Absolute Position Indicator	
<LATER> (3.5)	25. Core Flooding Tanks					LATER
	a. Pressure Channels	S	NA	R		
	b. Level Channels	S	NA	R		L10
3.3.15 PAM #11	26. Pressurizer Level Channels	S M SR 3.3.15.1	NA	R SR 3.3.15.2		L15
	27. Makeup Tank Level Channels	D	NA	R		LATER
<LATER> (3.4B)	28. Radiation Monitoring Systems other than containment high range monitors (item 57)				(1) Check functioning of self-checking feature on each detector.	
	a. Process Monitoring System (RCS Leakage monitors only)	S	Q	R		L13
3.3.16 Also See Page 71-2	b. Area Monitoring System (Control Room only)	S SR 3.3.16.1	M(1) SR 3.3.16.2	R SR 3.3.16.3		
	c. Main Steam Line Radiation Monitors	S	M	R		LA2 OOCM SAR

3.3.15
3.3.16

A3

Table 4.1-1 (Cont'd)

Channel Description	Check	Test	Calibrate	Remarks
20. Reactor Building Spray System System Logic Channels	NA	M(1)	NA	(1) Including RB spray pump, spray valves, and chem. add. valve logic channels.
21. Reactor Building Spray System Analog Channels				
a. Reactor Building Pressure Channels	NA	M	R	
22. Pressurizer Temperature Channels	S	NA	R	
23. Control Rod Absolute Position	S(1)	NA	R	(1) Compare with Relative Position Indicator.
24. Control Rod Relative Position	S(1)	NA	R	(1) Check with Absolute Position Indicator
25. Core Flooding Tanks				
a. Pressure Channels	S	NA	R	
b. Level Channels	S	NA	R	
26. Pressurizer Level Channels	S	NA	R	
27. Makeup Tank Level Channels	D	NA	R	
28. Radiation Monitoring Systems other than containment high range monitors (item 57)				(1) Check functioning of self checking feature on each detector.
a. Process Monitoring System (except RCS Leakage Monitoring)	S	Q	R	
b. Area Monitoring System (except Control Room)	S	M(1)	R	
c. Main Steam Line Radiation Monitors	S	M	R	

See Page 71-1

See Page 71-1

L15

3.3.16

Amendment No. 94, 126, 163

A3

Table 4.1-1 (Cont.)

	Channel Description	Check	Test	Calibrate	Remarks
3.3.15 PAMS #18 & #19	29. High and Low Pressure Injection Systems: Flow Channels	~~NA~~ M <Add SR 3.3.15.1>	NA	R SR 3.3.15.2	M7
<LATER> (3.4.8)	30. ~~Decay heat removal system isolation valve automatic closure and interlock system~~	~~S(1)(2)~~	~~M(1)(3)~~	~~R~~	~~(1) Includes RCS Pressure Analog Channel (2) Includes CFT Isolation Valve Position (3) At least once every refueling shutdown, with Reactor Coolant System Pressure greater than or equal to 200 psig, but less than 300 psig, verify automatic isolation of the decay heat removal system from the Reactor Coolant System on high Reactor Coolant System pressure.~~ LATER
	31. ~~Deleted~~				A1
<LATER> (3.8)	32. ~~Diesel generator protective relaying starting interlocks and circuitry~~	~~M~~	~~Q~~	~~NA~~	
<LATER> (3.8)	33. ~~Off-site power undervoltage and protective relaying interlocks and circuitry~~	~~W~~	~~R(1)~~	~~R(1)~~	~~(1) Shall be tested during refueling shutdown to demonstrate selective load shedding interlocks function during manual or automatic transfer of Unit 1 auxiliary load to Startup Transformer No. 2.~~ LATER
3.3.15 PAM #15	34. Borated water storage tank level indicator	~~W~~ M SR 3.3.15.1	NA	R SR 3.3.15.2	L10
<LATER> (3.3A)	35. ~~Reactor trip upon loss of main feedwater circuitry~~	~~M~~	~~PC~~	~~R~~	LATER

Amendment No. 4, ~~19~~, ~~50~~, ~~60~~, ~~67~~, ~~91~~, ~~152~~, ~~161~~, ~~163~~, 192

3.3.15

(A3)

Table 4.1-1 (Cont.)

	Channel Description	Check	Test	Calibrate	Remarks	
<LATER> (3.5)	36. Boric Acid Addition Tank					LATER
	a. Level Channel	NA	NA	R		A5
	b. Temperature Channel	M	NA	R		
3.3.8	37. Degraded Voltage Monitoring	W SR 3.3.8.1	R	R SR 3.3.8.2	<Add SR 3.3.8.2 Note>	L2
	38. Sodium Hydroxide Tank Level Indicator	NA	NA	R		R TRM
<LATER> (3.2)	39. Incore Neutron Detectors	M(1)	NA	NA	(1) Check Functioning	LATER
	40. Emergency Plant Radiation Instruments	M(1)	NA	R	(1) Battery Check	L15
<LATER> (3.3A)	41. Reactor Trip Upon Turbine Trip Circuitry	M	PC	R		LATER
	42. Deleted					A1

3.3.8

Amendment No. ~~25~~, ~~39~~, ~~50~~, ~~60~~, ~~61~~, ~~91~~, ~~110~~, ~~135~~, 192

(A3)

Table 4.1-1 (Cont.)

	Channel Description	Check	Test	Calibrate	Remarks	
<LATER> (3.3B)	43. ESAS Manual Trip Functions					LATER
	a. Switches & Logic	NA	R	NA		
	b. Logic	NA	M	NA		
<LATER> (3.3A)	44. Reactor Manual Trip	NA	P	NA		LATER
<LATER> (3.4B)	45. Reactor Building Sump Level	NA	NA	R		LATER
3.3.15 PAM #17	46. EFW Flow Indication	M SR 3.3.15.1	NA	R SR 3.3.15.2		(L10)

3.3.15

Amendment No. ~~25~~, ~~39~~, ~~60~~, ~~61~~, ~~91~~, ~~110~~, ~~135~~, ~~160~~, 192

(A3)

Table 4.1-1 (Cont.)

	Channel Description	Check	Test	Calibrate	Remarks
	47. RCS Subcooling Margin Monitor	D	NA	R	L15
	48. Electromatic Relief Valve Flow Monitor	D	NA	R	
	49. Electromatic Relief Block Valve Position Indicator	D	NA	R	
	50. Pressurizer Safety Valve Flow Monitor	D	NA	R	
3.3.15 PAM #11	51. Pressurizer Water Level Indicator	D (M) SR 3.3.15.1	NA	R SR 3.3.15.2	L10
	52. Deleted				A1
<LATER> (3.3C)	53. EFW Initiation				
	a. Manual	NA	M	NA	LATER
3.3.15 PAMS 12 & 13	b. SG Low Level, SGA or B	S (M) SR 3.3.15.1	M & LATER	R SR 3.3.15.2	& LATER
& <LATER> (3.3C)	c. Low Pressure SGA or B	S (M)	M	R	L10
<LATER> (3.3C)	d. Loss of both MFW Pumps and PWR > 10%	S	M	R	LATER

3.3.15

(A3)

Table 4.1-1 (Cont.)

	Channel Description	Check	Test	Calibrate	Remarks
<LATER> (3.3c)	d. SG A High Range Level High-high	S	M	R	LATER
	e. SG B High Range Level High-high	S	M	R	
3.3.15 PAM #9	57. Containment High Range Radiation Monitors	M SR 3.3.15.1	M	R SR 3.3.15.2	L12
3.3.15 PAM #7	58. Containment Pressure-High	M SR 3.3.15.1	NA	R SR 3.3.15.2	L10
3.3.15 PAM #6	59. Containment Water Level-Wide Range	M SR 3.3.15.1	NA	R SR 3.3.15.2	
<LATER> (3.4B)	60. Low Temperature Overpressure Protection Alarm Logic	NA	R	R	LATER
3.3.15 PAM #16	61. Core-exit Thermocouples	M SR 3.3.15.1	NA	R SR 3.3.15.2	L10
<LATER> (3.3A)	62. Electronic (SCR) Trip Relays	NA	Q	NA	LATER
3.3.15 PAM #5	63 RVLMS	M SR 3.3.15.1	NA	R SR 3.3.15.2	L10
3.3.15 PAM #3	64 HLLMS	M SR 3.3.15.1	NA	R SR 3.3.15.2	

+ <LATER> (3.3A, 3.3B, 3.3C, 3.4B)

NOTE:

S - Each Shift
W - Weekly
M - Monthly
D - Daily

T/W - Twice per Week
Q - Quarterly
P - Prior to each startup if not done previous week
B/M - Every 2 months

R - Once every 18 months
PC - Prior to going Critical if not done within previous 31 days
NA - Not Applicable
SA - SA Twice per Year

(A4) + LATER + (R) TRM

3.3.15

4.12 HYDROGEN RECOMBINERS SURVEILLANCE

Applicability

Applies to the surveillance of the hydrogen recombiner systems.

Objective

To verify an acceptable level of efficiency and operability of the hydrogen recombiner systems.

Specification

<LATER> (3.6) 4.12.1 Each hydrogen recombiner system shall be demonstrated OPERABLE: — LATER

a. At least once per 6 months by verifying during a recombiner system functional test that the minimum heater sheath temperature increases to greater than or equal to 700°F within 90 minutes. Upon reaching 700°F, increase the power setting maximum power for 2 minutes and verify that the power meter reads greater than or equal to 60 KW.

b. At least once per 18 months by:

1. Performing a CHANNEL CALIBRATION of all recombiner instrumentation and control circuits,

2. Verifying through a visual examination that there is no evidence of abnormal conditions within the recombiner enclosure (i.e., loose wiring or structural connections, deposits of foreign materials, etc.), and

3. Verifying the integrity of the heater electrical circuits by performing a resistance to ground test following the above required functional test. The resistance to ground for any heater phase shall be greater than or equal to 10,000 ohms.

Table 3.3.15-1 #10 SR 3.3.15.2 4.12.2 Hydrogen concentration instruments shall be calibrated once every 18 months with proper consideration to moisture effect. — LA1 Bases

Bases

The OPERABILITY of the recombiners for the control of hydrogen gas ensures that this equipment will be available to maintain the hydrogen concentration within containment below its flammable limit during post-LOCA conditions. Either recombiner unit is capable of controlling the — A2

<Add SR 3.3.15.1 for PAM #10> — M2

expected hydrogen generation associated with 1) zirconium-water reactions, 2) radiolytic decomposition of water, and 3) corrosion of metals within containment. The hydrogen recombiner systems are consistent with the recommendations of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following LOCA", Rev. 2, November, 1978.

A2

6.12.5 **Special Reports**

<LATER> (5.0) Special reports shall be submitted to the Administrator of the appropriate Regional Office within the time period specified for each report. These reports shall be submitted covering the activities identified below pursuant to the requirements of the applicable reference specification. LATER

a. Deleted A1

b. Inoperable Containment Radiation Monitors, Specification 3.5.1, Table 3.5.1-1. LA1 Bases

c. Deleted A1

<LATER> (5.0) d. Steam Generator Tubing Surveillance - Category C-3 Results, Specification 4.18. LATER

<LATER> (3.7) e. Miscellaneous Radioactive Materials Source Leakage Tests, Specification 3.12.2. LATER

f. Deleted

g. Deleted

h. Deleted

i. Deleted A1

<LATER> (3.8) j. Degraded Auxiliary Electrical Systems, Specification 3.7.2.H. LATER

k. Inoperable Reactor Vessel Level Monitoring Systems, Table 3.5.1-1

l. Inoperable Hot Leg Level Measurement Systems, Table 3.5.1-1 LA1 Bases

m. Inoperable Main Steam Line Radiation Monitors, Specification 3.5.1, Table 3.5.1-1. L14