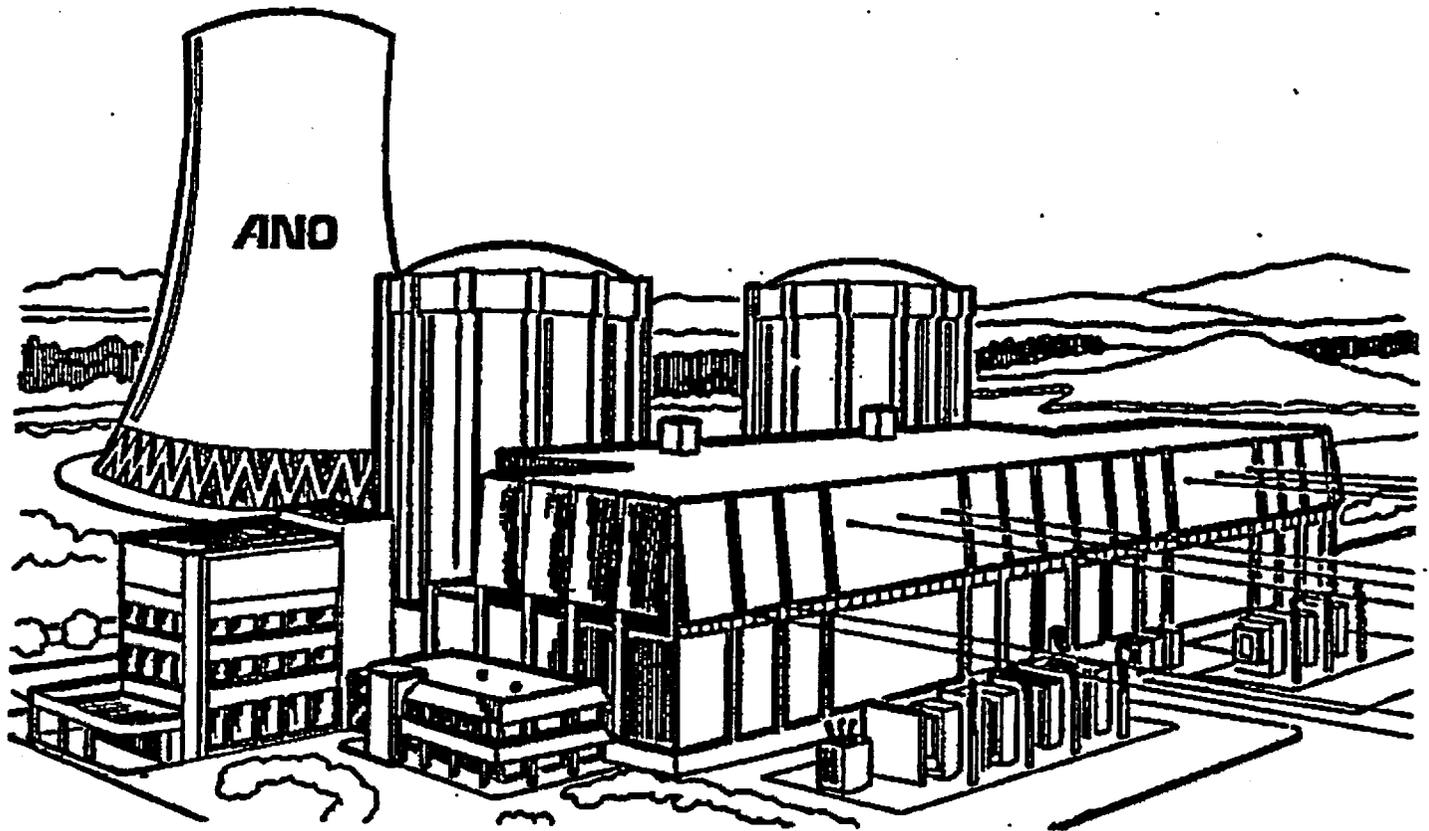


# ARKANSAS NUCLEAR ONE - UNIT 1

## IMPROVED TECHNICAL SPECIFICATIONS SUBMITTAL



**VOLUME 3 OF 7**

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## This Section Addresses the Following Specifications:

<u>NUREG-1430</u>	<u>ANO-1 ITS</u>	<u>Title</u>
3.3.11	3.3.11	Emergency Feedwater Initiation and Control (EFIC) System Instrumentation
3.3.12	3.3.12	Emergency Feedwater Initiation and Control (EFIC) Manual Initiation
3.3.13	3.3.13	Emergency Feedwater Initiation and Control (EFIC) Logic
3.3.14	3.3.14	Emergency Feedwater Initiation and Control (EFIC) - Emergency Feedwater (EFW) - Vector Valve Logic

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.

APPLICABILITY: According to Table 3.3.11-1.

ACTIONS

NOTE

Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Emergency Feedwater (EFW) Initiation or Main Steam Line Isolation Functions listed in Table 3.3.11-1 with one channel inoperable.	A.1 Place channel(s) in bypass or trip.	1 hour
B. One or more EFW Initiation or Main Steam Line Isolation Functions listed in Table 3.3.11-1 with two channels inoperable.	B.1 Place one channel in bypass.	1 hour
	<u>AND</u> B.2 Place second channel in trip.	1 hour
C. One EFW Vector Valve Control channel inoperable.	C.1 Restore channel to OPERABLE status.	72 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>D. Required Action and associated Completion Time not met for Function 1.b.</p>	<p>D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 4.</p>	<p>6 hours  12 hours</p>
<p>E. Required Action and associated Completion Time not met for Functions 1.a or 1.d.</p>	<p>E.1 Reduce THERMAL POWER to <math>\leq 10\%</math> RTP.</p>	<p>6 hours</p>
<p>F. Required Action and associated Completion Time not met for Functions 1.c, 2, or 3.</p>	<p>F.1 Be in MODE 3. <u>AND</u> F.2.1 Reduce steam generator pressure to <math>&lt; 750</math> psig.  <u>OR</u> F.2.2 <del>NOTE</del> Only applicable for Function 3.a.  Close all associated valves.</p>	<p>6 hours  12 hours  12 hours</p>

**SURVEILLANCE REQUIREMENTS**

**NOTE**

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

<b>SURVEILLANCE</b>	<b>FREQUENCY</b>
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

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
<b>1. EFW Initiation</b>			
a. Loss of MFW Pumps (Control Oil Pressure)	≥ 10% RTP	4	SR 3.3.11.1 SR 3.3.11.2
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
c. SG Pressure - Low	1,2,3 <sup>(a)</sup>	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3
d. RCP Status	≥ 10% RTP	4	SR 3.3.11.1 SR 3.3.11.2
<b>2. EFW Vector Valve Control</b>			
a. SG Pressure - Low	1,2,3 <sup>(a)</sup>	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3
b. SG Differential Pressure - High	1,2,3 <sup>(a)</sup>	4	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3
<b>3. Main Steam Line Isolation</b>			
a. SG Pressure - Low	1,2,3 <sup>(a)(b)</sup>	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3

(a) When SG pressure ≥ 750 psig.

(b) Except when all associated valves are closed.

3.3 INSTRUMENTATION

3.3.12 Emergency Feedwater Initiation and Control (EFIC) Manual Initiation

LCO 3.3.12 Two manual initiation switches per actuation train for each of the following EFIC Functions shall be OPERABLE:

- a. Steam generator (SG) A Main Steam Line Isolation;
- b. SG B Main Steam Line Isolation; and
- c. Emergency Feedwater (EFW) Initiation.

APPLICABILITY: When associated EFIC Function is required to be OPERABLE.

ACTIONS

NOTE

Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more EFIC Function(s) with one or both required manual initiation switches inoperable in one actuation train.	A.1 Place actuation train for the associated EFIC Function(s) in trip.	72 hours
B. One or more EFIC Function(s) with one or both required manual initiation switches inoperable in both actuation trains.	B.1 Restore one actuation train for the associated EFIC Function(s) to OPERABLE status.	1 hour

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time not met for EFW Initiation Function.	C.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	C.2 Be in MODE 4.	12 hours
D. Required Action and associated Completion Time not met for Main Steam Line Isolation Function.	D.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	D.2.1 Reduce steam generator pressure to < 750 psig.	12 hours
	<u>OR</u>	
	D.2.2 Close all associated valves.	12 hours

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE	FREQUENCY
SR 3.3.12.1 Perform CHANNEL FUNCTIONAL TEST.	31 days

3.3 INSTRUMENTATION

3.3.13 Emergency Feedwater Initiation and Control (EFIC) Logic

LCO 3.3.13 Trains A and B of each Logic Function shown below shall be OPERABLE:

- a. Main Steam Line Isolation; and
- b. Emergency Feedwater (EFW) Initiation.

APPLICABILITY: When associated EFIC Function is required to be OPERABLE.

ACTIONS

NOTE

Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more train A Functions inoperable with all train B Functions OPERABLE; or one or more train B Functions inoperable with all train A Functions OPERABLE.	A.1 Restore affected 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.	6 hours
	<u>AND</u> B.2 Be in MODE 4.	12 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
<b>C. Required Action and associated Completion Time not met for Main Steam Line Isolation Function.</b>	<b>C.1 Be in MODE 3.</b>	<b>6 hours</b>
	<u><b>AND</b></u>	
	<b>C.2.1 Reduce steam generator pressure to &lt; 750 psig.</b>	<b>12 hours</b>
	<u><b>OR</b></u>	
	<b>C.2.2 Close all associated valves.</b>	<b>12 hours</b>

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE	FREQUENCY
<b>SR 3.3.13.1 Perform CHANNEL FUNCTIONAL TEST.</b>	<b>31 days</b>

3.3 INSTRUMENTATION

3.3.14 Emergency Feedwater Initiation and Control (EFIC) Vector Logic

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

APPLICABILITY: MODES 1 and 2,  
MODE 3 when steam generator pressure is  $\geq 750$  psig.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One vector 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 pressure to < 750 psig.	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

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#### BACKGROUND

The EFIC System instrumentation is designed to 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. The EFIC Functions that are supported and the parameters that are needed for each of these Functions are described next.

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; and
- c. Main Steam Line 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. Also, 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), ensures the EFW is available to raise SG levels to promote natural circulation cooling.

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.

The EFIC System also isolates main steam and MFW to an SG that has experienced an uncontrolled depressurization. With the uncontrolled depressurization, 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 below the normal operating point of the secondary system.

EFW initiation also enables EFIC vector logic which performs an EFW control function to preclude 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 vector 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 values 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.

The trip setpoints used in the bistables are based on the analytical limits stated in SAR, Chapters 7 and 14 (Refs. 2 and 3). The selection of these trip setpoints is such that adequate protection is provided when appropriate sensor and processing time delays are taken into account. The Allowable Values are conservatively adjusted with respect to the analytical limits to allow for calibration tolerances, instrumentation uncertainties, instrument drift, and environmental errors as required.

Guidance used to calculate the uncertainties associated with the trip setpoints is provided in Instrument Loop Error Analysis and Setpoint Methodology Manual Design Guide, IDG-001 (Ref. 4). The explicit uncertainties are addressed in the design calculations as required. The trip setpoint entered into the bistable may be more conservative than that specified by the Allowable Value to account for changes in instrument error detectable by a CHANNEL FUNCTIONAL TEST. A channel is inoperable if its as-found trip setpoint is not within its required Allowable Value.

Setpoints in accordance with the Allowable Value in conjunction with the LCOs and administrative controls 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 analyzed.

Each channel can be tested on line to verify that the trip setpoint is within the specified allowance requirements. Once a designated channel is taken out of service for testing, a simulated signal can be injected in place of the field instrument signal. The process equipment for the channel in test can then be tested, verified, and calibrated.

### Actuation Logic

SAR, Section 7.1.4 (Ref. 2), describes the 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 channels issue initiate commands. For the EFW Initiation and Main Steam Line Isolation functions, 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 below.

#### 1. EFW Initiation

Figure 10-2, Sheet 4, SAR, Chapter 10 (Ref. 5), illustrates each channel of the EFIC EFW Initiation Function. 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 six parameters within the EFIC System that automatically initiates EFW. 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  $\geq$  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."

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 are used to generate the signals used for detection for low level conditions for EFW actuation. There is one transmitter for each of the four channels A, B, C, and D. At least two channels are required to initiate EFW. SG Level - Low was chosen as an EFW automatic initiating parameter because it indicates that the normal feedwater source may be insufficient to meet the heat removal requirements.

Signals from channels A and B are also used to control SG level at approximately 31 inches when one or more RCPs are operating. This parameter is referenced to the top of the lower tube sheet.

c. SG Pressure - Low

Four transmitters per SG (one transmitter per channel) provide the EFIC System with channels A through D of SG Pressure - Low. These are the same transmitters used by the Main Steam Line Isolation Function. When the SG pressure at the transmitter drops below the bistable Allowable Value of 584.2 psig on a given channel, an EFW Initiation signal is sent to the automatic actuation logic. At least two channels are required to initiate EFW and main steam line isolation. The Allowable Value of  $\geq 584.2$  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 low pressure Function may be manually bypassed when either SG is less than 750 psig. If both SG pressure inputs exceed 750 psig, the EFIC channel bypass is automatically removed. The low pressure operational bypass allows for normal cooldown without EFIC actuation. The parameter value (i.e., 750 psig) is a nominal value.

SG Pressure - Low is a primary indication and actuation signal for a steam line break or feedwater line break (non-design basis transient). For a small break, which does not depressurize the SG or takes a long time to depressurize the SG, automatic actuation is not required. The operator has time to diagnose the problem and take the appropriate actions.

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 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 control the level at approximately 312 inches in the SG. This higher level provides a thermal center in the SG at a higher elevation than that of the reactor to enhance natural circulation of the reactor coolant. This parameter is referenced to the top of the lower tube sheet.

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

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.

2. EFW Vector Valve Control

Figure 10-2, Sheet 4, SAR, Chapter 10 (Ref. 5), illustrates the EFIC EFW Vector Valve Control inputs to the EFIC Vector Logic (See Bases for LCO 3.3.14, "EFIC Vector Logic"). The function of the EFW vector logic is to determine whether EFW should not be fed to one or the other SG once

enabled by the EFW Initiation Function. This is to preclude the continued addition of EFW to a depressurized SG and, thus, to minimize the overcooling effects.

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 584.2 psig;
- b. SG B pressure less than 584.2 psig;
- c. SG A pressure 100 psid greater than SG B pressure; and
- d. SG B pressure 100 psid greater than SG A pressure.

The Allowable Value of  $\geq 584.2$  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.

The vector logic outputs are in a neutral state until enabled by the train A or B trip logics. When enabled, the vector logic can issue 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 controllers which control the position of the EFW control valves.

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

The valve open or close commands are determined by the relative values of SG pressures as discussed in the Bases for LCO 3.3.14.

### 3. Main Steam Line Isolation

SAR, Section 7.1.4 (Ref. 2) describes one channel of the EFIC Main Steam Line Isolation logic. Four pressure transmitters (one transmitter per channel) per SG provide EFIC with channels A through D logic of SG pressure. The channels are as described for EFW Initiation mentioned earlier.

#### 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 train. An interlock feature prevents bypassing more than one channel at a time. In addition, since the EFIC System receives signals from the RPS, the maintenance bypass from the RPS is interlocked with the EFIC System. If one channel of the RPS is in maintenance bypass, only the corresponding channel of the EFIC may be

bypassed (e.g., channel A, RPS, and channel A, EFIC). This ensures that only the corresponding channels of the EFIC and RPS are placed in maintenance bypass at the same time.

EFIC channel maintenance bypass does not bypass EFW Initiation from ESAS. The EFIC EFW initiation from ESAS is, however, bypassed when its associated ESAS channel is bypassed.

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

The EFIC System is designed to perform its intended EFW Initiation and Main Steam Line Isolation function with one channel in maintenance bypass (in effect, inoperable) concurrent with a postulated single failure in any one of the remaining channels. This is in compliance with IEEE-279-1971 (Ref. 6).

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## APPLICABLE SAFETY ANALYSES

### 1. EFW Initiation

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. As part of the post-TMI review, a loss of main feedwater was analyzed (Ref. 3). The EFIC System response for a loss of MFW conservatively assumes the actuation of EFW on low SG level. If the loss of feedwater is due to loss of MFW pumps, EFW will be actuated earlier than it would on low SG level, which will increase the SG heat transfer capability and will lessen the severity of the transient.

The basis for initiation of the EFW systems is a loss of MFW. For this analysis, SG Level - Low is the most conservative parameter from which to automatically initiate EFW since this yields the least SG inventory available for heat removal. SG Level - Low would be an indicator of any event involving a loss of SG secondary side inventory heat removal capability.

SG Pressure - Low is a primary indication and provides an actuation signal for a SLB. 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.

Loss of four RCPs is a primary indicator of the need for emergency feedwater (EFW) for the loss of electric power analysis, SAR Section 14.1.2.8 (Ref. 3).

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.

2. EFW Vector Valve Control

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.

3. Main Steam Line Isolation

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.

In MODE 1, the EFIC System satisfies Criterion 3 of 10 CFR 50.36 (Ref. 7). In MODES 2 and 3, the 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 full rated power.

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LCO

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

Four channels are required OPERABLE for all EFIC Functions. 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.

EFIC initiation function values for the bypass removal functions are specified in terms of applicability limits (i.e., identified in the Applicable MODES or Other Specified Conditions column of Table 3.3.11-1) for the associated trip Function. Trip setpoints are specified in the setpoint calculations or calibration procedures. The trip 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. Guidance used to calculate the uncertainties associated with the trip setpoints is provided in Reference 4.

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

#### Loss of MFW Pumps

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.

#### SG Level - Low

Four EFIC dedicated low range level transmitters per SG shall be OPERABLE with an SG Level - Low actuation Allowable Value of  $\geq 11.1$  inches, to generate the signals used for detection for low level conditions for EFW Initiation. 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. 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 level at approximately 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 operational margin between the integrated control system 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.

#### SG Pressure - Low

Four EFIC channels per SG shall be OPERABLE with an SG low pressure actuation Allowable Value of  $\geq 584.2$  psig. The setpoint is chosen to avoid actuation under transient conditions not requiring secondary system isolation, preferring to maintain a steaming path to the condenser, if possible. Small break LOCA analyses have indicated minimum secondary system pressures of greater than the above setpoint. The SG Pressure - Low Function includes a bypass enable and removal function. The bypass removal value is chosen to allow sufficient operating margin for the operator to bypass when cooling down. 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.

### SG Differential Pressure - High

Four EFIC channels for SG differential pressure shall be OPERABLE. This Function ensures that automatic EFW isolation to a depressurized SG occurs. 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 assumptions.

### 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 312 inches, providing a higher SG level for establishing and maintaining natural circulation conditions. 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 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.

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## 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 conservative with respect to the specific accidents and conditions for which it is designed to mitigate the consequences. The parameter values provided as part of the Applicability do contain an allowance for instrument error.

The initiation of EFW on the Loss of MFW Pumps shall only be required when the unit is  $\geq 10\%$  RTP. Below 10% RTP, the EFW Initiation on low SG level will mitigate primary system overheating.

EFW Initiation on low SG level shall be OPERABLE in MODES 1, 2, and 3 which are conditions during which the SG is required for heat removal.

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 during MODE 3 operation.

The EFW System Initiation on loss of all RCPs Function shall be operable at  $\geq 10\%$  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 Main Steam Line Isolation and EFW Vector Valve Control Functions shall be OPERABLE in MODES 1 and 2, and MODE 3 with SG pressure  $\geq 750$  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 instrumentation is not required to be OPERABLE.

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## 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

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

With one channel inoperable in one or more EFW Initiation or Main Steam Line 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.

### B.1 and B.2

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

With two EFW Initiation or Main Steam Line 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.

#### 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) Vector Logic."

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

If the Required Actions and associated Completion 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 less than 10% RTP for Functions 1.a and 1.d, MODE 4 for Function 1.b, and SG pressure less than 750 psig for all other Functions. In addition, for Function 3.a, once the unit is in MODE 3, a nonapplicable condition may be achieved by closing the valves associated with the Main Steam Line Isolation Function. 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.

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### **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. 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 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 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 factors including 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. 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, where practical, to be reading at the bottom of the range and not failed downscale.

The Frequency 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 trip functions must be found within the Allowable Value. (Note that the values for the bypass removal functions are identified 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 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 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 setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.**

**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.**

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**REFERENCES**

- 1. 10 CFR 50.62.**
  - 2. SAR, Chapter 7.**
  - 3. SAR, Chapter 14.**
  - 4. Instrument Loop Error Analysis and Setpoint Methodology Manual, Design Guide, IDG-001.**
  - 5. SAR, Chapter 10, Figure 10-2, Sheet 4.**
  - 6. IEEE-279-1971, April 1972.**
  - 7. 10 CFR 50.36.**
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## B 3.3 INSTRUMENTATION

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

#### BASES

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#### 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 Steam Line Isolation for steam generator (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 prior to automatic actuation or in the event that EFIC does not automatically actuate when required. These are backup Functions to those performed automatically by EFIC.

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.

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

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#### 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 initiation Functions and allow operators to actuate EFW or Main Steam Line Isolation whenever these Functions are needed. Furthermore, the manual initiation of EFW and Main Steam Line Isolation may be specified in unit operating procedures.

The EFIC manual initiation functions satisfy Criterion 4 of 10 CFR 50.36 (Ref. 2).

## LCO

Instrumentation on the main control board performing an EFIC manual initiation Function shall be OPERABLE.

Two manual initiation switches per actuation train (Train A and Train B) of each Function (A and B Main Steam Line Isolation, and EFW Actuation) are required to be OPERABLE. 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 on 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.

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## APPLICABILITY

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.

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## 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 train, the train for the associated EFIC Function(s) must be placed in the tripped condition within 72 hours. With the train in the tripped condition, the single-failure criterion is met. Failure to perform Required Action A.1 could allow a single failure of another switch to prevent manual actuation of at least one of the two trains. The Completion Time allotted to trip the train allows the operator to take all the appropriate actions for the failed train and still ensure that the risk involved in operating with the failed train is acceptable.

### B.1

With one or both required manual initiation switches of one or more EFIC Function(s) inoperable in both actuation trains, one actuation train for each Function must be restored to OPERABLE status within 1 hour. With the train restored, the

second train must be placed in the tripped condition within 72 hours (Required Action A.1). With the train in the tripped condition, the single-failure criterion is met. The Completion Time allotted to restore the train allows the operator to take all the appropriate actions for the failed train and still ensures that the risk involved in operating with the failed train is acceptable.

C.1 and C.2

If the Required Action and the associated Completion Time is not met for any EFW Initiation Function, 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.

D.1, D.2.1, and D.2.2

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 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.

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**SURVEILLANCE REQUIREMENTS**

SR 3.3.12.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the trains can perform their intended functions. However, for Main Steam Line Isolation and EFW Initiation, 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 Main Steam Line Isolation or EFW Initiation during testing at power. The Frequency of 31 days is based on operating experience with regard to channel OPERABILITY that demonstrates the rarity of more than one train failing within the same 31 day interval.

**REFERENCES**

1. IEEE-279-1971, April 1972.
  2. 10 CFR 50.36.
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## B 3.3 INSTRUMENTATION

### B 3.3.13 Emergency Feedwater Initiation and Control (EFIC) Logic

#### BASES

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#### BACKGROUND

##### Main Steam Line 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. SAR, Section 7.1.4 (Ref. 1), describes the Main Steam Line Isolation Logics. The trip logic modules are identified as being part of the "A" and "B" trains and are physically located in the "A" and "B" EFIC channel cabinets. Train "A" actuation logic initiates when instrumentation channel "A" or "B" initiates and channel "C" or "D" initiates, which in simplified logic is:

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

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

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

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

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

SG B Main Steam Line Isolation automatic actuation logics respond similarly for the SG B valve.

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.

##### Emergency Feedwater (EFW Initiation)

The four EFIC instrumentation channels for each of the parameters being sensed input their initiate commands to the trip logic modules. SAR, Section 7.1.4 (Ref. 1), describes the EFW initiation logic. These trip logic modules are identified as being part of the "A" and "B" trains and are physically located in the "A" and "B" EFIC channel cabinets.

EFW Initiation functions use the same actuation logic combinations as Main Steam Line Isolation. EFW initiation also occurs on Engineered Safeguards Actuation System (ESAS) actuation and on Diverse Reactor Overpressure Protection System (DROPS) actuation.

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 > 10% RTP;
- c. Low level in either SG;
- d. Low pressure in either SG;
- e. Actuation of ESAS channels 3 or 4; or
- f. Actuation of DROPS channels 1 or 2.

#### Vector Valve Enable Logic

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.

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#### APPLICABLE SAFETY ANALYSES

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."

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#### LCO

Two trains each of Main Steam Line Isolation and EFW Initiation logics shall be OPERABLE. There are only two trains 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 train.

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.

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#### APPLICABILITY

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.

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#### ACTIONS

If a train is found inoperable, then all affected logic Functions provided by that train must be declared inoperable and the appropriate 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 train are inoperable (i.e., train A could be inoperable for both EFIC logic Functions and Condition A would still be applicable) with all Functions in the other train OPERABLE. This Condition is equivalent to failure of one EFW and Main Steam Line Isolation train.

With one automatic actuation logic train 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 trains per EFIC Function, the condition of one train inoperable is analogous to having one train of a two train Engineered Safeguards (ES) System inoperable. The system safety function can be accomplished; however, a single failure cannot be taken. Therefore, the failed train(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 both trains of the same Function. Consequently, any combination of failures in both trains 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 and its associated Completion Time is not met for the EFW Initiation Function, 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.

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

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 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.

## **SURVEILLANCE REQUIREMENTS**

### **SR 3.3.13.1**

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the trains can perform their intended functions. This test verifies 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 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 with Main Steam Line Isolation or actuation of EFW during testing at power. The Frequency of 31 days is based on operating experience with regard to channel OPERABILITY, which has demonstrated the rarity of more than one channel failing within the same 31 day interval.

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## **REFERENCES**

1. SAR, Chapter 7.
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## B 3.3 INSTRUMENTATION

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

#### BASES

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#### BACKGROUND

The function of the EFIC vector 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 steam generator (SG) and, thus, minimize the overcooling effects. Each vector logic may isolate EFW to one SG or the other, never both.

There are four sets of vector logic; one in each channel of EFIC. 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;
- b. SG "B" pressure less than 600 psig;
- c. SG "A" pressure 100 psid greater than SG "B" pressure; and
- d. SG "B" pressure 100 psid greater than SG "A" pressure.

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

Each vector logic also receives an enable signal from both EFIC train A and train B when EFW is actuated.

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

The vector logic outputs are in a neutral state with the valves fully open until enabled by the EFW Initiation (train A or B) trip logics. When enabled, the vector 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.

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

PRESSURE STATUS	SG VALVES	
	"A"	"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		
<u>AND</u>		
• SG "A" & SG "B" within 100 psid	Open	Open
• SG "A" 100 psid > SG "B"	Open	Close
• SG "B" 100 psid > SG "A"	Close	Open

#### APPLICABLE SAFETY ANALYSES

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

#### LCO

Four channels of the EFIC vector logic module are required to be OPERABLE. The necessity for four channels is discussed in the BASES for ACTIONS. The 600 psig and 100 psid setpoints were chosen as discussed in Specification B 3.3.11, "EFIC Instrumentation." The feed only good generator verification study assumed a differential pressure vector value of 150 psid. A 100 psid setpoint conservatively assumes a 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. These values (i.e., 600 psig and 100 psid) do contain an allowance for instrument error.

#### APPLICABILITY

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  $\geq 750$  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.

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## ACTIONS

### A.1

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

- a. Provide EFW on demand; and
- b. 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.

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 3.7.5, "EFW System." As such, the Completion Time of 72 hours is based on engineering judgment.

### 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 SG pressure must be reduced to  $< 750$  psig 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.

## **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 vector logic performs its function as desired. The Frequency is based on operating experience with respect to channel OPERABILITY that demonstrates the rarity of more than one channel failing within the same 31 day interval.

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## **REFERENCES**

None.

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# CTS DISCUSSION OF CHANGES

## ITS Section 3.3C: Instrumentation - EFIC

Note: ITS Section 3.3C package includes the following ITS:  
ITS 3.3.11 Emergency Feedwater Initiation and Control (EFIC) System Instrumentation  
ITS 3.3.12 EFIC Manual Initiation  
ITS 3.3.13 EFIC Logic  
ITS 3.3.14 EFIC-Emergency Feedwater (EFW)-Vector Valve Logic  
which address the corresponding NUREG-1430 RSTS.

### 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 3.5.1.1 does not clearly specify that the number of channels identified in Table 3.5.1-1, Column 1, are required to be OPERABLE, but CTS 3.5.1.2 provides directions when channels are inoperable. 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 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:

<u>CTS</u>	<u>ITS</u>
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 listed above are applicable to this package.)

- A5 The Notes which allow for separate entry into the ACTIONS of ITS 3.3.11, ITS 3.3.12, and ITS 3.3.13, and the Note for ITS 3.3.11 which indicates that ITS Table 3.3.11-1 identifies the applicable SRs, have been adopted. These additions have been made to provide requirements in a format consistent with NUREG-1430. The addition of these Notes maintains allowances consistent with the use and application of the requirements of the corresponding portions of CTS Table 3.5.1-1. This change represents a change in presentation format only with no addition or deletion of requirements.
- A6 Requirements for Emergency Feedwater Initiation and Control System (EFIC) instrument channels for manual actuation presented in CTS Table 3.5.1-1, items 1.a, 2.a, and 3.a, and Note 1, have been replaced by the requirements of ITS 3.3.12. This change maintains the requirement for two OPERABLE channels of instrumentation for each of the required parameters. It does however represent a change in format for these requirements, although no additional requirements have been added by this change and no current requirements have been deleted.
- 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.

## CTS DISCUSSION OF CHANGES

- A8 CTS 3.5.1.15.a and 3.5.1.16 are revised to specifically identify that the Applicability for ITS Table 3.3.11-1, Functions 1.c and 3.a includes MODES 1 and 2, and MODE 3 when steam generator pressure is  $\geq$  750 psig (per ITS Table Note (a)). These are considered to be equivalent since the CTS identifies the "minimum operability conditions" as when the main steam pressure exceeds (or is greater than) 750 psig, and the steam pressure of 750 psig is normally achieved and exceeded in MODE 3. This is a change in format only and is therefore an administrative change.
- A9 The "exceeds" and "greater than" requirements for EFIC instrumentation channel Applicability in CTS 3.5.1.15 and 3.5.1.16, have been revised to " $\geq$ " in the associated Applicability identified in ITS Table 3.3.11-1. These are considered to be essentially equivalent since the parameter can be greater than the identified limit, but be so close as to be imperceptible. This change is consistent with NUREG-1430.
- A10 The EFIC instrumentation channels testing requirements of CTS Table 4.1-1, items 56.d and 56.e have not been included in ITS. This change is considered administrative in nature because this equipment has never been installed in the plant. These Surveillance Requirements were included based on an early design of EFIC during implementation of NUREG-0737; however, during NRC review, the design was revised to omit these functions. This change makes the EFIC requirements consistent with the final unit design.
- A11 CTS Table 3.5.1-1, EFIC Functional Units 1.b, 1.c, 1.d, 1.e, 2.b, and 3.b, have been replaced by ITS LCO 3.3.11, Table 3.3.11-1, Functions 1.a, 1.b, 1.c, 1.d, and 3.a. The adoption of ITS LCO 3.3.11 represents a change in format, however it does not change the application of the requirements found in CTS as they relate to the EFIC (except as discussed in other applicable DOCs). This change is consistent with NUREG-1430.
- A12 CTS Table 3.5.1-1, EFIC Functional Unit 1.f has been replaced by ITS LCO 3.3.13.b. The adoption of ITS LCO 3.3.13.b represents a change in format, however it does not change the application of the requirements found in CTS as they relate to the EFIC logic (except as discussed in other applicable DOCs). This change is consistent with NUREG-1430.
- A13 CTS 3.5.1.15 identifies three EFIC Functions with the phrase "which are bypassed at cold shutdown conditions." Since the Applicability for these Functions does not include cold shutdown conditions, this is unnecessary descriptive information which is not included in ITS. Omitting this information does not change the applicable requirements, nor their application. Therefore, this change is considered administrative. This change is consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

- A14 CTS Table 4.1-1, item 53.d, includes a calibration requirement for the "loss of both MFW pumps with power > 10%" Function. The ITS item does not include a calibration Surveillance Requirement for the "loss of main feedwater pumps" Function. This Function is actually provided as a direct output from the RPS which is binary in nature. The RPS Function which provides the signal is calibrated per ITS 3.3.1 Surveillance Requirements. Therefore, no separate calibration of this "binary" indication is required for the EFIC Function and the NUREG requirement to perform SR 3.3.11.3 for ITS Table 3.3.11-1, Function 1.a is not adopted. This change results in no changes in the calibration of equipment for the unit and is considered to be a change only in the presentation of the requirements. Therefore, this is considered an administrative change.
- A15 Not used.
- A16 Not used.
- A17 CTS 4.1.c is omitted since it duplicates requirements provided in the regulations, i.e., 10 CFR 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, this is considered an administrative change. Further, changes to the requirements are controlled by the NRC. This change is consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

### TECHNICAL CHANGE – MORE RESTRICTIVE

M1 CTS Table 3.5.1-1 Note 1 provides action requirements in the event any Functional unit of the EFIC System is inoperable. CTS Table 3.5.1-1, Note 1 currently requires that the unit be placed in hot shutdown (ITS MODE 3) within 12 hours if any of the EFIC Functional units are inoperable. ITS 3.3.11 will include Condition A to also require the inoperable channel to be placed in trip or bypassed within one hour. Since this Required Action is not in CTS, this change is more restrictive than CTS. This action is appropriate since the Required Action either bypasses and removes the channel from the logic and allows the remaining channels to function as designed, or places the channel in trip and reduces the logic such that one additional channel in trip will initiate EFIC. Either of these actions will allow EFIC to initiate EFW when required, therefore, these conditions are acceptable for short periods of operation to allow restoration of the channel without cycling the unit through an unnecessary shutdown and subsequent startup. This change is consistent with NUREG-1430.

In addition, for the EFW Initiation and MSL Isolation Functions (ITS Table 3.3.11-1 Functions 1 and 3), ITS 3.3.11 will include Condition B for two channels inoperable. This Condition will require one inoperable channel to be placed in bypass and the second inoperable channel placed in trip within one hour. Since this Required Action is not in CTS, this change is more restrictive than CTS. This action is appropriate since the Required Action bypasses one channel and removes it from the logic and allows the remaining channels to function as designed, with the second channel already in trip such that one additional channel in trip will initiate EFIC. These actions will allow EFIC to initiate EFW when required, therefore, these conditions are acceptable for short periods of operation to allow restoration of the channel without cycling the unit through an unnecessary shutdown and subsequent startup. This change is consistent with NUREG-1430.

M2 Specific Applicability is included for ITS Table 3.3.11-1, Function 1.b and LCO 3.3.11 is revised to include associated Required Action D.2. CTS Table 3.5.1-1, Note 1 currently requires that the unit be placed in hot shutdown (ITS MODE 3) within 12 hours if the steam generator low level Function of EFIC is inoperable. This would imply an Applicability of MODES 1 and 2 since no further actions are required. Therefore, the proposed ITS Applicability of MODES 1, 2, and 3 is more restrictive than CTS. Additionally, ITS will include Required Action B.2 to exit the revised Applicability by requiring the unit to be in MODE 4 within 12 hours. This is also more restrictive. These additional applicable MODES and Required Actions are appropriate since EFIC is necessary in MODE 3 to provide additional assurance sufficient cooling water is provided to the steam generators in a timely manner. Further, this Applicability is necessary to support the OPERABILITY of the actuated EFW components. This change is consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

- M3** An LCO, including the number of required channels, and specific Applicability are included for ITS Table 3.3.11-1, Functions 2.a and 2.b, "EFW Vector Valve Control," with Note (a), and ITS LCO 3.3.11 is revised to include associated Required Actions C.1, F.1, and F.2.1. CTS Table 4.1-1, Item 56, currently requires only Surveillances for this equipment with no associated LCO, Applicability, or Actions identified. These ITS restrictions are appropriate to provide additional assurance that the specified EFW vector valve logic will function when required. This more restrictive change eliminates a potential source of confusion, and is consistent with NUREG-1430.
- M4** The CTS markup shows a specific Applicability is included for ITS Table 3.3.11-1, Function 3.a (per Note b), and ITS LCO 3.3.11 is revised to include associated Required Actions F.2.1 and F.2.2 with its Note. CTS Table 3.5.1-1 currently requires only that the unit be placed in MODE 3 if this Function is inoperable. ITS will further require that the steam generator pressure be lowered below 750 psig, or that the main steam isolation valves be closed. These ITS restrictions are appropriate to provide additional assurance that the specified EFIC initiation logic is not required. This more restrictive change eliminates a potential area of unit operation where the system might be desired but not available. This change is consistent with NUREG-1430.
- M5** CTS Table 3.5.1-1, Note 1 currently requires that the unit be placed in hot shutdown, i.e., subcritical, within 12 hours if any EFIC Functional unit is inoperable. The ITS includes appropriate Required Actions to be subcritical (ITS MODE 3) within 6 hours. These are ITS 3.3.11 Required Actions D.1 and F.1, ITS 3.3.12 Required Actions C.1 and D.1, and ITS 3.3.13 Required Actions B.1 and C.1. This is more restrictive; however, it allows sufficient time to reach the required conditions from full power in an orderly manner and without challenging unit systems. This change is consistent with NUREG-1430.
- M6** Specific Applicability is included for ITS 3.3.12 and CTS Table 3.5.1-1, Note 1, is revised to include associated ITS Required Actions C.2, D.2.1, and D.2.2. CTS Table 3.5.1-1, Note 1 currently requires that the unit be placed in hot shutdown (ITS MODE 3) within 12 hours if the manual initiation Function of EFIC is inoperable. This would imply an Applicability of MODES 1 and 2 since no further actions are required. Therefore, the proposed ITS Applicability of MODES 1, 2, and 3 is more restrictive than CTS. Additionally, ITS will include Required Action C.2 to exit the revised Applicability by requiring the unit to be in MODE 4 within 12 hours. This is also more restrictive. These additional applicable MODES and Required Actions are appropriate since EFIC is necessary in MODE 3 to provide additional assurance sufficient cooling water is provided to the steam generators in a timely manner. This change is consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

- M7** LCO 3.3.13.a with specific Applicability, specific Applicability for LCO 3.3.13.b, along with associated Required Actions for each (except Required Action C.1 which is from CTS 3.5.1-1, Note 1), and associated SR 3.3.13.1 for each, are included in ITS. CTS requires only the specific initiation channels without identifying specific controls for the EFIC main steam line isolation logic. These ITS restrictions, and the associated Surveillance Requirement, are appropriate to provide additional assurance that the specified EFIC logic trains will function when required. This more restrictive change eliminates a potential source of confusion, and is generally consistent with NUREG-1430 requirements for these functions.
- M8** ITS LCO 3.3.14, with Applicability, associated Required Actions A.1 and B.2, and associated SR 3.3.14.1 are incorporated. CTS requires only SRs for the specific channels of EFW valve commands without identifying specific controls for the EFIC EFW vector valve logic. These ITS restrictions are appropriate to provide additional assurance that the specified EFIC logic will function when required. This more restrictive change eliminates a potential source of confusion, and is consistent with NUREG-1430.
- M9** A specific Required Action (F.2.1) is included for ITS Table 3.3.11-1, Function 1.c. CTS Table 3.5.1-1, Note 1, currently requires only that the unit be placed in MODE 3 if this Function is inoperable. ITS will further require that the steam generator pressure be lowered below 750 psig. This ITS restriction is appropriate to provide additional assurance that the specified EFIC initiation logic is not required. This more restrictive change eliminates a potential area of unit operation where the system might be desired but not available. This change is consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

### TECHNICAL CHANGE – LESS RESTRICTIVE

- L1 NUREG-1430 3.3.12 Required Actions A.1 and B.1 have been adopted in the ITS. This change establishes Condition A with a 72 hour Completion Time during which the unit may continue operation, with one or more EFIC Function(s) having one or both manual initiation switches inoperable in one actuation train, prior to entering an ACTION which results in the unit being required to be placed in MODE 3. This change also establishes Condition B with a 1 hour Completion Time during which the unit may continue operation, with one or more EFIC Function(s) having one or both manual initiation switches inoperable in both actuation trains, prior to entering an ACTION which results in the unit entering MODE 3. This change has been made to provide an opportunity to repair the inoperable components prior to requiring an unnecessary shutdown and subsequent startup of the unit. This allowance is acceptable since the manual initiation of EFIC is not credited in the safety analysis, and provides a backup ability to initiate EFW only. Additionally, this change is consistent with NUREG-1430.
- L2 CTS Table 3.5.1-1, Note 1 currently requires that the unit be placed in hot shutdown, i.e., subcritical, within 12 hours if either of the EFIC Functional units for EFW initiation on loss of main feedwater pumps (CTS Function 1.d, ITS Function 1.a) or reactor coolant pump status (CTS Function 1.e, ITS Function 1.d) are inoperable. ITS 3.3.11 includes Required Action E.1 to require only that THERMAL POWER be reduced to  $\leq 10\%$  RTP. This removes the unit from the Applicability of the requirement for both CTS and ITS. However, since the CTS required that the unit be placed in hot shutdown (equivalent to ITS MODE 3) even though the equipment was only required above 10% RTP, the ITS is considered less restrictive than CTS. This change is consistent with NUREG-1430 general application for Required Actions.
- L3 CTS Table 3.5.1-1, Note 6 currently provides for reduction of the minimum number of operable channels to 2 provided that the system is reduced to 1 out of 2 coincidence by tripping the remaining channel. NUREG 3.3.11 Required Action B.2 also allows continued operation if one of the two inoperable channels is placed in trip within one hour. ITS 3.3.11 also includes Required Action B.2. The CTS does not include an allowed outage time prior to placing the channel in trip as required, however, the NUREG and ITS both provide a Completion Time of 1 hour to accomplish the Required Action. This is less restrictive than CTS, but appropriate since some time is necessary when the condition is identified (rather than preplanned), and the one hour is sufficient to accomplish the Required Action. This change is also consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

### 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

3.5.1.11  
Table 3.5.1-1 Column 1  
Table 3.5.1-1 Column 2  
Table 3.5.1-1 Note 15  
Table 3.5.1-1 Note 19

#### New Location

Bases 3.3.11, BACKGROUND  
Bases 3.3.11, BACKGROUND  
Bases 3.3.11, BACKGROUND  
Bases 3.3.11, BACKGROUND  
Bases 3.3.11, BACKGROUND

3.3.11  
3.3.12  
3.3.13

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

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

LATER  
(3.3A, 3.3B, 3.3D, 3.4E)

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

A3  
LATER

3.5.1.3 For on-line testing or in the event of a protection instrument channel failure, a key operated channel bypass switch associated with each reactor protection channel may be used to lock the channel trip relay in the untripped state as indicated by a light. 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 one channel bypass key shall be accessible for use in the control room. 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 reactor protection channel shall not be used during reactor power operation 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 maintained in the source range until the one decade overlap is achieved.

LATER  
(3.3A)

LATER

3.5.1.6 In the event that one of the trip devices in either of the source range 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 and 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 period, the reactor shall be placed in the hot shutdown condition within an additional four hours.

~~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:

~~(LATER)~~  
~~(3.3D)~~

- ~~a. The 4.16 KV emergency bus undervoltage relay setpoints shall be >3115 VAC but <3177 VAC.~~
- ~~b. The 460 V emergency bus undervoltage relay setpoints shall be >423 VAC but <431 VAC with a time delay setpoint of 8 seconds ±1 second.~~

~~LATER~~

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

~~(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.~~

~~LATER~~

~~3.5.1.10 Deleted~~ (A1) 1

~~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. (LA1) bases

~~3.5.1.12~~ The Containment High Range Radiation Monitoring instrumentation, shall be operable with a minimum measurement range from 1 to 10<sup>6</sup> R/hr. LATER

~~(LATER)~~  
~~(3.3D)~~

<LATER>  
(3.3D)

3.3.1.13 Two control room ventilation radiation monitoring channels shall be operable whenever the reactor coolant system is above the cold shutdown condition or during handling of irradiated fuel.

LATER

<LATER>  
(3.3D)

3.3.1.14 The Main Steam Line Radiation Monitoring Instrumentation shall be operable with a minimum measurement range from 10<sup>-1</sup> to 10<sup>4</sup> mR/hr, whenever the reactor is above the cold shutdown condition.

LATER

Table 3.3.11.1

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

A13

#1.c Appl  
w/ Note (a)

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

A8

#1.d Appl

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

A9

#1.a Appl

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

#3.a Appl  
w/ Note (a)

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

A8

<LATER>  
(3.7)

<Add 3.3.11 RA F.2.1 for Table 3.3.11-1, Function 1.c > M9

<Add Appl. for Table 3.3.11-1, Function 1.b > M12

<Add 3.3.11 RA D.2 for Table 3.3.11-1, Function 1.b >

<Add LCD and Appl for Table 3.3.11-1, Functions 2.a and 2.b, + Table Note (a) > M13

<Add 3.3.11 RA C.1, F.1 + F.2.1 for Table 3.3.11-1, Functions 2.a and 2.b >

<Add Table 3.3.11-1, Function 3.a, Note (b) > M14

<Add 3.3.11 RA F.2.1 + F.2.2 w/Note for Table 3.3.11-1, Function 3.a >

3.3.11  
3.3.12  
3.3.13

(A2)

#### Bases

Every reasonable effort will be made to maintain all safety instrumentation 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 system and other interconnected systems is evaluated. The affected reactor protection 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. Administrative controls are established to preclude placing a reactor protection channel in channel bypass when any other reactor protection channel contains an inoperative 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.

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

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.

(R)  
TRM

(A2)

3.3.11  
3.3.12  
3.3.13

AZ

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 unless 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 3.3.1-1 are implemented. The EFIC can be tested 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. Activation of both relays is required in order to actuate the controllers. The two relays are tested individually to prevent automatic actuation of the component. 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 LOFT 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.

3.3.11  
3.3.12  
3.3.13

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 Degraded Voltage Monitoring 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 the allowable starting voltage plus maximum system voltage drops to the motor terminals, which allows approximately 78% of motor rated voltage at the motor terminals. The 460V undervoltage relay setpoint is based on long term motor voltage requirements plus the maximum feeder voltage drop allowance resulting in a 92% setting of motor rated voltage.

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 (HLMS) 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 HLMS 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), their operation may continue until the next scheduled refueling outage and a report filed.

3.3.11  
3.3.12  
3.3.13

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 CRVVS must be placed in a condition that does not require the isolation to occur (i.e., one operable train of CRVVS 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:

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

(A2)

Table 3.5.1-1 Instrumentation Limiting Conditions for Operation

(Note 6)

(A1)

REACTOR PROTECTION SYSTEM

<u>Functional Unit</u>	<u>1</u> No. of channels	<u>2</u> No. of channels for system trip	<u>3</u> Min. operable channels	<u>4</u> Min. degree of redundancy	<u>5</u> Operator action if conditions of column 3 or 4 cannot be met
1. Manual pushbutton	1	1	1	0	Note 1
2. Power range instrument channel	4	2	3 (Note 4)	1 (Note 4)	Note 1
3. Intermediate range instrument channels	2	Note 7	1	0	Notes 1, 2
4. Source range instrument channels	2	Note 7	1	0	Notes 1, 2, 3
5. Reactor coolant temperature instrument channels	4	2	2	1	Note 1
6. Pressure-temperature instrument channels	4	2	2	1	Note 1
7. Flux/imbalance/flow instrument channels	4	2	2	1	Note 1
8. Reactor coolant pressure					
a. High reactor coolant pressure instrument channels	4	2	2	1	Note 1
b. Low reactor coolant pressure instrument channels	4	2	2	1	Note 1
9. Power/number of pumps instrument channels	4	2	2	1	Note 1
10. High reactor building pressure channels	4	2	2	1	Note 1

(LATER)  
(3.3A)

LATER

4A

3.3.11

Amendment No. 91

Add 3.3.11 ACTIONS Note  
Add 3.3.12 ACTIONS Note  
Add 3.3.13 ACTIONS Note  
Add 3.3.11 SR Note

Table 3.5.1-1 (Cont'd)

ENGINEERED SAFEGUARDS ACTUATION 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
----------------------	--------------------------------------	-----------------------------	--------------------------------	---

4. Reactor building spray pumps (Note 8)

- a. Reactor building 30 psig instrument channel
- b. Manual trip pushbutton

3	2	3 (Note 6)	1	Notes 1, 5
2	1	2	1	Notes 1, 5

5. Reactor building spray valves (Note 8)

- a. Reactor building 30 psig instrument channel
- b. Manual trip pushbutton

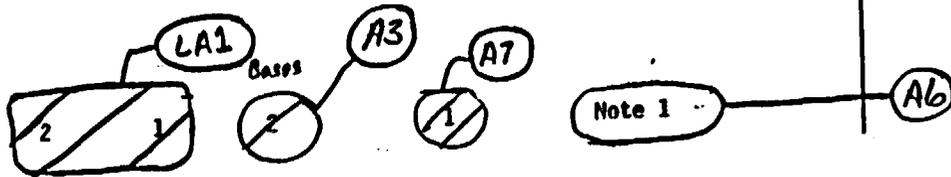
3	2	3 (Note 6)	1	Notes 1, 5
2	1	2	1	Notes 1, 5

LATER

EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM

1. EFW Initiation

3.3.12 LCO #C a. Manual



< Add 3.3.12 RA A.1 & B.1 >

< Add 3.3.12 Appl. of RA C.2, D.2.1 & D.2.2 >

L1

m6

3.3.11  
3.3.12  
3.3.13

(LATER) (3.3B)

45a

Amendment No. 91

**EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM (Cont'd)**

Table 3.5.1-1 (Cont'd)

Functional Unit

1	2	3	4	5
No. of channels	No. of channels for system trip	Min. operable channels	Min. degree of redundancy	Operator action if conditions of column 3 or 4 cannot be met
4/SG	2/SG	2/SG	1	Note 1
4/SG	2/SG	2/SG	1	Note 1, 19
4	2	2	1	Note 1
4	2	2	1	Note 1, 15
2	1	2	1	Note 1
2	1	2	1	Note 1
4	2	2	1	Note 1, 19
2	1	2	1	Note 1
4	2	2	1	Note 1, 19

- T3.3.11-1 #1b b. Low Level SG A or B
- #1.c c. Low Pressure, SG A or B
- #1.a d. Loss of Both MFW Pumps and PWR > 10%
- \*1.d e. Loss of 4 RC Pumps
- 3.3.13 LCD#b f. ESAS Actuation Logic Tripped
- 2. SG-A Main Steam Line Isolation
- 3.3.12 LCO#a a. Manual
- T3.3.11-1, #3.a b. Low SG A Pressure
- 3. SG-B Main Steam Line Isolation
- 3.3.12 LCO#b a. Manual
- T3.3.11-1, #3.a b. Low SG B Pressure

LAI Bases

A3

A7

Note 1  
Note 1, 19

AIL  
& LATER

Note 1  
Note 1, 15  
Note 1

A11  
A12

Note 1  
Note 1, 19

A6  
A11

Note 1  
Note 1, 19

A6  
A11

< Add 3.3.13 LCO#a with Appl, Cond. A, RAs C.2.1 & C.2.2, and SR 3.3.13.1 >  
 < Add 3.3.13 LCO#b Appl, RAs A.1 & B.2, and SR 3.3.13.1 >  
 < Add ITS 3.3.14 >

M7

M8

3.3.11  
3.3.12  
3.3.13  
3.3.14

< Add 3.3.11 RA E.1 >

< Add 3.3.11 RA A.1 & B.1 >

(L2) (A3) (M1)

TABLE 3.5.1-1 (Cont'd)

MODE 3

in the hot shutdown & LATER

(A1)

(M5)

3.3.11 Notes:  
RAs D.1 & F.1  
(LATER)  
(3.3A/B/D & 3.9B)

1. Initiate a shutdown using normal operating instructions and place the reactor in the hot shutdown condition within 2 hours if the requirements of Columns 3 and 4 are not met.

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

3. When 1 of 2 intermediate range instrument channels is greater than 10-18 amps, hot shutdown is not required. LATER

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

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

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

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

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. LATER

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. LATER

11. With the number of operable channels less than required, isolate the electromagnetic relief valve within 4 hours, otherwise Note 9 applies.

(LATER)  
(3.3A)

(LATER)  
(3.3B & 3.9B)

3.3.11 RA B.2  
(LATER)  
(3.3A & 3.3B)

(LATER)  
(3.3A)

(LATER)  
(3.3B)

(LATER)  
(3.3D)

(L3)

3.3.11

TABLE 3.3.1-1 (Cont'd)

3.3.12

RA, C, 1 & D; 1

(LATER)

(3.3A/B/D

& 3.9B)

Notes:

1. Initiate a shutdown using normal operating instructions and place the reactor in the hot shutdown condition within 6 hours if the requirements of Columns 3 and 4 are not met.
2. When 2 of 4 power range instrument channels are greater than 10% rated power, hot shutdown is not required.
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.
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.
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.
7. These channels initiate control rod withdrawal inhibits not reactor trips at -10% rated power. Above 10% rated power, those inhibits are bypassed.
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.
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.
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.
11. With the number of operable channels less than required, isolate the electromagnetic relief valve within 4 hours, otherwise Note 9 applies.

Addressed  
on Page  
45e-1

MODE 3

A1

A3

LATER

M5

3.3.12

TABLE 3.5.1-1 (Cont'd)

A3

A1

MDC 3  
the hot shutdown

LATER

M5

3.3.13  
RAB.14C.1  
(LATER)  
(3.3A/B/D  
43.4B)

Notes:

1. ~~Initiate a shutdown using normal operating instructions and place the reactor in the hot shutdown condition within 6 hours if the requirements of Columns 3 and 4 are not met.~~
2. When 2 of 4 power range instrument channels are greater than 10% rated power, hot shutdown is not required.
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.
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.
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.
7. These channels initiate control rod withdrawal inhibits not reactor trips at -10% rated power. Above 10% rated power, those inhibits are bypassed.
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.
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.
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.
11. With the number of operable channels less than required, isolate the electromechanical relief valve within 4 hours, otherwise Note 9 applies.

Addressed  
on Page  
45e-1

3.3.13

TABLE 3.5.1-1 (Cont'd)

- <LATER> (3.3D) 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 electromagnetic relief valve power supply within the following 12 hours. LATER
- <LATER> (3.3D) 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. LATER
- <LATER> (3.3D, 3B) 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. LATER
- + <LATER> (3.3A) 15. This trip function may be bypassed at up to 10% reactor power. (LAI)
- <LATER> (3.3A) 16. This trip function may be bypassed at up to 45% reactor power. LATER (LAI) Bases
- <LATER> (3.3D) 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. LATER
- 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. LATER
- 19. This function may be bypassed below 750 psig DTSG pressure. Bypass is automatically removed when pressure exceeds 750 psig. (LAI) Bases
- <LATER> (3.3D) 20. With one channel inoperable, (1) either restore the inoperable channel to operable status within 7 days, or (2) prepare and submit a Special Report to the Commission pursuant to Specification 6.12.3 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 in addition to the actions described above. LATER
- 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.

3.3.11  
3.3.12  
3.3.13

**SURVEILLANCE REQUIREMENTS (Continued)**

**4.0.5 (Continued)**

(LATER)  
(5D)

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

<u>ASME Boiler and Pressure Vessel Code and applicable Addenda terminology for inservice inspection and testing activities</u>	<u>Required frequencies for performing inservice inspection and testing activities</u>
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 testing activities.
- d. Performance of the above inservice inspection and testing activities 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 requirements of any Technical Specification.

**4.1 OPERATIONAL SAFETY ITEMS**

Applicability

Applies to items directly related to safety limits and limiting conditions for 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 reactor protective system and engineered safeguards system instrumentation when the reactor is critical shall be as stated in Table 4.1-1.

(A1)

(A3)  
(R)  
T&W

3.3.11  
3.3.12  
3.3.13

**OPERATIONAL SAFETY ITEMS (continued)**

4.1 (Continued)

A1

(LATER)  
(3.3A,  
3.3B,  
3.3D)

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

A3  
LATER  
R TRM

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

A17  
LATER

(LATER)  
(3.2)

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

**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(e)(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.

3.3.11  
3.3.12  
3.3.13

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)

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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)

3.3.11  
3.3.12  
3.3.13

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.

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.

A2

3.3.11  
3.3.12  
3.3.13

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

AZ

TRM

TRM

(A3)

Table 4.1-1 (Cont.)

Channel Description	Check	Test	Calibrate	Remarks
47. RCS Subcooling Margin Monitor	D	NA	R	LATER
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	
51. Pressurizer Water Level Indicator	D	NA	R	

(LATER)  
(3.3D)

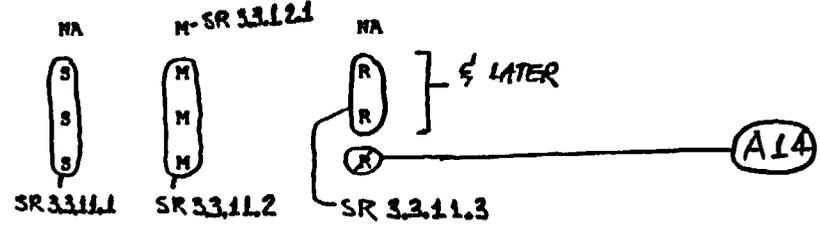
(A1)

52. Deleted

3.3.12 53. EFW Initiation

Table 3.3.11-1

- a. Manual
- # 1.b b. SG Low Level, SGA or B
- # 1.C c. Low Pressure SGA or B
- # 1. d. Loss of both MFW Pumps and PWR > 100



(LATER)  
(3.3D)

(A14)

3.3.11  
3.3.12

A3

T3.3.11-1

Table 4.1-1 (Cont.)

Amendment No.	Channel Description	Check	Test	Calibrate	Remarks
#1.d	e. Loss of 4 RC pumps	S-SR3.11.1	M-SR3.11.2	NA	
3.3.13	f. ESAS automatic logic tripped	NA	M-SR3.11.1	NA	
91	54. SGA main steam line isolation				
3.3.12	a. Manual	NA	M-SR3.12.1	NA	
T3.3.11-1 #3a	b. SGA pressure low	S-SR3.11.1	M-SR3.11.2	R-SR3.11.3	
	55. SGB main steam line isolation				
3.3.12	a. Manual	NA	M-SR3.12.1	NA	
T3.3.11-1 #3a	b. SGB pressure low	S-SR3.11.1	M-SR3.11.2	R-SR3.11.3	
72c	56. EFW valve commands (Vector)				
T3.3.11-1 #2.a	a. SG A pressure low	S	M	R	
#2.a	b. SG B pressure low	S	M	R	
#2.b	c. SG pressure difference	S	M	R	
#2.b	SG A pressure >	S	M	R	
	SG B pressure >	S	M	R	
	SG A pressure	S	M	R	
		SR 3.3.11.1	SR 3.3.11.2	SR 3.3.11.3	

3.3.11  
3.3.12  
3.3.13

(A3)

Table 4.1-1 (Cont.)

Channel Description	Check	Test	Calibrate	Remarks
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d. SG A High Range Level High-high	S	M	R	(A10)
e. SG B High Range Level High-high	S	M	R	

<LATER> (3.3D)

57. Containment High Range Radiation Monitors	D	M	R	LATER
58. Containment Pressure-High	M	NA	R	
59. Containment Water Level-Wide Range	M	NA	R	

<LATER> (3.4B)

60. Low Temperature Overpressure Protection Alarm Logic	NA	R	R	LATER
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<LATER> (3.3D)

61. Core-exit Thermocouples	M	NA	R	LATER
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<LATER> (3.3A)

62. Electronic (SCR) Trip Relays	NA	Q	NA	LATER
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<LATER> (3.3D)

63. RVIMS	M	NA	R	LATER
64. HLIMS	M	NA	R	

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

B - 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

+ <LATER>  
(3.3A)  
(3.3B)  
(3.3D)  
(3.4B)

3.3.11  
3.3.12  
3.3.13

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## ITS Section 3.3C: Instrumentation - EFIC

Entergy Operations has evaluated these proposed Technical Specification changes and has determined that they involve no significant hazards consideration. This determination has been performed in accordance with the criteria set forth in 10CFR 50.92(c) as indicated below:

### 3.3C L1

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change establishes a 72 hour Completion Time during which the unit may continue operation with one or more Emergency Feedwater Initiation and Control System (EFIC) Function(s) having one or both manual initiation switches inoperable in one actuation channel prior to requiring a unit shutdown. This change also establishes a 1 hour Completion Time during which the unit may continue operation with one or more EFIC Function(s) having one or both manual initiation switches inoperable in both actuation channels prior to requiring a unit shutdown. This change provides an opportunity to repair the inoperable components prior to requiring a shutdown/startup cycle of the unit. This allowance is acceptable since the manual initiation of EFIC is not credited in the safety analysis, but provides a backup function only. The addition of this allowed condition with a short Completion Time does not result in any hardware changes. The allowed condition also does not significantly increase the probability of occurrence for initiation of any analyzed event since the function of the equipment does not change (and therefore any initiation scenarios are not changed) and the proposed Completion Time is short (and therefore limits the impact on probability). Also, including this allowed condition provides additional opportunity to restore compliance with the requirements and avoid the increased potential for a transient during the shutdown process. Further, the allowed condition does not significantly increase the consequences of an accident because manual initiation of EFIC is not considered in the assumed response of the equipment in performing its specified mitigation functions.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure prompt restoration of compliance with the limiting condition for operation, or prompt and appropriate compensatory actions are taken. Additionally, the proposed change will still ensure proper surveillances are required for all equipment considered in the safety analysis. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3C L1 (continued)

### 3. Does this change involve a significant reduction in a margin of safety?

Prompt and appropriate Required Actions have been determined based on the safety analysis functions to be maintained. The allowed condition has been determined appropriate based on a combination of the time required to perform the action, the relative importance of the function or parameter to be restored, and engineering judgment. Therefore, this new allowed condition does not involve a significant reduction in the margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3C L2

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

The change in the Required Action does not result in any hardware changes. The change also does not significantly increase the probability of occurrence for initiation of any analyzed event since the function of the equipment, or limit for the parameter, does not change (and therefore any initiation scenarios are not changed). The change provides consistency between the Required Actions and Applicable conditions for the LCO. The change of Required Actions does not significantly increase the consequences of an accident because the change does not affect the assumed response of the equipment in performing its specified mitigation functions, or change the response of the core parameters, from that resulting from the original analysis. Further, the subject area pertaining to this change is not credited in the accident analysis.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure prompt restoration of compliance with the limiting condition for operation, or prompt and appropriate compensatory actions are taken, for unit conditions during which analysis assumes the equipment to function. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

Prompt and appropriate Required Actions have been determined based on the safety analysis functions to be maintained. The Required Actions are revised to be consistent with the Applicability for the equipment. Therefore, the change does not involve a significant reduction in the margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3C L3

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change establishes a 1 hour Completion Time during which the unit may continue operation with one or more Emergency Feedwater Water (EFW) Initiation or Main Steam Line Isolation Function(s) having two channels inoperable prior to placing one of the inoperable channels in trip. This change provides an opportunity to repair the inoperable components prior to requiring a shutdown/startup cycle of the unit. This allowance is acceptable since the Emergency Feedwater Initiation and Control (EFIC) Functions are not considered as initiators of any previously analyzed event. Therefore, the allowed condition does not significantly increase the probability of occurrence for initiation of any analyzed event since the function of the equipment does not change (and therefore any initiation scenarios are not changed) and the proposed Completion Time is short (and therefore limits the impact on probability). Also, including this allowed condition provides additional opportunity to restore compliance with the requirements and avoid the increased potential for a transient during the shutdown process. Further, the allowed condition does not significantly increase the consequences of an accident because the Required Action continues to restore the EFIC Function to provide the same response as previously considered.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure prompt restoration of compliance with the limiting condition for operation, or prompt and appropriate compensatory actions are taken. Additionally, the proposed change will still ensure proper surveillances are required for all equipment considered in the safety analysis. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

Prompt and appropriate Required Actions have been determined based on the safety analysis functions to be maintained. The allowed condition has been determined appropriate based on a combination of the time required to perform the action, the relative importance of the function or parameter to be restored, and engineering judgment. Therefore, this new allowed condition does not involve a significant reduction in the margin of safety.

## **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.

## ITS DISCUSSION OF DIFFERENCES

- 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. Finally, ITS Table 3.3.11-1, Note (b) is revised to be consistent with the ITS 3.7.2 Required Actions for MSIVs, i.e., closed. Appropriate revisions are also made to the Bases. This change is consistent with CTS.
- 6 NUREG 3.3.11 - The Required Actions for NUREG Condition F are revised to provide both possible methods for exiting the Applicability of ITS Table 3.3.11-1, Function 3.a. The table identifies that Function 3.a is applicable in MODE 3 as modified by Notes (a) and (b). Note (a) limits the Applicability to "when SG pressure is  $\geq 750$  psig" and Note (b) provides an exception "when all associated valves are closed." The NUREG Condition provided only one Required Action to reduce steam generator pressure to  $< 750$  psig within 12 hours. For Function 3.a, an action of closing all the associated valves within 12 hours is also acceptable. Neither of these are addressed in CTS, since the CTS Table 3.5.1-1 Note 1 actions require only placing the unit in a non-critical condition (i.e., ITS MODE 3). Further, 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 also corrected. This portion of the change is consistent with CTS Table 3.5.1-1, Note 1.

## ITS DISCUSSION OF DIFFERENCES

- 7 **NUREG 3.3.11 - The ALLOWABLE VALUES requirements of NUREG Table 3.3.11-1 are not adopted. The CTS for the ANO-1 EFIC System does not include these requirements. These safety analysis parameters have been adequately controlled in the past by the associated administrative requirements, and are proposed to remain so controlled. Therefore, all NUREG-1430 references to these requirements are omitted from ITS. The associated Bases are also revised as necessary.**
- 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.**
- 10 **NUREG 3.3.11 - ITS Table 3.3.11-1, Function 1.a, does not include a requirement to conduct a CHANNEL CALIBRATION per SR 3.3.11.3. This Function is actually provided as a direct output from the RPS which is binary in nature. The RPS Function which provides the signal is calibrated per ITS 3.3.1 Surveillance Requirements. Therefore, no separate calibration of this "binary" indication is required for the EFIC Function and the ITS requirement to perform SR 3.3.11.3 for ITS Table 3.3.11-1, Function 1.a is not adopted. This change results in no changes in the calibration of equipment for the unit and is considered to be a change only in the presentation of the requirements. The associated Bases are also revised to omit references to this SR for this Function.**

## ITS DISCUSSION OF DIFFERENCES

- 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.

## ITS DISCUSSION OF DIFFERENCES

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  $\geq$  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 3.3.14 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.

## ITS DISCUSSION OF DIFFERENCES

- 14 NUREG 3.3.12 LCO, Actions and Bases were revised to refer to the Manual Trip as being a train function rather than a channel function. This terminology better describes the actual location that the manual trip function is located within the EFIC system.

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.

- 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.

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
	AND A.2 Place channel(s) in trip.	72 hours
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
	AND B.2 Place second channel in trip.	1 hour
		(continued)

NA

NA

Table 3.5.1-1  
Note 6

CTS

ACTIONS		
CONDITION	REQUIRED ACTION	COMPLETION TIME
<del>B. (continued)</del>	<del>B.3 Restore one channel to OPERABLE status.</del>	<del>72 hours</del>
C. One EFV 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. AND D.2.1 <del>NOTE Only required for Function 1a.</del>	6 hours
	<del>Open CONTROL ROD drive trip breakers.</del> AND D.2.2 <del>NOTE Only required for Function 1b</del>	<del>6 hours</del>
	Be in MODE 4.	12 hours
E. Required Action and associated Completion Time not met for Function 1.d. <u>1.a or</u>	E.1 Reduce THERMAL POWER to $\leq 10\%$ RTP.	6 hours

②

NA

Table 3.5.1  
Note 1

⑤

NA

NA

⑤

(continued)

CTS

**ACTIONS (continued)**

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time not met for Functions 1.c, 2, <del>3</del>	F.1 <del>F.1</del> F.2.1 Be in MODE 3. Reduce <del>once through</del> steam generator pressure to < 750 psig.	6 hours 12 hours
	OR F.2.2 ----- NOTE -----	

Table 3.3.11-1  
Note 1  
NA  
NA  
NA

**SURVEILLANCE REQUIREMENTS**

Only applicable for Function 3.a.  
Close all associated valves. 12 hours

6

**NOTE**

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

NA

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
<del>SR 3.3.11.4 Verify EFIC RESPONSE TIME is within limits.</del>	<del>[18] months on a STAGGERED TEST BASIS</del>

[See Table]

3

EFIC System Instrumentation  
3.3.11

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	ALLOWANCE VALUE	
1. EFV Initiation	$\geq 10\% RTP$ <del>1,2(a), 3(a)</del> 5	4)	SR 3.3.11.1 SR 3.3.11.2 <del>SR 3.3.11.3</del>	$\geq 650$ psig	7 T3.5.1-1 EFIC 1d 3.5.1.15:c T4.1-1, #53d
a. Loss of NFW Pump (Control Oil Pressure)		10			
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	$\geq 87$ inches	T3.5.1-1 EFIC 1b T4.1-1, #53b NA
c. SG Pressure - Low	1,2,3(b)	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3	$\geq 600$ psig	T3.5.1-1 EFIC 1c 3.5.1.15:a T4.1-1, #53c
d. RCP Status	$\geq 10\% RTP$ 5	4	SR 3.3.11.1 SR 3.3.11.2 <del>SR 3.3.11.3</del>	NA	T3.5.1-1 EFIC 1e 3.5.1.15:b T4.1-1, #53e
2. EFV Vector Valve Control					
a. SG Pressure - Low	1,2,3(b)	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3	$\geq 600$ psig	NA T4.1-1, #56a,b
b. SG Differential Pressure - High	1,2,3(b)	4	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3	$\geq 125$ psid	NA T4.1-1, #56c
c. SG Level - High	1,2,3(b)		SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3	$\geq 13$ inches	4
3. Main Steam Line Isolation					
a. SG Pressure - Low	1,2,3(b)(c) 5	4 per SG	SR 3.3.11.1 SR 3.3.11.2 SR 3.3.11.3 3	$\geq 600$ psig	T3.5.1-1 EFIC #2.6 #3.6 3.5.1.16 T4.1-1, #54a,b,55b
4. NFW Isolation					
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	$\geq 600$ psig	1

- (a) when not in shutdown bypass. 5
- (b) when SG pressure  $\geq 750$  psig.
- (c) Except when all associated valves are closed and [deactivated]. NA
- (d) Except when all [DIFVs], [DIFVs], [or associated SFCVs] are closed and [deactivated] [or isolated by a closed manual valve]. 1

3.3 INSTRUMENTATION

3.3.12 Emergency Feedwater Initiation and Control (EFIC) Manual Initiation

LCO 3.3.12

Two manual initiation switches per actuation <sup>train</sup>channel for each of the following EFIC Functions shall be OPERABLE:

14  
3.5.1-1  
EFIC

- a. Steam generator (SG) A Main Feedwater (MFW) Isolation;
- b. SG B MFW Isolation;
- c. SG A Main Steam Line Isolation;
- ~~b~~ SG B Main Steam Line Isolation; and
- ~~c~~ Emergency Feedwater ~~Actuation~~ (EFW) Initiation.

1  
#2a  
#3a  
#1a

APPLICABILITY:

MODES 1, 2, and 3

NA

When associated EFIC Function is required to be OPERABLE.

11

ACTIONS

NOTE

Separate Condition entry is allowed for each Function.

NA

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p><sup>required</sup> A. One or more EFIC Function(s) with one or both manual initiation switches inoperable in one actuation <sup>train</sup>channel.</p>	<p>A.1 Place actuation <sup>train</sup>channel for the associated EFIC Function(s) in trip.</p>	72 hours
<p><sup>required</sup> B. One or more EFIC Function(s) with one or both manual initiation switches inoperable in both actuation <sup>trains</sup>channels.</p>	<p>B.1 Restore one actuation <sup>train</sup>channel for the associated EFIC Function(s) to OPERABLE status.</p>	1 hour

NA

14

NA

14

(continued)

CTS

**ACTIONS (continued)**

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

T3.3.1-1, 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>**

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

3.3 INSTRUMENTATION

3.3.13 Emergency Feedwater Initiation and Control (EFIC) Logic

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

- ~~a. Main Feedwater Isolation;~~ (1)
- ~~a/b Main Steam Line Isolation; and~~
- ~~b/c Emergency Feedwater Actuation; and~~
- ~~d. Vector Valve Enable Logic.~~ (EFW) Initiation (1)

NA  
T3S.1-1 EFC #1.f

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

ACTIONS

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

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

NA  
(15)

T3S.1-1  
EFC 1.f, Note 1

NA  
(11)

(INSERT 3.3-33A)

**<INSERT 3.3-33A>**

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

EFIC Logic  
3.3.13

CTS

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE	FREQUENCY
SR 3.3.13.1 Perform CHANNEL FUNCTIONAL TEST.	31 days

T4.1-1  
#53.f  
& NA

CTS

9

edit  
NA

3.3 INSTRUMENTATION

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

LCO 3.3.14 Four channels of the ~~vector valve~~ <sup>EFIC</sup> logic shall be OPERABLE.

APPLICABILITY: MODES 1 <sup>(2)</sup> and 3 <sup>(2)</sup>  
MODE 3 when steam generator pressure is  $\geq 750$  psig. (11)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One vector <del>valve</del> 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
	AND B.2 <sup>Reduce steam generator pressure to <math>&lt; 750</math> psig.</sup> <del>Be in MODE 3.</del>	12 hours (11)

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
- d. Main Feedwater (MFW) Isolation.

10

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),

Also

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(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.

INSERT  
B 3.3-92A

experienced an  
↑  
uncontrolled  
depressurization

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. *below*

EFW initiation also enables EFIC vector logic which

vector

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~~ <sup>S</sup> 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., ~~3% (FACT calibration + comparator setting accuracy)~~).

The trip setpoints used in the bistables are based on the analytical limits stated in PSAR, Section 14.11 (Refs. 2 and 3). The selection of these trip setpoints is such that adequate protection is provided when ~~any~~ sensor and processing time delays are taken into account. The Allowable Values specified in Table 3.3.11-1 in the accompanying LCD 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~~

appropriate

*as required*

(continued)

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9  
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1  
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**<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.

the uncertainties associated with

Guidance

BASES

BACKGROUND

Instrument

Trip Setpoints and Allowable Values (continued)

environments as defined by 10 CFR 50.49 (Ref. 2) (R) 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 Allowable Value to account for changes in ~~random measurement~~ error 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 ~~activation~~ trip setpoint is not within its required Allowable Value.

In conjunction with the LCDs and administrative controls 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 LCDs at the onset of the DBA, and that the equipment functions as ~~designed~~. analysed

Each channel can be tested on line to verify that the setpoint ~~accuracy~~ is within the specified allowance requirements of Figure 1.7, FSAR, Chapter 17 (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.

Figures 1.7, FSAR, Chapter 17 (Ref. 4). describes the 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

Instrument Loop Error Analysis and Setpoint Methodology Manual, LRG-001

The explicit uncertainties are addressed in the design calculations as required.

may be

trip

can

Actuation Logic

16

7

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edit

edit  
edit

(continued)

BASES

BACKGROUND

Actuation Logic

EFIC Setpoints and Allowable Values (continued)

edit

9

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 below

edit

edit

For the EFW Initiation and Main Steam Line Isolation functions,

1. EFW Initiation

Sheet 4

each

Figure 10-2, OSAR, Chapter 10 (Ref. 5), 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 six 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  $\leq$  20% RTP and the RPS is in shutdown bypass. The bypass is automatically removed when THERMAL POWER is greater than 20% RTP.

INSERT  
B3.3-91A

Loss of both MFW Pumps was chosen as an EFIC 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

edit

(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  $\geq 10\%$  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

At least two channels are required to initiate EFW.

b. SG Level—Low (continued)

From channels A and B

conditions for EFW actuation. There is one transmitter for each of the four channels A, B, C, and D. The signals are also used ~~for EFW~~ ~~to control SG level at the low level~~ ~~setpoint of 60 inches~~ when one or more RCPs are ~~operational~~.

9  
edit

approximately

operating. This parameter is referenced to the top of the lower tube sheet.

The lower and upper taps for the low range level transmitters are located at 6 inches and 27 inches, respectively, above the upper face of the SG's lower tube sheet. The calibrated range is 0-150 inches.

9

Normal

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.

may be

edit

c. SG Pressure—Low

(one transmitter per channel)

edit

at the transmitter

584.2

< INSERT B3.3-95A >

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 ~~EPH~~ and Main Steam Line Isolation Function. 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.

Allowable Value

9

either

both SG pressure inputs

< INSERT B3.3-95B >

a

does

the SG

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

edit  
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edit

a non-design basis transient

(continued)

**<INSERT B 3.3-95A>**

At least two channels are required to initiate EFW and main steam line isolation. The Allowable Value of  $\geq 584.2$  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>**

The parameter value (i.e., 750 psig) is a nominal value.

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 ~~control~~ signals are input into the four channels of EFIC.

edit

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~~ <sup>at</sup> approximately ~~50%~~ <sup>50%</sup> in the SG. This higher ~~setpoint~~ <sup>level</sup> provides a thermal center in the SG at a higher elevation than that of the reactor to ~~ensure~~ <sup>enhance</sup> natural circulation of the reactor coolant.

9  
edit

This parameter is referenced to the top of the lower tube sheet

312 inches

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 remain 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.

RTP

edit

INSERT B3.3-96A

INSERT B3.3-96B 2.

EFW Vector Valve Control

Figure ~~10-2~~ <sup>10-2, Sheet 4</sup> (Ref. ~~5~~ <sup>5</sup>), 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~~.

9

edit

INSERT B3.3-96C

INSERT B3.3-96D

9

edit

(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~~ psid greater than SG B pressure; and *100*
- d. SG B pressure ~~125~~ psid greater than SG A pressure. *100*

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.~~

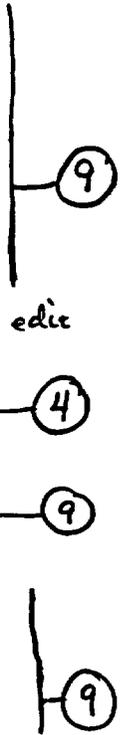
~~The vector logic develops signals to open or to close SG A and B EFW valves.~~

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

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

*Train*  
open or closed commands to the

The level control module provides input to the flow controllers which control the position of the EFW control valves.



(continued)

**<INSERT B 3.3-97A>**

The Allowable Value of  $\geq 584.2$  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:

discussed in the Bases for LCO 3.3.14.

PRESSURE STATUS	SG VALVES	
	"A"	"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

9

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 ~~IX~~ and RPS, the maintenance bypass from the ~~IX~~ and RPS is interlocked with the EFIC System. If one channel of the ~~IX~~ and RPS is in maintenance bypass, only the corresponding channel of the EFIC may be bypassed (e.g., channel A, ~~IX~~ or RPS, and channel A, EFIC). This ensures that only the corresponding channels of the EFIC and ~~IX~~ and RPS are placed in maintenance bypass at the same time.

train

the

9

EFW Initiation from ESAS

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

its associated

channel

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

(continued)

BASES

BACKGROUND

Bypass (continued)

Operational bypass of the 0.5G 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:]

MOVE TO Page B3.3-98

3. Main Steam Line and MFW Isolation

Section 7.1.4

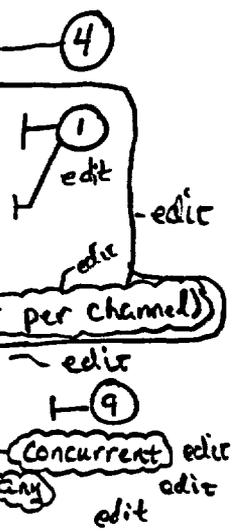
Figure 1, SAR, Chapter 7 (Ref. 3) illustrates one channel of the EFIC Main Steam Line and MFW Isolation logic. Four pressure transmitters per SG provide EFIC with channels A through D logic of SG pressure. The channels are as described for EFW initiation mentioned earlier.

(one transmitter per channel)

EFW Initiation and Main Steam Line Isolation

postulated

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. 4) due to the redundancy and independence in the EFIC design.



APPLICABLE SAFETY ANALYSES

1. EFW Initiation

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

EFIC system response for a

it would on low SG level

Assumes

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 assumes the actuation of EFW on low SG level. If the loss of feedwater is due to loss of MFW pumps, EFW will be actuated when earlier than assumed in the analysis, which will increase the SG heat transfer capability and will lessen the severity of the transient.

analysis from which since this

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



(continued)

BASES

APPLICABLE  
SAFETY ANALYSES

side inventory

1. EFW Initiation (continued)

~~evaluation of this DBA. SG Level-Low would be an indicator of all accidents involving a loss of primary secondary heat removal. any event Capability~~

~~'SG Pressure-Low is a primary indication and provides the actuation signal for SLB or EFW. 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.~~

~~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.~~

Analysis, SAR Section 14.1.2.8 (Ref. 3).

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.

emergency

Insert B3.3-10CA

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.~~

INSERT B3.3-10CB

3. Main Steam Line and MFW Isolation

~~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~~

INSERT B3.3-10CC

(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

In MODE 1

3.3.11-1 Main Steam Line (and MFW) Isolation (continued)

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

9

The EFIC System satisfies Criterion 3 of the ARC Policy Statement. 10 CFR 50.36 (Ref. 7).

13

LCO

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

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, 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

(i.e., identified in the Applicable MODES or Other Specified Conditions column of Table 3.3.11-1) for

trip

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 the associated trip function. Nominal Trip setpoints are specified in the Unit Specific setpoint calculations. 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).

7  
9 edit

or calibration procedures.

associated with the trip setpoints is provided

Reference 4.

Guidance used to calculate the

(continued)

16

**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~~ [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 M/RPS. The bypass removal function is based on maintaining consistency with RPS LCO and design of system.

9

SG Level—Low

Allowable Value

Insert B3.3-102B

Four EFIC dedicated low range level transmitters per SG shall be OPERABLE with SG Level—Low actuation ~~setpoints~~ [11.1] of ~~10~~ [10] inches, to generate the signals used for detection for low level conditions for EFW Initiation. 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 level setpoint of~~ [3] 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~~ [at approximately] margin between the integrated control system ~~low~~ [operational] ~~lead setpoint~~ 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.

9

edit

edit

9

9

This parameter is referenced to the top of the lower tube sheet

SG Pressure—Low

Allowable Value

584.2

Four EFIC channels per SG shall be OPERABLE with SG low pressure actuation ~~setpoints~~ [584.2] of ~~600~~ [600] 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 psia. The SG Pressure—Low 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

INSERT B3.3-103A

edit

9

SG Differential Pressure—High

Four EFIC channels for SG differential pressure shall be OPERABLE with setpoints of ~~1281-1310~~ <sup>1281-1310</sup>. The ~~setpoint~~ <sup>Function</sup> ensures that automatic EFW isolation to a depressurized SG occurs for the range of sizes of SIBs 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.

INSERT B3.3-103B

Function

9  
edit  
edit

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 <sup>312 inches</sup> 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.~~

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) 4

SG Level - High  
For this unit, the basis for SG Level - High signal is as follows:

APPLICABILITY Conservative with respect to

*for which*

INSERT B33-104A 5

*mitigate*

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~~.

*when the unit is  $\geq 10\%$  RTP.*

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~~ ~~operate when core power production and heat removal requirements are the greatest.~~ Below ~~these and conditions~~ the EFW Initiation on low SG level ~~is rapid enough to avoid~~ ~~unnecessary~~ primary system overheating. *will mitigate*

*in MODES 1, 2, and 3 which are conditions during which*

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. 9

The EFW System Initiation on loss of all RCPs Function shall be operable at  $\geq 10\%$  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. 9

*reactor building*

The ~~MFW~~ Main Steam Line Isolation and EFW Vector Valve MODE 1 edit Control Functions shall be OPERABLE in MODES ~~2, and 3~~ with SG pressure  $\geq 750$  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 edit* 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 9 Isolation Functions can be bypassed to avoid actuation during normal unit cooldowns. The EFW Vector Valve Control

*The energy level is low and the secondary side feedwater flow rate is low or non-existent. Also*

(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)

*Typically*

~~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 from the primary system. Therefore, EFIC instrumentation is not required to be OPERABLE.~~  
*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~~

Condition A applies to failures of a single EFW Initiation <sup>or</sup> Main Steam Line Isolation ~~or MFW Isolation~~ instrumentation channel. This includes failure of a common instrumentation channel in any combination of the Functions.

2

1

With one channel inoperable in one or more EFW Initiation <sup>or</sup> 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

*of the same*

Condition B applies to a situation where two instrumentation channels ~~of MFW~~ protection functions of EFW Initiation, 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.

With two EFW Initiations <sup>or</sup> 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.4~~ (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 E.1~~ F.2.1, and F.2.2

5  
6

and associated  
Times are not met

If the Required Actions ~~cannot be met within the required Completion Time~~, 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 ERD trip breakers for Functions 1.a, MODE 4 for Function 1.b, less than 10% RTP for Function 1.c, and 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  
and 1.d,

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

6

(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 SR-Low Level Function is the only Function that was modeled in transient analysis, and thus is the only EFV Initiation Function subjected to response time testing. Response time testing is also required for Main Steam Line and AFV 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

provides reasonable assurance for prompt identification of

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.

edit

factors including

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. where practical, edit

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. CAP edit

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 Values 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 DPC SPECIFIC setpoint analysis. identified 9 edit

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 an ~~18~~<sup>at least</sup> 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).

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.

(3)

(continued)

BASES (continued)

REFERENCES

- 3. SAR, ~~Section 14.1~~, <sup>Chapter 14.</sup>
- 2. 10 CFR 50.45.
- 3. "[Unit Name], "Unit Specific Setpoint Methodology."
- 2. SAR, Chapter 17.
- 6. 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

Steam generator (SG)

prior to automatic actuation or in the event that EFIC

<Insert B3.3-112A>

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 when required.

1

edit

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 ~~and~~ or 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.

and

initiation edit

1

The EFIC manual initiation functions satisfy Criterion <sup>(4)</sup> of the NRC Policy Statement. 10 CFR 50.36 (Ref. 2).

13

LCO

On the main control board ~~(M)~~ 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.

train

9

edit

14

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)

12

<Insert B 3.3-113A>

~~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.

14

APPLICABILITY

INSERT  
B3.3-113B

11

~~The (MFW and) Main Steam Line Isolation manual initiation Function(s) 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.

ACTIONS

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

A.1

*required*

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

14

(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  
train

14

B.1

<sup>required</sup> 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 <sup>and the operator can still initiate one actuation channel given a single failure in the other channel.</sup> 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.

train

trains

14

C.1 and C.2

<sup>the</sup> ~~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 <sup>and the associated</sup> 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>**

**D.1, D.2.1, and D.2.2**

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 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 (continued)

SURVEILLANCE  
REQUIREMENTS

SR 3.3.12.1

and EFW Initiation

trains

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. However, for EFW 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 EFW 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.

Initiation

train



REFERENCES

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

edit

with regard to  
Channel OPERABILITY

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

Section 7.1.4 describes

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 1) PSAR, 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:

H-0

edic

H-1

H-15

edic

H-15

edic

H-1

H-15

H-1

H-15

H-1

"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."

identified as being part of the "A" and "B" trains and are

Train

Train

train

trains

INSERT B3.3-116A

(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)  
describes

are identified  
as being part  
of the "A" and  
"B" trains and

INSERT  
B3.3-117A

Emergency Feedwater (EFW) <sup>Initiation</sup> Actuation Section 7.1.4

The four EFIC instrumentation channels for each of the parameters being sensed input their initiate commands to the trip logic modules. Figure 17, FSAR, Chapter 17 (Ref. 1), illustrates the EFW initiation logic. These trip logic modules are physically located in the "A" and "B" EFIC channel cabinets.

EFW <sup>Initiation</sup> ~~Actuation~~ functions <sup>use</sup> the same logic combinations as <sup>Actuation</sup> 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 <sup>10%</sup> ~~> 20% RTP with the nuclear instrumentation Reactor Protection System not in shutdown bypass;~~
- c. Low level in either ~~above through~~ SG;
- d. Low pressure in either SG; ~~of ESAS~~
- e. ~~HPI Actuation on both A and B Engineered Safety Feature Actuation System channels 3 or 4; or~~
- f. ~~Actuation of DROPS channels 1 or 2.~~

Vector Valve Enable Logic

The EFW module logic is responsible for sending open or close signals to the EFW control and isolation valves. Figure 17, FSAR, Chapter 17 (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.

INSERT  
B3.3-117B

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edit

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(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 <sup>Line</sup> Isolation and EFW Initiation Functions is discussed in the Bases for LCO 3.3.11, "EFIC Instrumentation." EFIC Logic B 3.3.13

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.

LCO

*trains*

Two channels each of MFW and Main Steam Line Isolation <sup>Initiation</sup> Vector Valve Enable, and EFW <sup>actuation</sup> 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 <sup>channel</sup> *train*.

INSERT B 3.3-118A

APPLICABILITY

INSERT B 3.3-118B

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

(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.

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ACTIONS

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

train

appropriate

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

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edit

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 API 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.

train

both

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1

train

trains

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.

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guards

(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.

*train*

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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 same*

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.

*trains*

*edit*

*edit*

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**B.1 and B.2**

*and its associated*

*are not met for the EFW Initiation Function*

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.

*edit*

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*INSERT  
B.3.3-120A*

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**SURVEILLANCE REQUIREMENTS**

**SR 3.3.13.1**

*trains*

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. This test verifies EFW 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 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

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*edit*

(continued)

**<INSERT B 3.3-120A>**

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

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 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 regard to  
channel OPERABILITY

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

REFERENCES

1. CSAR, Chapter 4/13.

edit

9

B 3.3 INSTRUMENTATION

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

9

BASES

BACKGROUND

The function of the ~~EFW~~ <sup>EFIC</sup> 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.

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edit

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:

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- a. SG "A" pressure less than 600 psig;
- b. SG "B" pressure less than 600 psig;
- c. SG "A" pressure <sup>100</sup>~~125~~ psid greater than SG "B" pressure; and
- d. SG "B" pressure <sup>100</sup>~~125~~ psid greater than SG "A" pressure.

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B3.3-122A

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

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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.

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EFW Initiation

(train)

(continued)

**<INSERT B 3.3-122A>**

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

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**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"	"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 1.) SG "A" & SG "B" within 25 psid	Open	Open
100 1.) SG "A" 25 psid > SG "B"	Open	Close
8 1.) SG "B" 25 psid > SG "A"	Close	Open

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**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

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(continued)

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

EFIC ~~EFW~~ Vector ~~Valve~~ Logic  
B 3.3.14

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.~~

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 ~~0.25~~ 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. ~~25 A~~ ~~0.25~~ psid setpoint conservatively assumes a ~~25~~ psi margin for instrument error. Failure to meet this LCO results in not being able to meet the single-failure criterion.

~~INSERT B33-124A~~

50 psi (25 psi per pressure channel)

APPLICABILITY

~~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.~~

~~INSERT B3.3-124B~~

ACTIONS

A.1

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

- 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  $\geq 750$  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.

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**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.

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**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 2~~ 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.

SG pressure must be reduced to < 750 psig

K11

**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

**REFERENCES**

None.

with respect to Channel OPERABILITY

## This Section Addresses the Following Specifications:

<u>NUREG-1430</u>	<u>ANO-1 ITS</u>	<u>Title</u>
3.3.8	3.3.8	Emergency Diesel Generator (EDG) Loss of Power Start (LOPS)
3.3.15	N/A	Reactor Building (RB) Purge Isolation - High Radiation
3.3.16	3.3.16	Control Room Isolation - High Radiation
3.3.17	3.3.15	Post Accident Monitoring (PAM Instrumentation
3.3.18	N/A	Remote Shutdown System

**3.3 INSTRUMENTATION**

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

**LCO 3.3.8** Two channels of loss of voltage Function and one channel of degraded voltage Function 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 channels for one or more DGs inoperable.	A.1 Restore channel(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
<p>SR 3.3.8.2</p> <p style="text-align: center;"><del>NOTE</del></p> <p>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 channel monitoring the Function for the bus is OPERABLE.</p> <hr/> <p>Perform CHANNEL CALIBRATION with setpoint as follows:</p> <ul style="list-style-type: none"><li>a. Degraded voltage &gt; 423 and &lt; 431 V with a time delay of <math>\geq 7</math> seconds and <math>\leq 9</math> seconds; and</li><li>b. Loss of voltage &gt; 3115 and &lt; 3177 V.</li></ul>	<p>18 months</p>

**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. <del>NOTE</del> 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

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Two required hydrogen monitor channels inoperable.	D.1 Restore one required hydrogen monitor channel to OPERABLE status.	72 hours
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

SURVEILLANCE	FREQUENCY
<p>SR 3.3.15.2      -----NOTE-----</p> <p>Neutron detectors are excluded from CHANNEL CALIBRATION.</p> <p>-----</p> <p>Perform CHANNEL CALIBRATION.</p>	<p>18 months</p>

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 <sup>(a)(b)</sup>	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. <u>AND</u> C.2 Be in MODE 5.	6 hours  36 hours
D. One or two channels inoperable during movement of irradiated fuel.	D.1 Place one OPERABLE CREVS train in emergency recirculation mode. <u>OR</u> D.2 Suspend movement of irradiated fuel assemblies.	Immediately  Immediately

**SURVEILLANCE REQUIREMENTS**

<b>SURVEILLANCE</b>		<b>FREQUENCY</b>
SR 3.3.16.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.16.2	<p>-----NOTE-----</p> <p>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.</p> <p>-----</p> <p>Perform CHANNEL FUNCTIONAL TEST.</p>	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

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#### 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. Two loss of voltage relays are provided on the 4.16 kV bus with a nominal voltage setting of 78% of the motor rated voltage of 4000 V and a time dial setting of 1.0. 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 have a nominal setting of 92% of the motor rated voltage of 460 V. 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).

#### Trip Setpoints

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.

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## 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.

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## LCO

The LCO for the DG LOPS requires that two channels per DG (DG1 and DG2) of the loss of voltage instrumentation Function shall be OPERABLE and one channel 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 channels may be bypassed for  $\leq 30$  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 setpoint calculations. 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 to account 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 the allowable starting voltage plus maximum system voltage drops to the motor terminals, which allows approximately 78% (at the motor terminals) 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 an approximately 92% setting of the motor rated voltage of 460 V.

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## 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.

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## ACTIONS

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

If a channel's trip setpoint is found nonconservative with respect to the Allowable Value, or the channel is found inoperable, then the function that the channel provides must be declared inoperable and the LCO Condition entered for the particular protection function affected. Since the required channel Functions are specified on a per DG basis, the Condition may be entered separately for each DG.

A.1

With one or more channels in one or more Functions for one or more DGs inoperable, Required Action A.1 requires the inoperable channel(s) to be restored to OPERABLE status within 1 hour. With a channel 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.

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**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.

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#### 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."
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## B 3.3 INSTRUMENTATION

### B 3.3.15 Post Accident Monitoring (PAM) Instrumentation

#### BASES

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#### 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.

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#### 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).

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#### 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. Wide Range Neutron Flux

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. Reactor Coolant System (RCS) Hot Leg Temperature

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. RCS Hot Leg Level

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.

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## 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.

### A.1

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.

### B.1

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.

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### **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.

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#### 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.
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## B 3.3 INSTRUMENTATION

### B 3.3.16 Control Room Isolation - High Radiation

#### BASES

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#### 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).

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#### 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).

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## 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.

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## 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.

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## 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).

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## **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.

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**REFERENCES**

1. ANO-2 SAR, Section 6.4.
  2. 10 CFR 50.36.
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## 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:

<u>CTS</u>	<u>ITS</u>
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.

## CTS DISCUSSION OF CHANGES

- 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.

## CTS DISCUSSION OF CHANGES

**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 ( $\geq 300$  psig), reactor coolant temperature ( $\geq 200^\circ\text{F}$ ), 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.

## CTS DISCUSSION OF CHANGES

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.

## CTS DISCUSSION OF CHANGES

- 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.

## CTS DISCUSSION OF CHANGES

### 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.

## 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 ( $\geq 200^\circ\text{F}$ ), 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  $\geq 280^\circ\text{F}$  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.

## CTS DISCUSSION OF CHANGES

- 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 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. This change is consistent with the safety function of the equipment and with NUREG-1430.
- 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." 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 only that 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). This change is consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

- 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). 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." 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. This change is consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

- 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.

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. This change is consistent with NUREG-1430.

## CTS DISCUSSION OF CHANGES

- 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.

## CTS DISCUSSION OF CHANGES

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.

## CTS DISCUSSION OF CHANGES

### 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.

<u>CTS Location</u>	<u>New Location</u>
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 & b (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

## CTS DISCUSSION OF CHANGES

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 REACTOR BUILDING SPRAY SYSTEMS

Applicability

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

AI

Objectivity

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

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 nozzle 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, powered from independent essential buses, to provide redundant and independent flow paths.

LATER

<LATER>  
(3.5)

(D) Two engineered safety feature actuated Low Pressure Injection (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  $40.2 \pm 1.8$  ft. ( $387,400 \pm 17,300$  gallons) of water having a concentration of  $2470 \pm 200$  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) (35, 36, 37) 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

3.3.15 3.3.6 PAM #15 RA F.1/F.2 & (LATER) (35, 36, 37) 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 hours, and, if not corrected, in cold shutdown condition within an additional 72 hours.)~~ (12) ~~MODE 4~~ ~~MODE 3~~ M10 + LATER

3.3.7 Exceptions to 3.3.6 shall be as follows:

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~~ <sup>30</sup> days unless such components are sooner made operable, provided that during such seven days the other BWST level instrument channel shall be operable. L11 AL

~~(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 CNT instrument channel (pressure of level) shall be operable.~~ LATER

~~(LATER) (3.6) (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.~~ LATER

~~(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.<sup>(2)</sup>
- (C) As a supply of borated water for flooding the fuel transfer canal during refueling operation.<sup>(2)</sup>

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  $\Delta k/k$  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  $600 \pm 25$  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.

3.3.15

**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) AND 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

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

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

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

*A3*

*& Later*

3.5.1.3 For on-line testing or in the event of a protection instrument channel failure, a key operated channel bypass switch associated with each reactor protection channel may be used to lock the channel trip relay in the untripped state as indicated by a light. 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 one channel bypass key shall be accessible for use in the control room. 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 reactor protection channel shall not be used during reactor power operation 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 maintained in the source range until the one decade overlap is achieved.

*<LATER>*  
(3.3A)

*LATER*

3.5.1.6 In the event that one of the trip devices in either of the source range instrumentation fails in the untripped state, the power supplied to the rod drive mechanisms through the failed trip device shall be manually removed within 15 minutes following detection. The condition will be corrected as 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 period, the reactor shall be placed in the hot shutdown condition within an additional four hours.

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

- a. ~~The 4.16 KV emergency bus undervoltage relay setpoints shall be >3115 VAC but <3177 VAC.~~
- b. ~~The 460 V emergency bus undervoltage relay setpoints shall be >423 VAC but <431 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<sup>7</sup> R/hr.~~ (LA1) Bases  
Table 3.3.15-1 PAM #9

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 or during ~~handling~~ <sup>movement</sup> of irradiated fuel. ~~assemblies~~

3.3.16 LCO  
3.3.16 Appl.

(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)  
CCM  
SAK

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 150 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>  
(3.3C)

LATER

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>  
(3.3e + 37)

LATER

- <Add 3.3.16 Condition C > (M4)
- <Add 3.3.16 Condition D > (L13)
- <Add 3.3.16.2 Note >

2.3.8  
3.3.15  
3.3.16

(A2)

Bases

Every reasonable effort will be made to maintain all safety instrumentation 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 system and other interconnected systems is evaluated. The affected reactor protection 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. Administrative controls are established to preclude placing a reactor protection channel in channel bypass when any other reactor protection channel contains an inoperable 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.

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

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.

(P)  
TRM

(A2)

3.3.8  
3.3.15  
3.3.16

AZ

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 EFIC 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 unless 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 tested 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. Activation of both relays is required in order to actuate the controllers. The two relays are tested individually to prevent automatic actuation of the component. 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 MFV 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. E. 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 Degraded Voltage Monitoring 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 the allowable starting voltage plus maximum system voltage drops to the motor terminals, which allows approximately 78% of motor rated voltage at the motor terminals. The 460V undervoltage relay setpoint is based on long term motor voltage requirements plus the maximum feeder voltage drop allowance resulting in a 92% setting of motor rated voltage.

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 (SM), and core-exit thermocouples (CET), Reactor Vessel Level Monitoring System (RVLMS) and Hot Leg Level Measurement System (HLMS) 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 HLMS 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.

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:

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

(A2)

**ENGINEERED SAFEGUARDS ACTUATION SYSTEM**

**Table 3.5.1-1 (Cont'd)**

Functional Unit		No. of channels	No. of channels for system trip	Min. operable channels	Min. degree of redundancy	Operator action if conditions of column 3 or 4 cannot be met
1. High pressure injection system (Note 8)						
Table 3.3.15-1 PAM #4 (LATER) (3.3B)	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
(LATER) (3.3B)	c. Manual trip pushbutton	2	1	2	1	Notes 1, 5
2. Low pressure injection system (Note 8)						
Table 3.3.15-1 PAM #4 (LATER) (3.3B)	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
(LATER) (3.3B)	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

(LAI) Bases

(A3)

(A7)

(M7) & LATER

LATER

(LAI) Bases

(A3)

(A7)

(M7) & LATER

LATER

Amendment No. 91

**EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM (Cont'd)**

**Table 3.5.1-1 (Cont'd)**

<u>Functional Unit</u>	<u>No. of channels</u>	<u>No. of channels for system trip</u>	<u>Min. operable channels</u>	<u>Min. degree of redundancy</u>	<u>Operator action if conditions of column 3 or 4 cannot be met</u>
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

Table 3.3.15-1  
LATER (3.3C)  
Table 3.3.15-1  
LATER (3.3C)

45b

(LATER)  
(3.3C)

(LA1) Bases

(A3)

(A7)

(M7)

d LATER

LATER

3.3.15

Table 3.5.1-1 (cont'd)

**OTHER SAFETY RELATED SYSTEMS**  
(Cont'd)

Functional Unit	No. of channels	No. of channels for system trip	Min. operable channels	Min. degree of redundancy	Operator action if conditions of column 3 or 4 cannot be met	Notes
Table 3.3.15-1 #11 2. Pressurizer level channels	2	N/A	2	1	Note 10	A1, LA1 Bases, A3
Table 3.3.15-1 #17 3. Emergency Feedwater flow channels	2/S.G.	N/A	2/2/S.G.	0	Note 10	A7, A3, A1, M9
4. RCS subcooling margin monitors	2	N/A	1	0	Note 10	LA1
5. Electromatic relief valve flow monitor	2	N/A	1	0	Note 11	LA15
6. Electromatic relief block valve position indicator	1	N/A	1	0	Note 12	A10
7. Pressurizer code safety valve flow monitors	2/valve	N/A	1/valve	0	Note 10	A3, A7, A1
3.3.8 LCD 8. Degraded Voltage Monitoring						
a. 4.16 KV Emergency Bus Undervoltage	2/Bus	1/Bus	2/Bus	0	Note 14	A1
b. 460 V Emergency Bus Undervoltage	*1/Bus	1/Bus	1/Bus	0	Notes 13, 14	LA1 Bases
9. Deleted						A1
Table 3.3.15-1 #9 10. Containment High Range Radiation Monitoring	2	N/A	2	0	Note 20	A1, LA1 Bases
Table 3.3.15-1 #7 11. Containment Pressure - High Range	2	N/A	2	0	Note 21	A3, A1
Table 3.3.15-1 #6 12. Containment Water Level - Wide Range	2	N/A	2	0	Note 21	A7, LA1 Bases

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

Table 3.5.1-1 (cont'd)

OTHER SAFETY RELATED SYSTEMS  
(Cont'd)

Functional Unit

Table 3.3.15-1  
PAM #16

3.3.16 LCO

Table 3.3.15-1  
PAM #5

Table 3.3.15-1  
PAM #3

13. In core thermocouples  
(core-exit thermocouples)

14. Control Room  
Radiation Monitors

15. Reactor Vessel Level Monitoring System

16. Hot Leg Level Measurement System (HLLMS)

17. Main Steam Line  
Radiation Monitors

1	2
No. of channels	No. of channels for system trip
5/core quadrant	N/A

3
Min. operable channels
2/core quadrant

4
Min. degree of redundancy
0

5
Operator action if conditions of column 3 or 4 cannot be met
Note 22

2	1
No. of channels	No. of channels for system trip
2	N/A
2	N/A

2
Min. operable channels
2

2
Min. degree of redundancy
0
0

Note 17, 18

Note 28, 29

Note 28, 29

Note 30

1/steam line	N/A	1/steam line	0
No. of channels	No. of channels for system trip	Min. operable channels	Min. degree of redundancy
1/steam line	N/A	1/steam line	0

LAI  
BASES

A3

A7

A1

LAI  
BASES

A3

A7

A3

A1

LA2  
ODCM  
SAR

3.3.15  
3.3.16

A3

TABLE 3.5.1-1 (Cont'd)

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.	
	3. When 1 of 2 intermediate range instrument channels is greater than 10-10 amps, hot shutdown is not required.	LATER
	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.	
	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
	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
	7. These channels initiate control rod withdrawal inhibits not reactor trips at -10% rated power. Above 10% rated power, those inhibits are bypassed.	LATER
	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
	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
	11. With the number of operable channels less than required, isolate the electromagnetic relief valve within 4 hours, otherwise Note 9 applies.	M10

<LATER>  
(3.3A/B/C, 3.9B)

<LATER>  
(3.3A)

<LATER>  
(3.3B & 3.4E)

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

<LATER>  
(3.3A)

<LATER>  
(3.3B)

3.3.15  
PAMS 11&17  
RA A.1

<Add 3.3.15 RA B.1, RA C.1, RA F.1 & F.2 for PAMS #11&17>

L15

L5

L15

M10

L15

L5

M10

3.3.15

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 electromagnetic 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.~~ (LAI) Bases

3.3.8 RA A.1  
<LATER>  
(3.3.8)

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 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 in addition to the actions described above.~~ (L6) (LAI) 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.~~ (L7) (M10)

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

3.3.8  
3.3.15  
3.3.16

A3

Table 3.5.1-1 (cont'd)

Amendment No. 116  
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.

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

L5

M10

L5

< Add 3.3.8 App1 >

A9

< Add 3.3.8 ACTIONS Note >

A8

< Add 3.3.8 RA B.1 >

L1

M1

4571

3.3.8  
3.3.15

A3

Table 3.3.1-1 (cont'd)

3.3.15 28. With the number of OPERABLE channels one less than the minimum number of channels required to be OPERABLE:

PAMs #3 & #5

RAA.1

a. If repairs are feasible, restore the inoperable channel to OPERABLE status within <sup>30</sup>7 days or be in at least NOT SHUTDOWN within the next 12 hours.

L8

RAB.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 29. With the number of OPERABLE channels two less than the minimum channels required to be OPERABLE:

PAMs #3 & #5

RAC.1

a. If repairs are feasible, restore at least one inoperable channel to OPERABLE status within <sup>7 days</sup>72 hours or be in at least NOT SHUTDOWN within the next 12 hours.

L8

RAG.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

OOCM 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

3.14 HYDROGEN RECOMBINERS

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.

<LATER>  
(3.6)

LATER

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, FRAFL to PAM 10 >

L9

< Add 3.3.15 RA F.2 to PAM 10 >

M11

< INSERT CTS 66eA >

<Insert CTS 66eA>

3.3.15

Add 3.3.15, ACTIONS Note 1

(L4)

Add 3.3.15, ACTIONS Note 2

(A8)

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

(A1)

Add 3.3.15, Condition B Note for all PAM Functions

Add 3.3.15, Condition C Note for all PAM Functions

Add 3.3.15, Condition G Note for PAM Functions 3, 5, & 9

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

**<Insert CTS 66eA> (continued)**

**3.3.15**

**Add 3.3.15, Applicability for PAM Functions 3 & 5**

**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**

**M8**

**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 (S.O))

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  
Monthly  
Quarterly or every 3 months  
Semiannually or every 6 months  
Yearly or annually

At least once per 7 days  
At least once per 31 days  
At least once per 92 days  
At least once per 184 days  
At least once per 366 days

LATER

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 activities 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 requirements of any Technical Specification.

4.1 OPERATIONAL SAFETY ITEMS

Applicability

Applies to items directly related to safety limits and limiting conditions for 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 reactor protective system and engineered safeguards system instrumentation when the reactor is critical shall be as stated in Table 4.1-1.

(A1)

(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

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.

A2

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.

---

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.

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

A2  
R  
TRM

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.

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.

A2

3.3.8  
3.3.15  
3.3.16

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

A2  
R  
TRM

A3

TABLE 4.1.1 (Cont.)

	Channel Description	Check	Test	Calibrate	Remarks
(LATER) (3.3A)	13. High Reactor Building Pressure Channel	S	M	R	
(LATER) (3.3B)	14. High Pressure Injection Logic Channel	NA	M	NA	LATER
	15. High Pressure Injection Analog Channels				L10
3.3.15 PAM #4 (LATER) (3.3B)	a. Reactor Coolant Pressure Channel	(M) SR 3.3.15.1	M(1)	R SR 3.3.15.2	(1) Including test of shutdown bypass function (ECCS bypass function). M7 & LATER
	b. Reactor Building 4 psig Channel	S	M	R	LATER
(LATER) (3.3B)	16. Low Pressure Injection Logic Channel	NA	M	NA	
	17. Low Pressure Injection Analog Channels				L10
3.3.15 PAM #4 (LATER) (3.3B)	a. Reactor Coolant Pressure Channel	(M) SR 3.3.15.1	M(1)	R SR 3.3.15.2	(1) Including test of shutdown bypass function (ECCS bypass function). M7 & LATER
	b. Reactor Building 4 psig Channel	S	M	R	
(LATER) (3.3B)	18. Reactor Building Emergency Cooling and Isolation System Logic Channel	NA	M	NA	LATER
	19. Reactor Building Emergency Cooling and Isolation System Analog Channels				
	a. Reactor Building 4 psig Channels	S	M	R	

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.
	21. Reactor Building Spray System Analog Channels				
	a. Reactor Building Pressure Channels	NA	M	R	
	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.
	24. Control Rod Relative Position	S(1)	NA	R	(1) Check with Absolute Position Indicator
LATER (3.5)	25. Core Flooding Tanks				
	a. Pressure Channels	S	NA	R	
	b. Level Channels	S	NA	R	
3.3.15 PAM #11	26. Pressurizer Level Channels	S <sup>(M)</sup> SR 3.3.15.1	NA	R SR 3.3.15.2	
	27. Makeup Tank Level Channels	D	NA	R	
LATER (3.4B)	28. Radiation Monitoring System other than containment high range monitors (item 17)				(1) Check functioning of self-checking feature on each detector.
	a. Process Monitoring System (RCS Leakage monitors only)	S	Q	R	
	b. Area Monitoring System (Control Room only)	S SR 3.3.16.1	M(2) SR 3.3.16.2	R SR 3.3.16.3	
3.3.16 Also See Page 71-2	c. Main Steam Line Radiation Monitors	S	M	R	

L15

L10

L15

L13

LA2  
OOCM  
SAR

3.3.15  
3.3.16

(A3)

Table 4.1-1 (Cont'd)

	<u>Channel Description</u>	<u>Check</u>	<u>Test</u>	<u>Calibrate</u>	<u>Remarks</u>
	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	
See Page 71-1	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	
See Page 71-1	c. Main Steam Line Radiation Monitors	S	M	R	

(L15)

(A3)

Table 4.1-1 (Cont.)

Channel Description	Check	Test	Calibrate	Remarks
3.3.15 PAMS #15 & #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
(LATER) (3.4B) 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.
31. Deleted				(A1)
(LATER) (3.8) 32. Diesel generator protective relaying starting interlocks and circuitry	H	Q	NA	LATER
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.
3.3.15 PAM #15 34. Borated water storage tank level indicator	(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	H	PC	R	LATER

Table 4.1-1 (Cont.)

(A3)

Channel Description	Check	Test	Calibrate	Remarks
(LATER) (3.5) 36. Boic Acid Addition Tank a. Level Channel b. Temperature Channel	NA M	NA NA	R R	LATER (A5)
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. X-core 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	FC	R	LATER (A1)
42. Deleted				

3.3.8

(A3)

Table 4.1-1 (Cont.)

Channel Description	Check	Test	Calibrate	Remarks
(LATER) (3.3B) 43. ESAS Manual Trip Functions a. Switches & Logic b. Logic	NA NA	R M	NA NA	LATER
(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

(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	(L10)
3.3.15 PAM #11 51. Pressurizer Water Level Indicator	(M) D SR 3.3.15.1	NA	R SR 3.3.15.2	(L10)
52. Deleted				(A1) 1
(LATER) (3.3C) 53. EFW Initiation				LATER
a. Manual	NA	M	NA	
3.3.15 PAMS 12 & 13 b. SG Low Level, SGA or B	(M) (P) SR 3.3.15.1	(M) (P)	(R) SR 3.3.15.2	(LATER)
(LATER) (3.3C) c. Low Pressure SGA or B	(M) (P)	(M) (P)	(R)	(L10)
(LATER) (3.3C) d. Loss of both MFW Pumps and PWR > 10%	S	M	R	LATER

(A3)

Table 4.1-1 (Cont.)

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

NOTE:

(LATER) (3.3A) (3.3B) (3.3C) (3.4B)

~~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

4.12.1 Each hydrogen recombiner system shall be demonstrated OPERABLE:

- 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 to 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.

<LATER>  
(3.6)

LATER

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.

(LAI)

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)

3.3.15

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.

AZ

3.3.15

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. (LAI) 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 (A1)

g. Deleted

h. Deleted

i. Deleted

<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 (LAI) Bases

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

m. Inoperable Main Steam Line Radiation Monitors, Specification 3.5.7, Table 3.5.7-1. (L14)

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## ITS Section 3.3D: Instrumentation - MISC.

Entergy Operations has evaluated these proposed Technical Specification changes and has determined that they involve no significant hazards consideration. This determination has been performed in accordance with the criteria set forth in 10CFR 50.92(c) as indicated below:

### 3.3D L1

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

The change in the Required Actions for inoperable DG LOPS instrumentation does not result in any hardware changes. The change also does not significantly increase the probability of occurrence for initiation of any analyzed event since the function of the equipment does not change (and therefore any initiation scenarios are not changed) and the proposed Completion Time is short (and therefore limits the impact on probability). Further, the change of Required Actions does not significantly increase the consequences of any accident previously evaluated because the change does not affect the assumed response of the equipment in performing its specified mitigation function from that considered during the accident analysis.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure corrective actions are taken to restore plant systems to OPERABLE status, as assumed in the safety analysis. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

This change does not involve a significant reduction in a margin of safety since the OPERABILITY of the equipment and loss of function continue to be evaluated in the same manner. The increase in time allowed for such an evaluation and restoration is minimal and provides additional potential for the preferred action of restoration of the equipment to OPERABLE status, rather than requiring a shutdown transient.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L2

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

The change in the Required Action does not result in any hardware changes. The change also does not significantly increase the probability of occurrence for initiation of any analyzed event since the function of the equipment does not change (and therefore any initiation scenarios are not changed) and the proposed time for allowing testing is short (and therefore limits the impact on probability). The proposed changes allow time for testing the equipment which is less than the time allowed for restoration of the equipment if it were discovered to be inoperable. Since some time is currently allowed for operation with the equipment unavailable, this change does not involve an increase in the consequences of any accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure corrective actions are taken to restore plant systems to the OPERABLE status assumed in the safety analysis. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does this change involve a significant reduction in a margin of safety?

The margin of safety for the automatic start function for AC Sources is provided by the design requirements and assumed analysis response parameters. The design requirements and assumed analysis response parameters are not affected by a short allowance for unavailability to perform testing. Further, the proposed time for unavailability is less than is currently allowed for the equipment if it is discovered to be inoperable. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L3

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

The Borated Water Storage Tank (BWST) Level instrumentation is utilized as a post accident monitor (PAM). Therefore, it is used to support mitigation of the consequences of an accident, but it is not considered as initiator of any previously evaluated accident. As such the proposed revision of the Applicability does not significantly increase the probability of any accident previously evaluated. Since the PAM function of the BWST Level continues to be verified OPERABLE for any MODE in which previously evaluated events may require the PAM, the proposed revision of Applicability does not reduce the capability of required equipment to support mitigation of the event. Therefore, this change does not involve a significant increase in the consequences of any accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure proper availability of the PAM for the MODES of operation of the unit during which a design basis event is considered credible. The other operating MODES are not considered in the safety analysis as likely to require the PAM functions due to the significantly reduced unit operating conditions. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does this change involve a significant reduction in a margin of safety?

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. The availability and capability of the PAMs continue to be confirmed with the required Surveillances. The revision of the Applicability still provides assurance that the PAM function will perform its required function when needed. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L4

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change does not result in any hardware changes, but does allow startup with inoperable PAM functions. The PAMs provide indication only and are not considered as initiators of any analyzed event. Therefore, the change does not significantly increase the probability of occurrence of any previously analyzed event since the function of the equipment does not change (and therefore any initiation scenarios are not changed). Neither will the change result in a significant increase in the consequences of any accident previously evaluated since the consequences of an event occurring during the proposed operation of the unit during the proposed Completion Times are the same as the consequences of an event occurring while operating under the current ACTIONS. Therefore, the proposed change does not involve a significant increase to the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed). The equipment function has not changed, nor has its interface with other equipment. The proposed change will still ensure proper actions are required, consistent with applicable regulatory guidance. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. The availability and capability of the PAMs may be affected but is not considered to be significant 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. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L5

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change does not result in any hardware changes, but does allow additional continued operation with inoperable PAM functions. The PAMs provide indication only and are not considered as initiators of any analyzed event. Therefore, the change does not significantly increase the probability of occurrence of any previously analyzed event. Neither will the change result in a significant increase in the consequences of any accident previously evaluated since the consequences of an event occurring during the proposed operation of the unit during the proposed Completion Times are the same as the consequences of an event occurring while operating under the current ACTIONS. Therefore, the proposed change does not involve a significant increase to the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed). The equipment function has not changed, nor has its interface with other equipment. The proposed change will still ensure proper actions are required, consistent with applicable regulatory guidance. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. The availability and capability of the PAMs may be affected but is not considered to be significant 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. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L6

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change does not result in any hardware changes, but does allow additional continued operation with inoperable PAM functions. The PAMs provide indication only and are not considered as initiators of any analyzed event. Therefore, the change does not significantly increase the probability of occurrence of any previously analyzed event. Neither will the change result in a significant increase in the consequences of any accident previously evaluated since the consequences of an event occurring during the proposed operation of the unit during the proposed Completion Times are the same as the consequences of an event occurring while operating under the current ACTIONS. Therefore, the proposed change does not involve a significant increase to the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed). The equipment function has not changed, nor has its interface with other equipment. The proposed change will still ensure proper actions are required, consistent with applicable regulatory guidance. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. The availability and capability of the PAMs may be affected but is not considered to be significant 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. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L7

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change does not result in any hardware changes, but does allow additional continued operation with inoperable PAM functions. The PAMs provide indication only and are not considered as initiators of any analyzed event. Therefore, the change does not significantly increase the probability of occurrence of any previously analyzed event. Neither will the change result in a significant increase in the consequences of any accident previously evaluated since the consequences of an event occurring during the proposed operation of the unit during the proposed Completion Times are the same as the consequences of an event occurring while operating under the current ACTIONS. Therefore, the proposed change does not involve a significant increase to the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed). The equipment function has not changed, nor has its interface with other equipment. The proposed change will still ensure proper actions are required, consistent with applicable regulatory guidance. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. The availability and capability of the PAMs may be affected but is not considered to be significant 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. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L8

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change does not result in any hardware changes, but does allow additional continued operation with inoperable PAM functions. The PAMs provide indication only and are not considered as initiators of any analyzed event. Therefore, the change does not significantly increase the probability of occurrence of any previously analyzed event. Neither will the change result in a significant increase in the consequences of any accident previously evaluated since the consequences of an event occurring during the proposed operation of the unit during the proposed Completion Times are the same as the consequences of an event occurring while operating under the current ACTIONS. Therefore, the proposed change does not involve a significant increase to the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed). The equipment function has not changed, nor has its interface with other equipment. The proposed change will still ensure proper actions are required, consistent with applicable regulatory guidance. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. The availability and capability of the PAMs may be affected but is not considered to be significant 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. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L9

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change does not result in any hardware changes, but does allow additional continued operation with inoperable PAM functions. The PAMs provide indication only and are not considered as initiators of any analyzed event. Therefore, the change does not significantly increase the probability of occurrence of any previously analyzed event. Neither will the change result in a significant increase in the consequences of any accident previously evaluated since the consequences of an event occurring during the proposed operation of the unit during the proposed Completion Times are the same as the consequences of an event occurring while operating under the current ACTIONS. Therefore, the proposed change does not involve a significant increase to the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed). The equipment function has not changed, nor has its interface with other equipment. The proposed change will still ensure proper actions are required, consistent with applicable regulatory guidance. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. The availability and capability of the PAMs may be affected but is not considered to be significant 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. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L10

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

The PAMs are used to support mitigation of the consequences of an accident; however, they are not considered the initiator of any previously analyzed accident. As such, the proposed revision of the Surveillance Frequency of the PAMs does not significantly increase the probability of any accident previously evaluated. Since the function of the PAMs continues to be verified, and continues to be required to be OPERABLE, the change of the Surveillance Frequency will not reduce the capability of required equipment to mitigate the event. Therefore, this change does not involve a significant increase in the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure proper surveillances are required for the equipment considered in the safety analysis. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. 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. Therefore, the availability and capability of the PAMs continues to be assured by the proposed Surveillance Frequency and this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## **3.3D L11**

- 1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change does not result in any hardware changes, but does allow additional continued operation with inoperable PAM functions. The PAMs provide indication only and are not considered as initiators of any analyzed event. Therefore, the change does not significantly increase the probability of occurrence of any previously analyzed event. Neither will the change result in a significant increase in the consequences of any accident previously evaluated since the consequences of an event occurring during the proposed operation of the unit during the proposed Completion Times are the same as the consequences of an event occurring while operating under the current ACTIONS. Therefore, the proposed change does not involve a significant increase to the consequences of any accident previously evaluated.

- 2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed). The equipment function has not changed, nor has its interface with other equipment. The proposed change will still ensure proper actions are required, consistent with applicable regulatory guidance. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

- 3. Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. The availability and capability of the PAMs may be affected but is not considered to be significant 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. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L12

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

The PAMs are used to support mitigation of the consequences of an accident; however, they are not considered the initiator of any previously analyzed accident, nor do they provide any automatic actuation functions. As such, the proposed revision to omit the Surveillance Requirement for functional testing of the PAMs does not increase the probability of any accident previously evaluated. Since the capability of the PAMs to provide the required information continues to be verified, and continues to be required to be OPERABLE, the change will not reduce the capability of required equipment to mitigate the event. Therefore, this change does not involve a significant increase in the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure proper surveillances are required for the equipment considered in the safety analysis. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for PAMs is based on availability and capability of the instrumentation to provide the required information to the operator. 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. Therefore, the availability and capability of the PAMs continues to be assured by the proposed Surveillance Requirements and this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L13

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

The control room area radiation monitor is used to support mitigation of the consequences of an accident; however, it is not considered the initiator of any previously analyzed accident. Also, the addition of the Note to allow time for testing reduces the potential for initiation of a previously analyzed accident due to reduced potential for shutdowns and startups due to incomplete or missed surveillances. As such, the proposed revision to omit the check of the self-checking feature from the Surveillance Requirement for functional testing and to include an allowance for testing does not significantly increase the probability of any accident previously evaluated. This change does not result in any hardware changes, but does allow operation for a limited time with an inoperable monitor for the purposes of testing. Since the capability of the control room area radiation monitor to provide the required information continues to be verified, and the time allowed for inoperability for testing is short, the change will not reduce the capability of required equipment to mitigate the event. Also, the consequences of an event occurring during the proposed operation of the unit during the allowed inoperability for testing are the same as the consequences of an event occurring while operating under the current ACTIONS. Therefore, this change does not involve a significant increase in the consequences of any accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will still ensure proper surveillances are required for the equipment considered in the safety analysis. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety for the control room area radiation monitor is based on availability and capability of the instrumentation to provide the required information to the operator. 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. Therefore, the availability and capability of the control room area radiation monitor continues to be assured by the proposed Surveillance Requirements and this change does not involve a significant reduction in a margin of safety.

## NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

### 3.3D L14

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

This change does not result in any changes in hardware or methods of operation. The change in date for submittal of "after the fact" information is not considered in the safety analysis, and cannot initiate or affect the mitigation of an accident in any way. Therefore, this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or changes in parameters governing normal plant operation. The proposed change will impact only the administrative requirements for submittal of information and do not directly impact the operation of the plant. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The margin of safety is not dependent on the submittal of information. Therefore, this change does not involve a significant reduction in a margin of safety.

# NO SIGNIFICANT HAZARDS CONSIDERATIONS STATEMENTS

## 3.3D L15

1. **Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?**

The proposed change removes non-Type A, non-Category 1 post accident monitor (PAM) requirements from the ANO-1 Technical Specifications. This instrumentation is not assumed to be the initiator of any analyzed event and is not assumed to function to mitigate any previously evaluated accident. Therefore, this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. **Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?**

The proposed change does not necessitate a physical alteration of the plant (no new or different type of equipment will be installed) or change in parameters governing normal plant operation. The proposed change will not impose any different requirements and adequate control of information will be maintained. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **Does this change involve a significant reduction in a margin of safety?**

The proposed change will not reduce a margin of safety because the operation of the instrumentation is not considered in any safety analysis assumptions. Therefore, this change does not involve a significant reduction in a margin of safety.

**ITS DISCUSSION OF DIFFERENCES**  
**ITS Section 3.3D: Instrumentation - MISC.**

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

- RSTS 3.3.8 Diesel Generator (DG) Loss of Power Start (LOPS)
- RSTS 3.3.15 Reactor Building 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

- 1 NUREG 3.3.8 - The title of this instrumentation Specification is revised to omit the term "emergency" when referring to the diesel generators for consistency with the Section 3.8 Specifications, and "EDG" is revised to "DG." This change is consistent with both CTS and the majority of the NUREG, and is considered to be editorial in nature. This change is identified only in the title of the Section of the Specification and of the Bases, but not for each occurrence in the markup.
- 2 NUREG 3.3.8 - The Frequency for performance of CHANNEL CHECKS (SR 3.3.8.1) and CHANNEL CALIBRATIONS (SR 3.3.8.2) for DG LOPS instrumentation has been changed to 7 days and 18 months, respectively. This change is being made to maintain consistency with CTS Table 4.1-1, Item 37. There are no indications on the relays upon which to base a more frequent CHANNEL CHECK. The available indications consist only of power available lights and drop flags. Unit experience has indicated that the CTS Frequency of 18 months for the CHANNEL CALIBRATION is sufficient. The CHANNEL FUNCTIONAL TEST requirements are omitted as a specific line item in the ITS. However, this results in no change in requirements since the CTS CHANNEL FUNCTIONAL TEST requirements for the CTS Degraded Voltage Monitoring Functions in CTS Table 4.1-1 are required on the same Frequency, 18 months, as the CHANNEL CALIBRATION. Since the CHANNEL FUNCTIONAL TEST is required as part of the CHANNEL CALIBRATION, both surveillances continue to be performed. However, the discussion of CHANNEL FUNCTIONAL TEST has not been retained as this information duplicates the information provide in the Definition of CHANNEL CALIBRATION. The NOTE is retained to allow the testing to be performed at power, if necessary.
- 3 NUREG 3.3.8 - The ANO-1 Diesel Generator Loss of Power Start Functions consist of the following for each DG: 1) two loss of voltage channels in a one out of two logic configuration, and 2) one degraded voltage channel. The number of channels indicated in ITS LCO 3.3.8 was changed to indicate this ANO-1 specific design. This design additionally required the indicated changes to the ACTIONS of ITS 3.3.8 and to the Note in SR 3.3.8.2. The Bases are also significantly revised to reflect the unit design.
- 4 NUREG 3.3.8 - The word "per" was replaced by the phrase "for one or more" in ITS 3.3.8 Condition A. This change represents a site specific wording preference. This change is being made to ensure that the proper Condition and Required Actions are entered in the event that a Loss of Power Start Function, affecting only one Diesel Generator, is inoperable.

## ITS DISCUSSION OF DIFFERENCES

- 5 NUREG 3.3.8 - The detail of setpoint Allowable Values for degraded voltage and loss of voltage functions has been revised consistent with CTS 3.5.1.8. References to Allowable Values have been deleted for consistency with the CTS (which discusses "setpoints", not "Allowable Values"). The DG LOPS signals are not parameters explicitly modeled in the plant safety analysis. However, the function of the loss of voltage start signal is implicitly assumed to function in response to a loss of offsite power. The degraded voltage diesel generator start signal is assumed for the protection and OPERABILITY of equipment supplied by the respective ES bus. Accordingly, the Bases Background discussion is revised to omit the paragraph relating compliance with the Allowable Values to compliance with the Safety Limits. This discussion is not directly related to the DG LOPS setpoints since they are checked only against the previously documented analysis for consistency with the assumptions and results; not as direct inputs to confirm Safety Limit conformance.
- 6 NUREG 3.3.15 - The Reactor Building (RB) Purge Isolation - High Radiation" requirements are not adopted. The ANO-1 RB Purge System is required to remain isolated during operation in MODES 1, 2, 3, and 4. Further, the ANO-1 design does not include automatic isolation of the RB Purge System on a high radiation signal during any operating conditions. These valves may be closed by an operator from the control room following receipt of indication that a high radiation level exists in the RB, or based on other indications of need to isolate the RB Purge System.
- 7 NUREG 3.3.18 - The Remote Shutdown System requirements are not adopted. The ANO-1 CTS does not include any requirements related to shutdown from outside the control room.
- 8 NUREG 3.3.16 - The ANO control room is shared by the two units and isolation is provided by one channel primarily, but not completely, associated with each unit. The channel associated with each unit initiates the control room emergency ventilation system (CREVS) for that unit, but provides isolation for both unit's control rooms since they are a shared facility. Since there are two channels, appropriate ACTIONS are included. The Bases were also revised to reflect this change.
- 9 NUREG 3.3.16 - The ANO CREVS emergency recirculation mode is essentially the same as the toxic gas protection mode. Therefore, the Note in NUREG LCO 3.3.16 Required Action A.1 is not required.
- 10 NUREG 3.3.16 - The Frequency for the CHANNEL FUNCTIONAL TEST of the CREVS initiation instrumentation (i.e., SR 3.3.16.2) is revised to be consistent with unit specific information as provided in CTS Table 4.1-1, item 28.b, and in the ANO-2 CTS (Table 4.3-3). The Bases were also revised to reflect this change.
- 11 NUREG 3.3.16 - The Allowable Value is not included in ITS for this function. Therefore, this portion of SR 3.3.16.3 is not adopted. The setpoint for this instrumentation is not based on a specific safety analysis assumption or result, but is chosen to assure control room habitability and to prevent spurious actuations. The Bases were also revised to reflect this change.

## ITS DISCUSSION OF DIFFERENCES

- 12 NUREG 3.3.17 - Renumbered and moved to ITS 3.3.15. This is an administrative change only. The DOD reference is only provided at the first occurrence.
- 13 NUREG 3.3.17 - Required Actions B.1 and G.1 provide reference to the - The NUREG reporting requirements (NUREG 5.6.8) related to post accident monitor inoperability. These are not specifically identified in the ITS. A Special Report will continue to be required by the ACTIONS for the Post Accident Monitoring Instrumentation LCO, but details for content of the report will be provided only in the associated Bases for the Required Actions. These controls are considered sufficient since they are not directly pertinent to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety. Since the details of the report are also not necessary to fulfill the pertinent regulatory requirement, they are not mandated by 10 CFR 50.36, and they do not meet the criteria in 10 CFR 50.36, they can be appropriately retained in licensee controlled documents without a significant impact on safety. Retaining these requirements in controlled documents also provides adequate assurance that they will be maintained. Changes to the Bases are controlled by the proposed program in the Administrative Controls Section of the ITS. Additionally, this change is consistent with previously approved ITS for other ENTERGY stations, i.e., Grand Gulf and River Bend. (See also DOD 20 for Section 5.0.)
- 14 NUREG 3.3.17 - NUREG Table 3.3.17-1, Function 2, is revised such that the number of Required Channels is reduced from "2 per loop" to "2." There is only one PAM RCS Hot Leg Temperature monitoring channel per loop for this unit.
- 15 NUREG 3.3.17 - NUREG Table 3.3.17-1, Function 3, RCS Cold Leg Temperature, is not included in ITS since it is not a Type A or Category 1 post accident monitoring variable for this unit.
- 16 NUREG 3.3.17 - RCS Hot Leg Level is included in ITS Table 3.3.15-1 as Function 3 since this is a Type B, Category 1 post accident monitoring variable for this unit. This Function is currently required as item 16 in the "OTHER SAFETY RELATED SYSTEMS" portion of CTS Table 3.5.1-1 and as item 64 in CTS Table 4.1-1.
- 17 NUREG 3.3.17 - NUREG Table 3.3.17-1, Functions 6, 7, 8, 9, and 10, are revised consistent with the unit specific terminology of "Reactor Building" in lieu of the term "Containment." This is an administrative change only.
- 18 NUREG 3.3.17 - NUREG Table 3.3.17-1, Function 8, is revised (as ITS Function 8) to include the term "Automatic" since many non-automatic penetration isolation barriers do not include position indication. This is consistent with approved unit specific design.

The Table is also revised to incorporate TSTF-295.

## ITS DISCUSSION OF DIFFERENCES

- 19 NUREG 3.3.17 - NUREG Table 3.3.17-1, Function 12, is revised (as ITS Function 12a-d) to identify, as separate Functions, the Low Range and High Range of SG water level instrumentation for each SG. These Functions are Type A, Category 1 variables for this unit. Although the Low Range instrumentation is currently included in CTS Table 3.5.1-1, as item 1b in the "EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM" portion of the table and as item 53b in CTS Table 4.1-1, the High Range is not included in the CTS and neither are specifically identified as post accident monitors. These are provided as separate Functions for clarity only and is an administrative change.
- 20 NUREG 3.3.17 - SG Pressure is included in ITS Table 3.3.15-1 as Function 13 since this is a Type A, Category 1 post accident monitoring variable for this unit. This Function is currently required as item 1b in the "EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM" portion of CTS Table 3.5.1-1 and as item 53c in CTS Table 4.1-1. ITS Function 13 is identified as separate Functions for the pressure variable in each SG for clarity only and is an administrative change. The subsequent Functions in the Table are renumbered as appropriate.
- 21 NUREG 3.3.17 - Borated Water Storage Tank Level is included in ITS Table 3.3.15-1 as Function 15 since this is a Type A, Category 1 post accident monitoring variable for this unit. This Function is currently required by Specification 3.3.1(F), with Actions identified by 3.3.6 and 3.3.7(A), and as item 34 in CTS Table 4.1-1.
- 22 NUREG 3.3.17 - NUREG Table 3.3.17-1, Function 15, is revised (as ITS Function 17a&b) to identify, as separate Functions, the Emergency Feedwater Flow instrumentation to each SG. These Functions are Type D, Category 1 variables for this unit. There are 4 indicators of emergency feedwater flow for the unit with one indicator for the flow path from each emergency feedwater pump to each steam generator. Therefore, two are associated with each SG. This instrumentation is currently included in CTS Table 3.5.1-1, as item 3 in the "OTHER SAFETY RELATED SYSTEMS" portion of the table and as item 46 in CTS Table 4.1-1. These are provided as separate Functions for clarity only and is an administrative change.
- 23 NUREG 3.3.17 - High Pressure Injection Flow, Low Pressure Injection Flow, and Reactor Building Spray Flow are included in ITS Table 3.3.15-1 as Functions 18, 19, and 20, respectively, since these are Type A, Category 1 post accident monitoring variables for this unit. The HPI and LPI flow Functions are currently required as item 29 in CTS Table 4.1-1. RB Spray Flow is not required by CTS.
- 24 NUREG Bases 3.3.16 - The Bases were revised to reflect unit specific analysis, terminology, and design. For example, the "comparison" discussion for the CHANNEL CHECK of SR 3.3.16.1 is not applicable since there is no other channel with which to compare.
- 25 NUREG 3.3.8 - The Applicability requirements for ITS LCO 3.3.8 are revised to exclude the requirements for an automatic DG LOPS in MODES 5 and 6. Events occurring in these MODES are slowly evolving events which provide time for operator action to start the DG if necessary. Further, such starts are not required by the ANO-1

## ITS DISCUSSION OF DIFFERENCES

safety analyses, nor are such requirements included in the CTS. CTS Table 3.5.1-1, Note 14 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.

- 26 NUREG Bases 3.3.17 - The Bases for ITS LCO 3.3.15 are revised as necessary to reflect unit design and analyses.
- 27 NUREG 3.3.17 - ITS Table 3.3.15-1 Function 16, Core Exit Temperature, is revised to identify the Required Channels as "2 core exit thermocouples (CETs) per quadrant" and to delete the unnecessary Table Note (c). This editorial change is consistent with CTS Table 3.5.1-1, OTHER item 13, and consistent with the original generic requirements as provided in Generic Letter 83-37. The Table is also revised to move the designations of "(CETs) per quadrant" from the Required Channels column to the Function column in order to clearly preserve the intention of the ACTIONS Note which allows separate Condition entry for each "Function." With a Function designation of Core Exit Temperature (Core Exit Thermocouples per quadrant), then the Note would not be clear as to its intention when a second CET in a separate core quadrant becomes inoperable after the Condition has already been entered for a previous inoperable CET. Moving the "CETs per quadrant" to the Function Column clearly identifies the Function is on a core quadrant basis.
- 28 Not used.
- 29 NUREG 3.3.8 - Required Action C.1 is revised from "Enter applicable Condition(s) and Required Action for EDG made inoperable by EDG LOPS" to "Declare affected DG(s) inoperable." The NUREG uses a consistent convention for "Declare..." and "Enter..." statements with the exception of LCO 3.3.8 (and LCO 3.8.10). Generally, a "Declare..." statement is used as a Required Action to clarify that the equipment is inoperable, to provide a delay time before implementing the ACTIONS of the supported Specification, and/or to transfer ACTIONS from the supporting Specification to the supported Specification. An "Enter..." statement is typically used as a Note to ensure that ACTIONS for the supporting Specification and the supported Specification are implemented concurrently when certain conditions exist and no delay time is provided. The need in the ACTIONS for LCO 3.3.8 is to transfer ACTIONS from the supporting Specification to the supported Specification. Per the above convention, this should be a "Declare..." format. Since the result is the same, this change is an administrative change only.
- 30 NUREG Bases 3.3.17 - Incorporates TSTF-019, Rev. 1.
- 31 NUREG 3.3.8 Bases - The Bases have been generally revised to reflect unit specific design, analysis, and operating practices, or to provide descriptions consistent with other unit specific documents and terminology. Some specific revisions are as follows:
- LCO-  
Discussion was revised to remove an example. This example does not include any information that is necessary to identify or clarify what is required to be OPERABLE

## **ITS DISCUSSION OF DIFFERENCES**

by this LCO. Hence this is unnecessary information and can be removed with no impact.

Discussion was edited to remove detailed information regarding the determination of setpoints which is not applicable to ANO-1.

### **-Surveillance Requirements-**

General discussion, in NUREG SR 3.3.8.1, was edited to match the specific design of the instrumentation to which this SR is applicable. A 2 out of 2 logic does not require two failures, and there is no normal operational use of the associated displays.

Discussion of performance of CHANNEL CALIBRATION revised to omit reference to SAR since it does not describe the identified single point verification.

CHANNEL CALIBRATION Frequency discussion revised to reflect that some calculations assume longer than 18 months between calibrations.

- 32 NUREG Bases 3.3.8 – The Bases for SR 3.3.8.2 are revised to reflect the actual wording of the Note.
- 33 NUREG Bases - The Criterion statement at the conclusion of the Applicable Safety Analysis section was modified at each occurrence 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.

The 10 CFR 50.36 Criterion satisfied by the ITS LCOs was modified to preserve consistency with the ANO-1 license basis. The NUREG Criterion specified were modified to be consistent with the analysis assumptions regarding equipment availability and operating condition (i.e., MODE).

- 34 NUREG 3.3.8 Bases and 3.3.16 Bases were revised to reflect the unit specific methodology associated with the determination of instrument uncertainty. In addition, the Bases have been revised to correct terminology used to describe uncertainties with terminology used at ANO. These changes are considered to be administrative in nature.

## ITS 3.3.15, PAMs - CTS Cross References

The NUREG Markups typically show the CTS source in the right margin of the NUREG Specification pages. However, since there are 20 Post Accident Monitors (PAMs) each item of the Specification may have as many as 20 different sources. Obviously, there is not room in the margin to show all the sources. Rather than include each page for each Function, a Table has been constructed which identifies the CTS sources for each part of the ITS for each ITS Function. The KEY to reading this CTS Cross References table is provided below.

### KEY:

Each ITS 3.3.15 PAM Function is listed in a separate column by ITS PAM Function number (1 through 20) along with an abbreviated Function identification to provide a CTS source for each item in the ITS. For example, 1- N flux is the Neutron flux Function, 2- HL T is the Hot Leg Temperature function, etc.)

Each ITS 3.3.15 item is listed in the first column of the 4 tables, with 5 PAM functions addressed in each table. These separate ITS items include: LCO, APPLICABILITY, ACTIONS Notes 1 and 2, each Required Action, each Note identified in the Conditions column, the SR Note, each SR, and the Table 3.3.15-1 Notes a, b, & c.

For each item, the corresponding DOC(s) are then listed to identify the pertinent justification for adding.

- ~ - A double tilde indicates that the source was EQUIVALENT to the resulting ITS and no DOC was needed.
  - - Three hyphens indicate that this ITS item is NOT APPLICABLE for this ITS PAM Function.
  - new - indicates that this item was not directly addressed in the CTS and is ADDED as a new item for ITS.
- OTHER** - CTS Table 3.5.1-1 is divided into 4 parts for RPS, ESAS, EFIC SYSTEM, and OTHER SAFETY RELATED SYSTEMS. A CTS source of OTHER ## indicates this item is from the OTHER SAFETY RELATED SYSTEMS section of the Table. For example, Other 16, indicates that this ITS PAM Function is addressed in CTS Table 3.5.1-1, item number 16 in the OTHER SAFETY RELATED SYSTEMS section of the table.
- N##** - This refers to Note number ## of Table 3.5.1-1
- ##.#** - Where complete CTS items are the source, they are provided as the reference. For example, CTS 3.5.1.12 provides the source for the Reactor Building High Radiation Function LCO of ITS 3.3.15, Table 3.3.15-1, Function #9.
- ##** - For SRs, a simple number refers to the item as listed in CTS Table 4.1-1. For example, 64 refers to item 64 of Table 4.1-1.

### ITS 3.3.15, PAMs - CTS Cross References

PAM	1 - N flux	2 - HL T	3 - HL L	4 - RCS P	5 - RV L
LCO	new - M7	new - M7	Other 16 - ---	ESAS 1a - M7 ESAS 2a - M7	Other 15 - ---
APPL	new - M7	new - M7	new - M8	new - M7	new - M8
ACT N1	new - M7,L4	new - M7,L4	new - L4	new - M7,L4	new - L4
ACT N2	new - M7,A6	new - M7,A6	new - A6	new - M7,A6	new - A6
RA A.1	new - M7	new - M7	N28 - L8	new - M7	N28 - L8
Cond B N	new - M7,A1	new - M7,A1	new - A1	new - M7,A1	new - A1
RA B.1	new - M7	new - M7	N28 - L8	new - M7	N28 - L8
Cond C N	new - M7,A1	new - M7,A1	new - A1	new - M7,A1	new - A1
RA C.1	new - M7	new - M7	N29 - L8	new - M7	N29 - L8
RA D.1	---	---	---	---	---
RA E.1	new - M7,A1	new - M7,A1	new - A1	new - M7,A1	new - A1
RA F.1	new - M7	new - M7	---	new - M7	---
RA F.2	new - M7	new - M7	---	new - M7	---
Cond G N	---	---	new - A1	---	new - A1
RA G.1	---	---	N29 - L8	---	N29 - L8
SR N	new - M7,A1	new - M7,A1	new - A1	new - M7,A1	new - A1
SR 1	new - M7	new - M7	64 - L10	15a,17a - M7	63 - L10
SR 2	new - M7	new - M7	64 - ---	15a,17a - M7	63 - ---
T N(a)	---	---	---	---	---
T N(b)	---	---	---	---	---
T N(c)	---	---	---	---	---

PAM	6 - RB Wat L	7 - RB P	8 - RBIVs	9 - RB hi rad	10 - H2 Conc
LCO	Other 12 - ---	Other 11 - ---	new - M7	3.5.1.12 - --- Other 10 - ---	3.14.3 - ---
APPL	new - M8	new - M8	new - M7	new - A15	new - M8
ACT N1	new - L4	new - L4	new - M7,L4	new - L4	new - L4
ACT N2	new - A6	new - A6	new - M7,A6	new - A6	new - A6
RA A.1	N21 - L7/M10	N21 - L7/M10	new - M7	N20 - L6	3.14.4 - L9
Cond B N	new - A1	new - A1	new - M7,A1	new - A1	new - A1
RA B.1	new - L7	new - L7	new - M7	N20 - L6	new - L9
Cond C N	new - A1	new - A1	new - M7,A1	new - A1	new - A1
RA C.1	N21 - L7/M10	N21 - L7/M10	new - M7	N20 - L6	---
RA D.1	---	---	---	---	new - L9
RA E.1	new - A1	new - A1	new - M7,A1	new - A1	new - A1
RA F.1	N21 - L7/M10	N21 - L7/M10	new - M7	---	new - L9
RA F.2	new - L7/M10	new - L7/M10	new - M7	---	new - M11
Cond G N	---	---	---	new - A1	---
RA G.1	---	---	---	N20 - L6	---
SR N	new - A1	new - A1	new - M7,A1	new - A1	new - A1
SR 1	59 - L10	58 - L10	new - M7	57 - L10	new - M2
SR 2	59 - ---	58 - ---	new - M7	57 - ---	4.12.2 - ---
T N(a)	---	---	new - M7	---	---
T N(b)	---	---	new - M7	---	---
T N(c)	---	---	---	---	---

### ITS 3.3.15, PAMs - CTS Cross References

PAM	11 - Pzr L	12 - SG L	13 - SG P	14 - CST L	15 - BWST L
LCO	Other 2 - ---	EFIC 1b - M7	EFIC 1c - M7	new - M7	3.3.1(F) - ---
APPL	new - M8	new - M7	new - M7	new - M7	3.3.1 - L3/M6
ACT N1	new - L4	new - M7,L4	new - M7,L4	new - M7,L4	new - L4
ACT N2	new - A6	new - M7,A6	new - M7,A6	new - M7,A6	new - A6
RA A.1	N10 - L5/M10	new - M7	new - M7	new - M7	3.3.7(A) - L11
Cond B N	new - A1	new - M7,A1	new - M7,A1	new - M7,A1	New - A1
RA B.1	new - L5/M10	new - M7	new - M7	new - M7	New - L11
Cond C N	new - A1	new - M7,A1	new - M7,A1	new - M7,A1	New - A1
RA C.1	new - L5/M10	new - M7	new - M7	new - M7	New - L11
RA D.1	---	---	---	---	---
RA E.1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1	New - A1
RA F.1	new - L5/M10	new - M7	new - M7	new - M7	3.3.6 - L11/M10
RA F.2	new - L5/M10	new - M7	new - M7	new - M7	3.3.6 - L11/M10
Cond G N	---	---	---	---	---
RA G.1	---	---	---	---	---
SR N	new - A1	new - M7,A1	new - M7,A1	new - M7,A1	New - A1
SR 1	26,51 - L10	53b - M7,L10	53c - M7,L10	new - M7	34 - L10
SR 2	26,51 - ---	53b - M7	53c - M7	new - M7	34 - ---
T N(a)	---	---	---	---	---
T N(b)	---	---	---	---	---
T N(c)	---	---	---	---	---

PAM	16 - CETs	17 - EFW flo	18 - HPI flo	19 - LPI flo	20 - RB S flo
LCO	Other 13 - ---	Other 3 - ---	new - M7	new - M7	new - M7
APPL	new - M8	new - M8	new - M7	new - M7	new - M7
ACT N1	new - L4	new - L4	new - M7,L4	new - M7,L4	new - M7,L4
ACT N2	new - A6	new - A6	new - M7,A6	new - M7,A6	new - M7,A6
RA A.1	N22 - L5/M10	N10 - L5/M10	new - M7	new - M7	new - M7
Cond B N	new - A1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1
RA B.1	new - L5/M10	new - L5/M10	new - M7	new - M7	new - M7
Cond C N	new - A1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1
RA C.1	N22 - L5/M10	new - L5/M10	new - M7	new - M7	new - M7
RA D.1	---	---	---	---	---
RA E.1	new - A1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1
RA F.1	N22 - L5/M10	new - L5/M10	new - M7	new - M7	new - M7
RA F.2	new - L5/M10	new - L5/M10	new - M7	new - M7	new - M7
Cond G N	---	---	---	---	---
RA G.1	---	---	---	---	---
SR N	new - A1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1
SR 1	61 - L10	46 - L10	new - M7	new - M7	new - M7
SR 2	61 - ---	46 - ---	29 - ---	29 - ---	new - M7
T N(a)	---	---	---	---	---
T N(b)	---	---	---	---	---
T N(c)	---	---	---	---	---

EDG LOPS  
3.3.8

CTS

3.3 INSTRUMENTATION

3.3.8 Emergency Diesel Generator (EDG) Loss of Power Start (LOPS)

LCD 3.3.8

Two channels of loss of voltage Function and one channel of degraded voltage Function EDG LOPS instrumentation per EDG shall be OPERABLE.

T3.5.1-1  
OTHER:  
# 8.a  
# 8.b

APPLICABILITY: MODES 1, 2, 3, and 4

When associated EDG is required to be OPERABLE by LCD 3.8.2 "AC Sources - Shutdown."

NA

ACTIONS

NOTE

Separate Condition entry is allowed for each Function.

NA

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one channel per EDG inoperable.	A.1 Place channel in trip.	1 hour
A. One or more Functions with <u>two</u> or more channels per EDG inoperable. <u>For one or more</u>	A.1 Restore <u>all but one</u> channel to OPERABLE status. (S)	1 hour
B. Required Action and associated Completion Time not met.	B.1 Enter applicable Condition(s) and Required Action for EDG made inoperable by EDG LOPS.	Immediately

Declare affected DG(s) inoperable.

T3.5.1-1  
Notes 13 & 14

EDG LOPS  
3.3.8

① CTS

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE	FREQUENCY	
SR 3.3.8.1 Perform CHANNEL CHECK.	7 days 12 hours ②	T4.1-1 #37
SR 3.3.8.2 <del>NOTE</del> When EDG LOPS instrumentation is placed in an inoperable status solely for performance of this Surveillance, entry into associated Conditions and Required Actions may be delayed as follows: (a) up to 4 hours for the degraded voltage Function, and (b) up to 4 hours for the loss of voltage Function, provided the two channels monitoring the Function for the bus are OPERABLE or tripped.	③ one remaining 18 months 31 days	NA T4.1-1 #37
Perform CHANNEL FUNCTIONAL TEST. SR 3.3.8.3 Perform CHANNEL CALIBRATION with setpoint Allowable V <sub>1</sub> as follows: a. Degraded voltage >423V and <431V with a time delay of 27 seconds and = 9 seconds at 27 seconds at 1V; and b. Loss of voltage >5115V and <5177V with a time delay of 27 seconds at 1V.	18 months ⑤	② 3.5.1.8

6

RB Purge Isolation—High Radiation  
3.3.15

3.3 INSTRUMENTATION

3.3.15 Reactor Building (RB) Purge Isolation—High Radiation

LCO 3.3.15 [One] channel of Reactor Building Purge Isolation—High Radiation shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4,  
During CORE ALTERATIONS,  
During movement of irradiated fuel assemblies within the RB.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One channel inoperable in MODE 1, 2, 3, or 4.	A.1 Place and maintain RB purge valves in closed positions.	1 hour
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	6 hours
	<u>AND</u> B.2 Be in MODE 5.	36 hours
C. One channel inoperable during CORE ALTERATIONS or during movement of irradiated fuel assemblies within the RB.	C.1 Place and maintain RB purge valves in closed positions.	Immediately
	<u>OR</u> C.2.1 Suspend CORE ALTERATIONS. <u>AND</u>	Immediately

(continued)

6

RB Purge Isolation—High Radiation  
3.3.15

**ACTIONS**

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	C.2.2 Suspend movement of irradiated fuel assemblies within the RB.	Immediately

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE	FREQUENCY
SR 3.3.15.1 Perform CHANNEL CHECK.	12 hours
SR 3.3.15.2 Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.15.3 Perform CHANNEL CALIBRATION with setpoint Allowable Value $\leq$ [25] mR/hr.	[18] months

Control Room Isolation—High Radiation  
3.3.16

3.3 INSTRUMENTATION

3.3.16 Control Room Isolation—High Radiation

LCO 3.3.16 <sup>Two</sup> channels of Control Room Isolation—High Radiation shall be OPERABLE. <sup>and</sup>

⑧ 3.5.1.17  
T35.1-1  
Other #18

APPLICABILITY: <sup>and</sup> MODES 1, 2, 3, 4, 5, and 6, <sup>(During CORE ALTERATIONS.)</sup>  
During movement of irradiated fuel assemblies.

3.5.1.17

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
⑧ B. <sup>Two</sup> channels inoperable in MODE 1, 2, 3, or 4.	⑧ A.1 <del>NOTE</del> Place in toxic gas protection mode if automatic transfer to toxic gas protection mode is inoperable.  Place one OPERABLE Control Room Emergency Ventilation System (CREVS) train in the emergency recirculation mode.	1 hour
⑧ C. Required Action and associated Completion Time of Condition A, not met.	⑧ A.1 Be in MODE 3. AND ⑧ B.2 Be in MODE 5.	6 hours  36 hours
(continued)		
INSERT New Condition A.		
A. One channel inoperable in MODE 1, 2, 3, or 4.	A.1 (Same as proposed RAB.1)	7 days

⑧

⑨

T3.5.1-1  
Note 17

⑧ NA

⑧

T3.5.1-1  
Note 18

Control Room Isolation—High Radiation  
3.3.16

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>(D) One <sup>or two</sup> channels inoperable during (CORE ALTERATIONS or) movement of irradiated fuel.</p>	<p>(D) C.1 Place one OPERABLE CREVS train in emergency recirculation mode.</p>	Immediately
	<p>OR</p> <p>C.2.1 Suspend CORE ALTERATIONS.</p>	Immediately
	<p>AND</p> <p>(D) C.2.2 Suspend movement of irradiated fuel assemblies.</p>	Immediately

(B) NA

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.3.16.1 Perform CHANNEL CHECK.	12 hours
<p>SR 3.3.16.2</p> <p>-----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.</p> <p>Perform CHANNEL FUNCTIONAL TEST.</p>	<p>31 days</p>
<p>SR 3.3.16.3 Perform CHANNEL CALIBRATION with setpoint (Allowable Value &lt; 25) MR/hr.</p>	18 months

T4.1-1 #28b

NA

T4.1-1 #28b

T4.1-1 #28b

### ITS 3.3.15, PAMs - CTS Cross References

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#### KEY:

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For example, 1- N flux is the Neutron flux Function, 2- HL T is the Hot Leg Temperature function, etc.)

Each ITS 3.3.15 item is listed in the first column of the 4 tables, with 5 PAM functions addressed in each table.

These separate ITS items include: LCO, APPLICABILITY, ACTIONS Notes 1 and 2, each Required Action, each Note identified in the Conditions column, the SR Note, each SR, and the Table 3.3.15-1 Notes a, b, & c.

For each item, the corresponding DOC(s) are then listed to identify the pertinent justification for adding.

- - A double tilde indicates that the source was EQUIVALENT to the resulting ITS and no DOC was needed.
- - Three hyphens indicate that this ITS item is NOT APPLICABLE for this ITS PAM Function.
- new - Indicates that this item was not directly addressed in the CTS and is ADDED as a new item for ITS.
- other - CTS Table 3.5.1-1 is divided into 4 parts for RPS, ESAS, EFIC SYSTEM, and OTHER SAFETY RELATED SYSTEMS. A CTS source of OTHER ## indicates this item is from the OTHER SAFETY RELATED SYSTEMS section of the Table. For example, Other 16, indicates that this ITS PAM Function is addressed in CTS Table 3.5.1-1, item number 16 in the OTHER SAFETY RELATED SYSTEMS section of the table.
- N## - This refers to Note number ## of Table 3.5.1-1
- ##.# - Where complete CTS items are the source, they are provided as the reference. For example, CTS 3.5.1.12 provides the source for the Reactor Building High Radiation Function LCO of ITS 3.3.15, Table 3.3.15-1, Function #9.
- ## - For SRs, a simple number refers to the item as listed in CTS Table 4.1-1. For example, 64 refers to item 64 of Table 4.1-1.

Insert after page 3.3-39  
Page 1 of 3

ITS 3.3.15, PAMs - CTS Cross References

PAM LCO	1 - N flux new - M7	2 - HL T new - M7	3 - HL L Other 16 - ~	4 - RCS P ESAS 1a - M7 ESAS 2a - M7	5 - RV L Other 15 - ~
APPL	new - M7	new - M7	new - M8	new - M7	new - M8
ACT N1	new - M7,L4	new - M7,L4	new - L4	new - M7,L4	new - L4
ACT N2	new - M7,A6	new - M7,A6	new - A6	new - M7,A6	new - A6
RA A.1	new - M7	new - M7	N28 - L8	new - M7	N28 - L8
Cond B N	new - M7,A1	new - M7,A1	new - A1	new - M7,A1	new - A1
RA B.1	new - M7	new - M7	N28 - L8	new - M7	N28 - L8
Cond C N	new - M7,A1	new - M7,A1	new - A1	new - M7,A1	new - A1
RA C.1	new - M7	new - M7	N29 - L8	new - M7	N29 - L8
RA D.1	—	—	—	—	—
RA E.1	new - M7,A1	new - M7,A1	new - A1	new - M7,A1	new - A1
RA F.1	new - M7	new - M7	—	new - M7	—
RA F.2	new - M7	new - M7	—	new - M7	—
Cond G N	—	—	new - A1	—	new - A1
RA G.1	—	—	N29 - L8	—	N29 - L8
SR N	new - M7,A1	new - M7,A1	new - A1	new - M7,A1	new - A1
SR 1	new - M7	new - M7	64 - L10	15a,17a - M7	63 - L10
SR 2	new - M7	new - M7	64 - ~	15a,17a - M7	63 - ~
T N(a)	—	—	—	—	—
T N(b)	—	—	—	—	—
T N(c)	—	—	—	—	—

PAM LCO	6 - RB Wat L Other 12 - ~	7 - RB P Other 11 - ~	8 - RBIVs new - M7	9 - RB hi rad 3.5.1.12 - ~ Other 10 - ~	10 - H2 Conc 3.14.3 - ~
APPL	new - M8	new - M8	new - M7	new - A15	new - M8
ACT N1	new - L4	new - L4	new - M7,L4	new - L4	new - L4
ACT N2	new - A6	new - A6	new - M7,A6	new - A6	new - A6
RA A.1	N21 - L7/M10	N21 - L7/M10	new - M7	N20 - L6	3.14.4 - L9
Cond B N	new - A1	new - A1	new - M7,A1	new - A1	new - A1
RA B.1	new - L7	new - L7	new - M7	N20 - L6	new - L9
Cond C N	new - A1	new - A1	new - M7,A1	new - A1	new - A1
RA C.1	N21 - L7/M10	N21 - L7/M10	new - M7	N20 - L6	—
RA D.1	—	—	—	—	new - L9
RA E.1	new - A1	new - A1	new - M7,A1	new - A1	new - A1
RA F.1	N21 - L7/M10	N21 - L7/M10	new - M7	—	new - L9
RA F.2	new - L7/M10	new - L7/M10	new - M7	—	new - M11
Cond G N	—	—	—	new - A1	—
RA G.1	—	—	—	N20 - L6	—
SR N	new - A1	new - A1	new - M7,A1	new - A1	new - A1
SR 1	59 - L10	58 - L10	new - M7	57 - L10	new - M2
SR 2	59 - ~	58 - ~	new - M7	57 - ~	4.12.2 - ~
T N(a)	—	—	new - M7	—	—
T N(b)	—	—	new - M7	—	—
T N(c)	—	—	—	—	—

**ITS 3.3.15, PAMs - CTS Cross References**

PAM	11 - Pzr L	12 - SG L	13 - SG P	14 - CST L	15 - BWST L
LCO	Other 2 - ~	EFIC 1b - M7	EFIC 1c - M7	new - M7	3.3.1(F) - ~
APPL	new - M8	new - M7	new - M7	new - M7	3.3.1 - L3/M6
ACT N1	new - L4	new - M7,L4	new - M7,L4	new - M7,L4	new - L4
ACT N2	new - A6	new - M7,A6	new - M7,A6	new - M7,A6	new - A6
RA A.1	N10 - L5/M10	new - M7	new - M7	new - M7	3.3.7(A) - L11
Cond B N	new - A1	new - M7,A1	new - M7,A1	new - M7,A1	New - A1
RA B.1	new - L5/M10	new - M7	new - M7	new - M7	New - L11
Cond C N	new - A1	new - M7,A1	new - M7,A1	new - M7,A1	New - A1
RA C.1	new - L5/M10	new - M7	new - M7	new - M7	New - L11
RA D.1	—	—	—	—	—
RA E.1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1	New - A1
RA F.1	new - L5/M10	new - M7	new - M7	new - M7	3.3.6 - L11/M10
RA F.2	new - L5/M10	new - M7	new - M7	new - M7	3.3.6 - L11/M10
Cond G N	—	—	—	—	—
RA G.1	—	—	—	—	—
SR N	new - A1	new - M7,A1	new - M7,A1	new - M7,A1	New - A1
SR 1	28,51 - L10	53b - M7,L10	53c - M7,L10	new - M7	34 - L10
SR 2	28,51 - ~	53b - M7	53c - M7	new - M7	34 - ~
T N(a)	—	—	—	—	—
T N(b)	—	—	—	—	—
T N(c)	—	—	—	—	—

---

PAM	16 - CETs	17 - EFW flo	18 - HPI flo	19 - LPI flo	20 - RB S flo
LCO	Other 13 - ~	Other 3 - ~	new - M7	new - M7	new - M7
APPL	new - M8	new - M8	new - M7	new - M7	new - M7
ACT N1	new - L4	new - L4	new - M7,L4	new - M7,L4	new - M7,L4
ACT N2	new - A6	new - A6	new - M7,A6	new - M7,A6	new - M7,A6
RA A.1	N22 - L5/M10	N10 - L5/M10	new - M7	new - M7	new - M7
Cond B N	new - A1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1
RA B.1	new - L5/M10	new - L5/M10	new - M7	new - M7	new - M7
Cond C N	new - A1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1
RA C.1	N22 - L5/M10	new - L5/M10	new - M7	new - M7	new - M7
RA D.1	—	—	—	—	—
RA E.1	new - A1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1
RA F.1	N22 - L5/M10	new - L5/M10	new - M7	new - M7	new - M7
RA F.2	new - L5/M10	new - L5/M10	new - M7	new - M7	new - M7
Cond G N	—	—	—	—	—
RA G.1	—	—	—	—	—
SR N	new - A1	new - A1	new - M7,A1	new - M7,A1	new - M7,A1
SR 1	61 - L10	48 - L10	new - M7	new - M7	new - M7
SR 2	61 - ~	48 - ~	29 - ~	29 - ~	new - M7
T N(a)	—	—	—	—	—
T N(b)	—	—	—	—	—
T N(c)	—	—	—	—	—

PAM Instrumentation  
3.3.1

CTS

3.3 INSTRUMENTATION

3.3.1 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.1 The PAM instrumentation for each Function in Table 3.3.1 shall be OPERABLE.

12

See cross reference Table

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 in accordance with Specification 5.6.8 to prepare and submit a Special Report.	Immediately
<p>NOTE</p> <p>Not applicable to hydrogen monitor channels.</p> <p>One or more Functions with two required channels inoperable.</p>	C.1 Restore one channel to OPERABLE status.	7 days

13

(continued)

CTS

15  
12

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Two required hydrogen monitor channels inoperable.	D.1 Restore one required hydrogen monitor channel to OPERABLE status.	72 hours
E. Required Action and associated Completion Time of Condition C or D not met.	E.1 Enter the Condition referenced in Table 3.3.0-1 for the channel.	Immediately
F. As required by Required Action E.1 and referenced in Table 3.3.0-1.	F.1 Be in MODE 3. AND F.2 Be in MODE 4.	6 hours 12 hours
G. As required by Required Action E.1 and referenced in Table 3.3.0-1.	G.1 Initiate action in accordance with Specification 5.6.8 to prepare and submit a Special Report.	Immediately

See cross reference Table

12

12

13

12

PAM Instrumentation  
3.3.1

CTS

15 12

15

**SURVEILLANCE REQUIREMENTS**

-----NOTE-----  
These SRs apply to each PAM instrumentation Function in Table 3.3.1-1.

See  
cross  
reference  
Table

SURVEILLANCE	FREQUENCY
SR 3.3.1.1 <sup>15</sup> Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days <sup>12</sup>
SR 3.3.2 <sup>15</sup> -----NOTE----- Neutron detectors are excluded from CHANNEL CALIBRATION. ----- Perform CHANNEL CALIBRATION.	----- 18 months <sup>12</sup> P P



CTS  
12

15  
Table 3.3.17-1 (page 1 of 1)  
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION (1)	edit
1. Wide Range Neutron Flux	2	F	14
2. RCS Hot Leg Temperature	2 per loop	F	15
3. RCS Cold Leg Temperature	2 per loop	F	16
4. RCS Pressure (Wide Range)	2	F	17
5. Reactor Vessel Water Level	2	G	18
6. <del>Containment</del> Water Level (Wide Range)	2	F	19
7. <del>Containment</del> Pressure (Wide Range)	2	F	20
8. <del>Containment</del> Isolation Valve Position <i>Penetration Flow Path Automatic</i>	2 per penetration flow path (a)(b)	F	21
9. <del>Containment</del> Area Radiation (High Range)	2	G	27
10. <del>Containment</del> Hydrogen Concentration	2	F	22
11. Pressurizer Level	2	F	23
12. Steam Generator Water Level	2 per SG	F	
13. Condensate Storage Tank Level	2	F	
14. Core Exit Temperature	2 (LETs per quadrant)	F	
15. Emergency Feedwater Flow	2	F	

INSERT  
3.3-43A

Reactor Building

INSERT  
3.3-43B

INSERT  
3.3-43C

INSERT  
3.3-43D

See cross reference Table

NOTE: Table 3.3.17-1 shall be amended for each unit as necessary to list all U.S. NRC Regulatory Guide 1.97, Type A instruments and all U.S. NRC Regulatory Guide 1.97, Category 1, non-Type A instruments in accordance with the unit's U.S. NRC Regulatory Guide 1.97, Safety Evaluation Report.

- (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.
- (c) The subcooling margin monitor takes the average of the five highest LETs for each of the ICON trains.

27

**<INSERT 3.3-43A>**

3. RCS Hot Leg Level 2 G

**<INSERT 3.3-43B>**

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

**<INSERT 3.3-43C>**

15. Borated Water Storage Tank Level 2 F

**<INSERT 3.3-43D>**

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

7

Remote Shutdown System  
3.3.18

3.3 INSTRUMENTATION

3.3.18 Remote Shutdown System

LCO 3.3.18 The Remote Shutdown System Functions in Table 3.3.18-1 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 required Functions inoperable.	A.1 Restore required Function to OPERABLE status.	30 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	<b>AND</b> B.2 Be in MODE 4.	12 hours

7

Remote Shutdown System  
3.3.18

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE	FREQUENCY
SR 3.3.18.1 Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days
SR 3.3.18.2 Verify each required control circuit and transfer switch is capable of performing the intended function.	[18] months
SR 3.3.18.3 <p style="text-align: center;">----- NOTE ----- Neutron detectors are excluded from CHANNEL CALIBRATION.</p> Perform CHANNEL CALIBRATION for each required instrumentation channel.	[18] months

7

Remote Shutdown System  
3.3.18

Table 3.3.18-1 (page 1 of 1)  
Remote Shutdown System Instrumentation and Controls

-----NOTE-----  
This Table is for illustration purposes only. It does not attempt to encompass every function used at every unit, but does contain the types of functions commonly found.  
-----

FUNCTION/INSTRUMENT OR CONTROL PARAMETER	REQUIRED NUMBER OF FUNCTIONS
<b>1. Reactivity Control</b>	
a. Log Power Neutron Flux	[1]
b. Source Range Neutron Flux	[1]
c. Reactor Trip Circuit Breaker Position	[1 per trip breaker]
d. Manual Reactor Trip	[1]
<b>2. Reactor Coolant System (RCS) Pressure Control</b>	
a. Pressurizer Pressure or RCS Wide Range Pressure	[1]
b. Pressurizer Power Operated Relief Valve (PORV) Control and Block Valve Control	[1]
<b>3. Decay Heat Removal via Steam Generators (SGs)</b>	
a. Reactor Coolant Hot Leg Temperature	[1 per loop]
b. Reactor Coolant Cold Leg Temperature	[1 per loop]
c. Condensate Storage Tank Level	[1]
d. SG Pressure	[1 per SG]
e. SG Level or Emergency Feedwater (EFW) Flow	[1 per SG]
f. EFW Controls	[1]
<b>4. RCS Inventory Control</b>	
a. Pressurizer Level	[1]
b. Reactor Coolant Injection Pump Controls	[1]

B 3.3 INSTRUMENTATION

B 3.3.8 Emergency Diesel Generator (EDG) Loss of Power Start (LOPS)



BASES

BACKGROUND

on unit vital buses.

The EDGs provide a source of emergency power when offsite power is either unavailable or is insufficiently stable to allow safe unit operations. Undervoltage protection will generate a LOPS in the event a loss of voltage or degraded voltage condition occurs in the switchyard. There are two LOPS Functions for each 4.16 kV vital bus.

of safety related loads.

edit

INSERT  
B.3.3-72A

Two ~~three~~ undervoltage relays with inverse voltage time characteristics are provided on each 4.16 kV Class 1E instrument bus for the purpose of detecting a sustained undervoltage condition of a loss of bus voltage. The relays are combined by a two-out-of-three logic to generate a LOPS if the voltage is below 75% for a short time or below 90% for a long time. The LOPS initiated actions are described in SAR, Section (B-3) (Ref. 1).

edit

3

B.3.1

is further

5

Trip Setpoints and Allowable Value

Section 8.3.1 (Ref. 1)

The trip setpoints used in the distables are based on the analytical limits presented in accident analysis in SAR, Chapter 14.4 (Ref. 2). 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 actual nominal trip setpoint entered into the distable is more conservative than that required by the unit specific setpoint calculations. A channel is inoperable if its actuation trip setpoint is not within its required

consistent with

3

edit

range

Allowable Value

5

Setpoints in accordance with the Allowable Value will assure that limits of Chapter 2.0, "Safety Limits," in the Technical Specifications are not violated during anticipated operational occurrences (AOOs); that the consequences of accidents will be acceptable, providing the unit is operated from within the LCOs at the onset of the AOO or accident; and that the equipment functions as designed.

5

The undervoltage protection scheme has been designed to protect the unit from spurious trips caused by the offsite power source. This is made possible by the inverse voltage

3

(continued)

**<INSERT B 3.3-72A>**

Two loss of voltage relays are provided on the 4.16 kV bus with a nominal voltage setting of 78% of the motor rated voltage of 4000 V and a time dial setting of 1.0. 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 have a nominal setting of 92% of the motor rated voltage of 460 V. 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.

BASES

BACKGROUND

Trip Setpoints and Allowable Value (continued)

actuation by

15  
Safeguards

~~Time characteristics of the relays used.~~ A complete loss of offsite power will result in approximately a [1]<sup>st</sup> second delay in LOPS actuation. The EDG starts and is available to accept loads within a 2<sup>nd</sup> second time interval on the Engineered Safety Features Actuation System (ESFAS) or LOPS. Emergency power is established within the maximum time delay assumed for each event analyzed in the accident analysis (Ref. 2). *in which a loss of offsite power is assumed*

The DG LOPS  
Conform to the

~~With three~~ protection channels in a two-out-of-three trip logic for each division of the 4.16 kV power supply, no single failure will cause or prevent protective system actuation. This arrangement meets IEEE-279-1971 (Criteria of (Ref. 3)).

*as discussed in Ref. 1.*

3

APPLICABLE SAFETY ANALYSES

The EDG LOPS is required for the Engineered ~~Safety Features~~ (ESF) to function in any accident ~~with~~ a loss of offsite power. ~~ES design basis is that of the ESFAS~~

which assumes

Accident analyses credit the loading of the EDG, based on the loss of offsite power, during a loss of coolant accident (LOCA). The actual EDG start has historically been associated with the ESFAS actuation. The diesel loading has been included in the delay time associated with each safety system component requiring EDG supplied power following a loss of offsite power. The analysis assumes a nonmechanistic EDG loading, which does not explicitly account for each individual component of the ~~loss of power~~ *assumed* detection and subsequent actions. The total actuation time for the limiting systems, high pressure injection, and low pressure injection ~~is 25 seconds. This delay time~~ includes contributions from the EDG Start, EDG loading, and safety injection system component actuation. The response of the EDG 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.

assumed

assumed

edit

edit

edit

for

The required channels of LOPS, in conjunction with the ESF systems powered from the EDGs, provide unit protection ~~in the event of any of the analyzed accidents discussed in the accident analysis (Ref. 2).~~ *in which a loss of offsite power is assumed.*

edit

(continued)

BASES

APPLICABLE  
SAFETY ANALYSES  
(continued)

The delay times assumed in the safety analysis for the ESF equipment include the <sup>15</sup> second EDG start delay and, if <sup>assumed</sup> applicable, the appropriate sequencing delay. The response times for ESFAS actuated equipment in LCO 3.3.5, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation," include the appropriate EDG loading and sequencing delay.

edit  
edit

Safeavards

In MODE 1,

The EDG LOPS channels satisfy Criterion 3 of the NRC Policy Statement. 10 CFR 50.36 (Ref. 3).

33

<INSERT B 3.3-74B>

LCO  
the loss of voltage

The LCO for the <sup>15</sup> LOPS requires that <sup>two</sup> channels per <sup>bus</sup> of each LOPS instrumentation function shall be OPERABLE in MODES 1, 2, 3, and 4 when the LOPS supports safety systems associated with the ESFAS. In MODES 5 and 6, the three channels must be OPERABLE whenever the associated EDG is required to be OPERABLE to ensure that the automatic start of the EDG is available when needed.

3

INSERT  
B 3.3-74A

Loss of LOPS function could result in the delay of safety systems initiation when required. This could lead to unacceptable consequences during accidents. During the loss of offsite power, which is an ADO, the EDG powers the motor driven emergency feedwater pumps. Failure of these pumps to start would leave only the one turbine driven pump and an increased potential for a loss of decay heat removal through the secondary system.

edit  
edit

considered OPERABLE

The <sup>only</sup> Allowable Values <sup>are specified</sup> for each function <sup>to be</sup> considered OPERABLE. <sup>LEO</sup> Nominal trip setpoints are specified in the <sup>unit</sup> <sup>specific</sup> setpoint calculations. The <sup>nominal</sup> setpoints are selected to ensure that the setpoint measured by CHANNEL FUNCTIONAL TESTS does not exceed the Allowable Value if the <sup>unit</sup> is performing as required. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within the Allowable Value, is acceptable provided that operation and testing is consistent with the assumptions of the unit specific setpoint calculation. Each Allowable Value <sup>specified</sup> is more conservative than <sup>the</sup> analytical limit assumed in the transient and accident analysis to account for instrument uncertainties appropriate to the trip function. <sup>These</sup> uncertainties <sup>are defined</sup> in the <sup>Limit</sup> <sup>Specific</sup> Setpoint Methodology <sup>(Ref. 4)</sup>.

edit  
edit  
edit

relay

Guidance used to calculate the

AWO-1 Design Guide, IDG-001, "Instrument Loop Error Analysis and Manual

associated with the relay settings is contained (continued)

34

**<INSERT B 3.3-74A>**

and one channel 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 channels may be bypassed for  $\leq 30$  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.

**<INSERT B 3.3-74B>**

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 3 and 4, the DG LOPS channels satisfy Criterion 4 of 10 CFR 50.36.

BASES

LCO  
(continued)

Degraded Voltage LOPS

Voltage: The minimum Allowable Value includes an allowance for relay coil calibration error and is based on maintaining at least [90%] of rated voltage on the 480 V motor control centers, with a [4.1%] V drop across the [4160/480] V stepdown transformers. The [4.1%] V drop associated with these transformers is the maximum expected due to ESF bus loading, while the MCC contactors are considered to require at least [90%] V for proper operation.

INSERT  
B3.3-75A

The maximum Allowable Value is not based on equipment operability concerns, but rather avoidance of unnecessary EDG starts due to spurious channel trip.

Time Delay: The response time includes [5 seconds] for undervoltage relay actuation following detection of degraded ES bus voltage, [13 seconds] for the bus trip delay timer, and [3 seconds] for the dead bus timer. Note that the acceptance criteria of [21 seconds] does not account for the setpoint tolerance of [10%] or [± 2.1 seconds].

Loss of Voltage LOPS

Voltage and Response Time: The Allowable Value for the loss of voltage channels is ≥ 0 V. This Allowable Value and the associated channel response time are based on the physical characteristics of the loss of voltage sensing relays. The loss of voltage channels respond to a complete loss of ES bus voltage, providing automatic starting and loading of the associated EDG. However, their response time is not critical to the overall ES equipment response time following an actuation, since the degraded voltage LOPS instrumentation will also respond to the complete loss of voltage, and will do so earlier than the loss of voltage instrumentation. The loss of voltage channel response includes only the time response associated with the undervoltage relays, including the nominal setpoint of [7.8 seconds] and a tolerance of [7%] or [0.55 seconds].

31

APPLICABILITY

The EDG LOPS actuation function shall be OPERABLE in MODES 1, 2, 3, and 4 because ESF functions are designed to provide protection in these MODES. Actuation is also

required

be OPERABLE

Automatic

not

25

(continued)

**<INSERT B 3.3-75A>**

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 the allowable starting voltage plus maximum system voltage drops to the motor terminals, which allows approximately 78% (at the motor terminals) 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 an approximately 92% setting of the motor rated voltage of 460 V.

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BASES

APPLICABILITY  
(continued)  
automatic protective

in MODES 5 or 6 since there is no required whenever the EDG is required to be OPERABLE by LCO 3.3.2. At Source Shutdown so that the EDG can perform its function on a loss of power or degraded power to the vital bus.

25

ACTIONS

Functions

If a channel's trip setpoint is found nonconservative with respect to the Allowable Value, or the channel is found inoperable, then the function that the channel provides must be declared inoperable and the LCO Condition entered for the particular protection function affected. Since the required channels are specified on a per EDG basis, the Condition may be entered separately for each EDG.

edit

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

A.1

or more

for one or more DGs

With

one channels per EDG in one or more Functions

inoperable, it must be tripped within 1 hour. With a channel in trip, the LOPS channels are configured to provide a one-out-of-two logic to initiate a trip of the incoming offsite power. In trip, one additional valid actuation will cause a LOPS signal on the bus. The 1 hour Completion Time is reasonable to evaluate and to take action by correcting a 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 when two or more undervoltage or two or more degraded voltage channels on a single bus are inoperable.

of a Function

Required Action A.1 requires the inoperable channels to be restored to OPERABLE status within 1 hour. With or more channels inoperable, the logic is not capable of providing an automatic EDG LOPS signal for valid loss of voltage or degraded voltage conditions. The 1 hour Completion Time is reasonable to evaluate and to take action by correcting the degraded condition in an orderly manner

for the associated DG

(continued)

3

edit

BASES

ACTIONS

A.1 (continued)

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 of Condition A or Condition B and the associated Completion Time is not met.

Required Action B.1 ensures that Required Actions for affected diesel generator inoperabilities are initiated. Depending on unit mode, the Actions specified in LCO 3.8.1, "AC Sources—Operating," or LCO 3.8.2, are required immediately.

the DG(s) affected

edit

29

25

SURVEILLANCE REQUIREMENTS

SR 3.3.8.1

7 days provides reasonable assurance for prompt identification of

~~SR 3.3.8.1 is the performance of the CHANNEL CHECK once every 12 hours to ensure 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 CALIBRATION.~~

2

edit

2

~~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 criteria, it is an indication that the channels are OPERABLE.~~

2

The Frequency ~~about once every shift~~ is based on operating experience that demonstrates channel failure is rare. Since

2

(continued)

1

BASES

SURVEILLANCE  
REQUIREMENTS

SR 3.3.8.1 (continued)

the probability of ~~two~~ random failures ~~in redundant channels~~ in any ~~12 hour~~ period is 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 this LCO's required channels.

7 day

This instrumentation

2  
31

SR 3.3.8.2

of the loss of voltage Function

The Note allows channel bypass for testing ~~without defining it as inoperable~~ 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 EDG will start ~~EDG~~ when necessary. It is not acceptable to ~~remove~~ remove channels from service for more than 4 hours to perform required Surveillance testing.

without entering the associated Conditions and Required Actions,

without declaring the channel inoperable.

3  
32

edit

A CHANNEL FUNCTIONAL TEST is performed on each required EDG LOPS channel to ensure the entire channel will perform the intended function. Any setpoint adjustments shall be consistent with the assumptions of the current unit specific setpoint analysis. The frequency of 31 days is considered reasonable based on the reliability of the components and on operating experience that demonstrates channel failure is rare.

2

SR 3.3.8.3

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 ~~as shown in Reference 4~~. CHANNEL CALIBRATION shall ~~also~~ verify measurement 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 in Reference 4.

Setpoints  
Required ranges

2  
31  
34  
5

(continued)

BASES

SURVEILLANCE  
REQUIREMENTS

SR 3.3.8.8<sup>2</sup> (continued)

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

the reliability of the components, on which demonstrates channel failure is rare.

at least

2

31

34

REFERENCES

1. SAR, Section (B.3) 8.3.1.
2. SAR, Chapter (14) 6 and 14.
3. IEEE-279-1971 April 1972.  
10 CFR 50.36.
4. [Unit Name] [Unit Specific Setpoint Methodology].  
AND-1 Design Guide, IO6-001, "Instrument  
Loop Error Analysis and Setpoint Methodology Manual."

edit

33

edit

6

RB Purge Isolation—High Radiation  
B 3.3.15

B 3.3 INSTRUMENTATION

B 3.3.15 Reactor Building (RB) Purge Isolation—High Radiation

BASES

---

BACKGROUND

The RB Purge Isolation—High Radiation Function closes the RB purge valves. This action isolates the RB atmosphere from the environment to minimize releases of radioactivity in the event an accident occurs. The high radiation signal indicates a failure of a barrier to the fuel radioactivity, and most likely a loss of coolant accident. The purge valves must begin to shut rapidly to ensure they reach a completely closed position prior to excessive pressures in the RB, against which the valves may not close.

The radiation monitoring system measures the activity in a representative sample of air drawn in succession through a particulate sampler, an iodine sampler, and a gas sampler. The LCO addresses only the gas sampler portion of this system. The sensitive volume of the gas sampler is shielded with lead and monitored by a Geiger-Mueller detector. The air sample is taken from the center of the purge exhaust duct through an isokinetic nozzle installed in the duct at a point selected for reduced turbulence.

If a gaseous activity flow rate of approximately  $1E-2$   $\mu\text{Ci}/\text{sec}$  (Kr-85) is exceeded, the monitor will alarm and initiate closure of the purge valves. This activity flow rate is selected on the basis of 50,000  $\text{scfm}$  flow rate in the purge exhaust and on the basis of a gas monitor setpoint equal to two times the expected background at the location of the monitor, which will provide fast detection of any release. The alarm setpoints for the particulate and iodine channels indicate that an alarm is obtained after the monitor samples a maximum permissible concentration level for 8 hours. Therefore, a maximum of 1.3 mCi of Cs-137 or 67  $\mu\text{Ci}$  of DOSE EQUIVALENT I-131 will be released to the atmosphere during this period.

The closure of the purge valves ensures the RB remains as a barrier to fission product release. There is no bypass for this function. The closure of the purge valves provides an RB isolation assumed in the accident analysis.

(continued)

Control Room Isolation—High Radiation  
B 3.3.16

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 given. ~~The noble gas monitors located in the station vent stack provide isolation and shutdown of the normal Control Room Emergency Ventilation System (CREVS).~~ *be initiated to supply fan.* *units*

INSERT  
B 3.3-133A

*significantly*  
*unit's*  
*both unit's*

The control room isolation signal is provided by a single channel containing an iodine monitor with a scintillation detector and a gaseous monitor with a Geiger-Mueller detector. The iodine channel includes a particulate prefilter with the charcoal cartridge. If a radioactivity concentration above normal background level is detected ~~at~~ *unit* ~~of a unit's capability is lost~~, the monitor will initiate a shutdown of the normal duty supply fans, ~~and will place the~~ *unit's* ventilation dampers in their recirculation mode, and start the ~~unit's~~ *unit's* Control Room Emergency Ventilation System (CREVS) supply fan. 24

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.,  $\pm$  [rack calibration + comparator setting accuracy]). 11

INSERT  
B 3.3-133B

The trip setpoints used in the bistables are based on the analytical limits derived from the FSAR, Section 14.1 (Ref. 1). The selection of these trip setpoints indicates that adequate protection is provided when all sensor and processing time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, and instrument drift, Allowable Values specified in LCO 3.3.16 are conservatively adjusted with respect to the analytical limits. A detailed description of the methodology used to calculate the trip setpoints, including their explicit uncertainties, is provided in the "Unit Specific Setpoint Methodology" (Ref. 2). The actual nominal trip setpoint

(continued)

**<INSERT B 3.3-133A>**

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.

**<INSERT B3.3-133B>**

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 basis are provided in the ANO Unit 2 SAR, Section 6.4 (Ref. 1).

Control Room Isolation—High Radiation  
B 3.3.16

BASES

BACKGROUND

Trip Setpoints and Allowable Values (continued)

entered into the bistable is more conservative than that specified by the Allowable Value to account for changes in random measurement errors that are detectable by a CHANNEL FUNCTIONAL TEST. One example of a change in measurement error is drift during the surveillance interval. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.

11

APPLICABLE SAFETY ANALYSES

INSERT  
B 3.3-134A

The CREVS is isolated when a reactor building high pressure Engineered Safety Feature Actuation System signal or a high radiation signal is received. For the first 4 days following a loss of coolant accident, the CREVS is operated in the total recirculation mode. Four days after the start of the accident, the CREVS is started in the intake and recirculation mode and continues to operate in this mode for 30 days. This intake slightly pressurizes the control room. In both cases, the air flows through charcoal filters that are 95% efficient for elemental, particulate, and organic materials. The high radiation function only performs the initial isolation function to begin the recirculation mode of operation.

24

The Control Room Isolation—High Radiation satisfies Criterion 3 of the NRC Policy Statement 10 CFR 50.26 (Ref. 2).

33

LCO  
INSERT  
B 3.3-134B

procedures.

as-found

The trip setpoint for this parameter does not include additional allowances for instrument uncertainty. Therefore, the trip setpoint and Allowable Value are the same

Only the Allowable Value is specified for each Control Room Isolation—High Radiation trip function in the LCO. Nominal trip setpoints are specified in the unit specific setpoint calculations. The nominal setpoints are selected to ensure the setpoint measured by the CHANNEL FUNCTIONAL TEST does 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 is 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

24

11

edit

edit

11

(continued)

**<INSERT B3.3-134A>**

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.

**<INSERT B3.3-134B>**

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).

Control Room Isolation—High Radiation  
B 3.3.16

BASES

LCO  
(continued)

uncertainties are defined in the "Unit Specific Setpoint Methodology" (Ref 2).

At this unit, the basis for the Allowable Value is as follows.

11

APPLICABILITY

The control room isolation capability on high radiation shall be OPERABLE whenever there is a chance for an accidental release of radioactivity. This includes MODES 1, 2, 3, 4, 5, and 6] (and during CORE ALTERATIONS] and MODES and conditions during movement of irradiated fuel assemblies. If a radioactive release were to occur during any of these conditions, the control room would have to remain habitable to ensure reactor shutdown and cooling can be controlled from the main control room.

in any MODE.

capability

continued

24

ACTIONS

A.1

inoperability

one channel of

Condition A applies to failure of the Control Room Isolation—High Radiation function in MODE 1, 2, 3, or 4.

INSERT  
B 3.3-135A

With both channels of Control Room Isolation—High Radiation inoperable, the CREVS must be placed in a condition that does not require the isolation to occur. To ensure that the ventilation system has been placed in a state equivalent to that which occurs after the high radiation isolation has occurred, one OPERABLE train of the CREVS is placed in the emergency recirculation mode of 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.

with

i.e.,

The Required Action is modified by a Note, which requires the CREVS be placed in the toxic gas protection mode if automatic transfer to the toxic gas protection mode is inoperable, since the pressurization mode would increase vulnerability to toxic gas releases.

8

9

(continued)

**<INSERT B3.3-135A>**

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.

BASES

ACTIONS  
(continued)

C 10.1 and C 10.2

the emergency

If the CREVS cannot be placed into 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.

H (B)  
H (24)

D 10.1, D 10.2.1, and D 10.2.2

Required Action D 10.1 is the same as discussed earlier for Condition A, except for Completion Time. If the CREVS cannot be placed into recirculation mode during CORE ALTERATIONS or while moving irradiated fuel assemblies, then Required Action C 10.2.1 and Required Action C 10.2.2 suspend actions that could lead to an accident that could release radioactivity resulting from a fuel handling accident.

D 2

H (B)  
H (24)

irradiated fuel

Required Action C 10.2.1 and Required Action C 10.2.2 place the core 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 reactor 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" for Required Action C 10.2.1 and Required Action C 10.2.2 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.

H (24)

edit

handling area

Note that in certain circumstances, such as fuel handling in the fuel building during power operation, both Condition A and Condition C may apply in the event of channel failure.

H (B)

(continued)

BASES (continued)

SURVEILLANCE  
REQUIREMENTS

SR 3.3.16.1

provides reasonable assurance for prompt identification of

~~SR 3.3.16.1 is the performance of a CHANNEL CHECK for the Control Room Isolation—High Radiation actuation instrumentation once every 12 hours (to ensure 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.~~

edit

24

edit

Performance of the CHANNEL CHECK helps ensure 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. If the radiation monitor uses keep alive sources or check sources operated from the control room, the CHANNEL CHECK should also note the detector's response to these sources.

24

Acceptance

Acceptance 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 criteria, it is an indication that the channels are OPERABLE. The frequency ~~about once every shift~~ is based on operating experience that demonstrates channel failure is rare. ~~[At this unit, the following administrative controls and design features (e.g., downscale alarms) immediately alert operators to loss of function.]~~

24

34

edit

SR 3.3.16.2

A Note ~~allows~~ a channel ~~to~~ <sup>inoperable</sup> being OPERABLE for up to 3 hours ~~while bypassed for surveillance testing. The Note allows channel bypass for testing without detuning it as inoperable, although during this time period it cannot actuate a control room isolation. This is based on the~~

edit

entering the associated Conditions and Required Actions

(continued)

BASES

SURVEILLANCE  
REQUIREMENTS

SR 3.3.16.2 (continued)

average time required to perform channel surveillance. It is not acceptable to ~~continually~~ remove channels from service for more than 3 hours to perform required surveillance testing, without declaring the channel inoperable.

edit

31

SR 3.3.16.2 is the performance of a CHANNEL FUNCTIONAL TEST once every ~~92~~ 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 ~~assumptions of the current unit specific~~ setpoint requirements. analysis.

10

11

INSERT  
B 3.3-138A

The justification of a 92 day Frequency, in view of the fact that there is only one channel, is Draft NUREG-166 (Ref. 3).

10

SR 3.3.16.3

This SR requires the performance of a CHANNEL CALIBRATION with a setpoint Allowable Value of < 125 mR/hr to ensure that the instrument channel remains operational with the correct setpoint. This test is a complete check of the instrument loop and the transmitter.

11

edit

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 unit specific setpoint analysis. at least requirements.

11

The Frequency is based on the assumption of an ~~18~~ month calibration interval in the determination of the magnitude of equipment drift (in the setpoint analysis) and is consistent with the typical refueling cycle.

11

(continued)

**<INSERT B3.3-138A>**

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.

Control Room Isolation—High Radiation  
B 3.3.16

BASES (continued)

REFERENCES

1. ~~ASAR~~, Section ~~[14.1]~~ <sup>ANJO-2</sup> 6.4. edit
2. ~~Unit Specific Setpoint Methodology.~~ <sup>10 CFR 50.36.</sup> (33)
- ~~Draft NUREG-1366.~~ edit

12

B 3.3 INSTRUMENTATION

B 3.3.15 Post Accident Monitoring (PAM) Instrumentation

12

BASES

BACKGROUND

monitor and

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 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 ~~Events~~ Accidents (DBAs).

edit

edit

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.

in SAR Table 7-11A

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 by ~~Unit Specific Documents~~ (Ref. 1) addressing the recommendations of Regulatory Guide 1.97 (Ref. 2) as required by Supplement 1 to NUREG-0737 (Ref. 3).

edit

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.

specified

edit

Type A variables are ~~included in this LCO~~ 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)~~ Accidents (DBAs).

edit

~~the list of Type A variables widely differs between units, Table 3.3.17-1 in the accompanying LCO contains only those examples of Type A variables that may also be Category I.~~

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;

(continued)

**BASES**

**BACKGROUND  
(continued)**

- 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 <sup>also</sup> identified by <sup>in SAR Eble 7-11A</sup> unit specific Regulatory Guide 1.97 analysis (Ref. 1). This analysis identifies the unit specific Type A and Category I variables and provides justification for deviating from the NRC proposed list of Category I variables.

Reviewer's Note: Table 3.3.17-1 provides a list of variables typical of those identified by a unit specific Regulatory Guide 1.97 analysis (Ref. 1). Table 3.3.17-1 in unit specific Technical Specifications shall list all Type A and Category I variables identified by the unit specific Regulatory Guide 1.97 analysis, as amended by the NRC's Safety Evaluation Report (SER).

The specific instrument functions listed in Table 3.3.17-1 are discussed in the LCO Section.

edit

edit

**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 <sup>abnormal and</sup> emergency operating procedures. These variables <sup>are restricted</sup> 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;

(continued)

**BASES**

**APPLICABLE SAFETY ANALYSES (continued)**

- 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 7.34 (Ref 4) documents the results of the (the unit specific) Regulatory Guide 1.97 analysis (documents) (the process that) identifies Type A and Category I non-type A variables. (which) (d)

edit

In MODE 1

10 CFR 50.36 (Ref. 5)

In MODES 2, and 3

PAH instrumentation that meets the definition of Type A in Regulatory Guide 1.97 satisfies Criterion 3 of (The NRC) (Policy Statement) 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

33

Criterion 4 of 10CFR 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. (More than two channels may be

INSERT B 3.3-142A

required at some units if the Regulatory Guide 1.97 analysis determines that failure of one accident monitoring channel results in information ambiguity (i.e., the redundant displays disagree) that could lead operators to defeat or to fail to accomplish a required safety function.)

26

reactor building

The exception to the two channel requirement is (containment) isolation valve position. In this case, the important information is the status of the (containment) penetrations. The LCO requires one position indicator for each (active automatic) (containment) isolation valve. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve

18

(continued)

**<INSERT B3.3-142A>**

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.

BASES

LCO  
(continued)

and prior knowledge of the passive valve or via system boundary status. If a normally active ~~containment~~ 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))

edit

Each of the following list is a discussion of the specified instrument functions listed in Table 3.3.15-1. These discussions are intended as examples of what should be provided for each function when the unit specific list is prepared. are discussed below:

edit

1. Wide Range Neutron Flux

a Type B, Category I variable

Wide Range Neutron Flux indication is provided to verify reactor shutdown. For this unit, the Wide Range Neutron Flux channels consist of the following:

edit

INSERT  
B 3.3-143A

2B

including determining when to secure reactor coolant pumps following a LOCA:

2. Reactor Coolant System (RCS) Hot and Cold Leg Temperature

15

RCS Hot and Cold Leg Temperature instrumentation Category I variable provided for verification of core cooling and long term surveillance. Reactor outlet temperature inputs of the RCS are provided by two fast response resistance elements and associated transmitters in each loop. The channels provide indication over a range of 22°F to 700°F.

edit

INSERT  
B 3.3-143B

26

INSERT  
B 3.3-143C

4. RCS Pressure (Wide Range)

16

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 outside the RB. Redundant monitoring capability is provided by two channels (pairs) of instrumentation. Control room indications are provided through the inadequate core cooling plasma display. The inadequate core cooling plasma

26

(continued)

**<INSERT B3.3-143A>**

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).

**<INSERT B3.3-143B>**

The two channels provide readout on one indicator and one recorder and on the SPDS.

**<INSERT B3.3-143C>**

3. **RCS Hot Leg Level**

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.

Consisting of one indicator and one recorder, and the SPDS

BASES

LCO

4. RCS Pressure (Wide Range) (continued)

This control room

display 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.

(26)

Category I

edit

In some units, RCS Pressure is a Type A 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. For some small break LOCAs, low pressure injection (LPI) may actuate with system pressure stabilizing above the shutoff head of the LPI pumps. If this condition exists, the operator is instructed to verify HPI flow and then terminate LPI flow prior to exceeding 30 minutes of LPI pump operation against a deadhead pressure. RCS Pressure, in conjunction with LPI flow, is also used to determine if a core flood line break has occurred.

(26)

5. Reactor Vessel Water Level

a Type B, Category I variable and is

edit

an indication

Reactor Vessel Water Level instrumentation is provided for verification and long term surveillance of core cooling. The reactor vessel level monitoring system provides a direct measurement of the collapsed liquid level above the fuel alignment plate. The collapsed level represents the amount of liquid mass that is in the reactor vessel above the core. Measurement of the collapsed water level is selected because it is a direct indication of the water inventory.

(26)

The collapsed level is obtained over the same temperature and pressure range as the saturation measurements, thereby encompassing all operating and accident conditions where it must function. Also, it functions during the recovery interval. Therefore, it is designed to survive the high steam temperature that may occur during the preceding core recovery interval.

(continued)

BASES

LCO

5. Reactor Vessel Water Level (continued)

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 alignment plate. 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.

edit

fuel

INSERT  
B3.3-145A

For this unit, the Reactor Vessel Water Level channels consist of the following:

(26)

6. Containment Sump Water Level (Wide Range)

Reactor Building

Containment Sump Water Level (Wide Range) instrumentation is provided for verification and long term surveillance of RCS integrity. For this unit, the Containment Sump Water Level instrumentation consists of the following:

(17)

edit

(26)

INSERT  
B3.3-145B

7. Containment Pressure (Wide Range)

Reactor Building

Containment Pressure (Wide Range) instrumentation is provided for verification of RCS and CONTAINMENT OPERABILITY. For this unit, Containment Pressure instrumentation consists of the following:

reactor building

(17)

edit

INSERT  
B3.3-145C

8. Containment Isolation Valve Position

a. Type B, Category I variable and is

(26)

(17)

edit

(18)

Automatic Reactor Building

Automatic Reactor Building  
Isolation Valve Position

reactor building

PCIV position is provided for verification of containment integrity. In the case of PCIV position, the important information is the isolation status of the containment penetration. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each ACTIVE PCIV in a containment penetration flow path, i.e., two total channels of PCIV position indication for a penetration flow path with two ACTIVE valves. For containment

automatic isolation valve

automatic

reactor building

(continued)

(26)

**<INSERT B3.3-145A>**

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.

**<INSERT B3.3-145B>**

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.

**<INSERT B3.3-145C>**

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).

12

BASES

Automatic Reactor Building

LCO

8. ~~Containment~~ Isolation Valve Position (continued)

penetrations with only one ~~active PIV~~ <sup>automatic valve</sup> having control room indication, Note (b) requires a single channel of valve position indication to be OPERABLE. This is sufficient to ~~redundantly~~ verify the isolation status of each isolable penetration via indicated status of the ~~active~~ valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration flow path is isolated, position indication for the ~~PIVTS~~ 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. ~~For this plant, the PIV position PAM instrumentation consists of the following:~~

automatic

isolation valves

INSERT B3.3-146A

INSERT B3.3-146B

Reactor Building

INSERT B3.3-146C

9. ~~Containment~~ Area Radiation (High Range)

~~Containment~~ Area Radiation (High Range) instrumentation 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. ~~For this unit, the Containment Area Radiation instrumentation consists of the following:~~

a Type E, Category I variable and is

INSERT B3.3-146C

10. ~~Containment~~ Hydrogen Concentration

~~Containment~~ Hydrogen Concentration instrumentation is provided to detect high hydrogen concentration conditions that represent a potential for ~~containment~~ breach. This variable is also important in verifying the adequacy of mitigating actions. ~~For this unit, the Containment Hydrogen Concentration instrumentation consists of the following:~~

Reactor Building

and the need to initiate hydrogen control measures such as hydrogen purge.

INSERT B3.3-146D

11. Pressurizer Level

Pressurizer Level instrumentation is used 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

in combination with other system parameters

(continued)

17  
18  
26

edit  
26

18  
26

17  
26

a Type A, Category I variable and is  
edit  
17  
26

a reactor building  
edit

**<INSERT B3.3-146A>**

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.

**<INSERT B3.3-146B>**

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.

**<INSERT B3.3-146C>**

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.

**<INSERT B3.3-146D>**

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.

BASES

LCO

11. Pressurizer Level (continued)

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. ~~(For this unit)~~ the Pressurizer Level instrumentation consists of the following:

INSERT  
B3.3-147A

26

and to determine the affected SG for isolation following a SGTR event.

12. Steam Generator Water Level

a Type A, Category I variable

Steam Generator Water Level instrumentation is provided to monitor operation of ~~(RCS)~~ heat removal via the SG. The indication of SG level is the ~~provided by~~ extended start-up range level instrumentation, covering a span of 6 inches to ~~393~~ inches above the lower tubesheet. The measured differential pressure is displayed in inches of water at 68°F. Temperature compensation for this indication is performed manually by the operator. Redundant monitoring capability is provided by two trains of instrumentation. The uncompensated level signal is input to the unit computer, a control room indicator, and the Emergency Feedwater (EFW) Control System.

low range and high

INSERT  
B3.3-147B

edit

19

high range

reflux boiling

INSERT  
B3.3-147C

SG level indication is used by the operator to manually raise and control SG level to establish ~~(boiler condenser)~~ heat transfer. Operator action is initiated on a loss of subcooled margin. Feedwater flow is increased until the indicated extended start-up range level reaches ~~(the boiler condenser)~~ setpoint.

19

20

14. Condensate Storage Tank (CST) Level

a Type A, Category I variable and is

readily available, Condensate quality

~~(CST)~~ Level instrumentation is provided to ensure a water supply for EFW. ~~The CST provides the assured, safety grade water supply for the EFW System. The CST consists of two identical tanks connected by a common outlet header. Inventory is monitored by a 0-60 to 30 feet level indication for each tank. (CST) Level is displayed on a control room indicator, set to chart, and one recorder, and unit computer. In addition, a control room annunciator alarms on low level.~~

edit

30 feet

and on the SPDS.

26

(continued)

**<INSERT B3.3-147A>**

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).

**<INSERT B3.3-147B>**

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.

**<INSERT B3.3-147C>**

**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.

15 12

BASES

LCO

14. Condensate Storage Tank (CST) Level (continued)

INSERT  
B 3.3-148A

CST Level is the primary indication used by the operator to identify loss of CST volume and replenish the CST or align suction of the EFW pumps from the hotwell.

to the safety related source, i.e., service water.

16. Core Exit Temperature 26

INSERT  
B 3.3-148E

Core Exit Temperature is provided for verification and long term surveillance of core cooling. An evaluation was made of the minimum number of valid core exit thermocouples (CETs) necessary for inadequate core cooling detection. The evaluation determined the reduced complement of CETs necessary to detect initial core recovery and to trend the ensuing core heatup. The evaluations account for core nonuniformities and cold leg injection. Based on these evaluations, adequate or inadequate core cooling detection is ensured with two sets of five valid CETs.

The subcooling margin monitor takes the average of the five highest CETs for each of the ICCM trains. Two channels ensure that a single failure will not disable the ability to determine the representative core exit temperature.

is a Type D, Category I variable and is

17. Emergency Feedwater Flow

INSERT B 3.3-148C

EFW Flow instrumentation is provided to monitor operation of heat removal via the SGs. The EFW Flow to each SG is determined from a differential pressure measurement calibrated to a span of 0 gpm to 900 gpm. Redundant monitoring capability is provided by two independent trains of instrumentation for each SG. Each differential pressure transmitter provides an input to a control room indicator and the unit computer.

OVER A RANGE

900

INSERT  
B 3.3-148D

EFW Flow is the primary indication used by the operator to determine the need to throttle flow during an SLB accident to prevent the EFW pumps from operating in runout conditions. EFW Flow is also used by the operator to verify that the EFW System is

(continued)

**<INSERT B3.3-148A>**

**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 is the level instrument tap, which is approximately 5 inches above the bottom of the tank.

**<INSERT B3.3-148B>**

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.

**<INSERT B3.3-148C>**

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.

**<INSERT B3.3-148D>**

(four indicators total) and to the SPDS. Flow measurement to each steam generator is considered a separate Function of PAM Instrumentation.

BASES

LCO

17/8

Emergency Feedwater Flow (continued)

INSERT  
B 3.3-149A

delivering the correct flow to each SG. However, the primary indication used by the operator to ensure an adequate inventory is SG level.

26

22

edit

RCS pressure is used by the operator to monitor the cooldown of the RCS following an SG tube rupture or small break LOCA. In addition, HPI flow is throttled based on RCS pressure, and subcooled margin. The indication is also used to identify an LPI pump operating at system pressures above its shutoff head. If this condition exists, the operator is instructed to verify this condition exists, to verify HPI flow, and to terminate LPI flow prior to exceeding 30 minutes of LPI pump operation against a deadhead pressure. RCS pressure, in conjunction with LPI flow, is also used to determine if a core flood line break has occurred.

may be

26

INSERT  
B 3.3-149B

23

APPLICABILITY

for safe shutdown and to determine that safety systems are performing their intended function when required.

The PAM instrumentation LCO is applicable in MODES 1, 2, and 3. These variables are related to the diagnosis and preplanned actions required to mitigate DBAs. The applicable DBAs are assumed to occur in MODES 1, 2, and 3. 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

edit

(continued)

**<INSERT B3.3-149A>**

**18, 19. High and 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.

**<INSERT B3.3-149B>**

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.

12

BASES

ACTIONS  
(continued)

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.

19  
20  
22

A.1  
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 or, in the case of a Function that has only one required channel, other non-Regulatory Guide 1.97 instrument channels to monitor the Function, 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.

edit

B.1

INSERT  
B3.3-150A

INSERT  
B3.3-150B

INSERT  
B3.3-150C

Required Action B.1 specifies initiation of actions described in Specification 5.6.8, that requires a written report to be submitted to the NRC. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. 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 ensures the requirements of Specification 5.6.8 are initiated.

13

13

28

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

(continued)

**<INSERT B3.3-150A>**

actions to prepare and submit a Special Report

**<INSERT B3.3-150B>**

The Special Report is to be submitted in accordance with 10 CFR 50.4 within 30 days of entering Condition B.

**<INSERT B3.3-150C>**

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.

BASES

ACTIONS

C.1 (continued)

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 ~~risk~~ that the PAM Function will be ~~in a degraded condition~~ should an accident occur.

probability

Unavailable

edit

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 ~~and the availability of alternative means to obtain the required information.~~ Continuous operation with two required channels inoperable is not acceptable because alternate indications are not available.

26

E.1

Required Action E.1 directs entry <sup>15</sup> into the appropriate Condition referenced in Table 3.3.1-1. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met ~~any~~ Required Action of Condition C or D, as applicable, ~~and the associated completion time has expired.~~ Condition E is entered for that channel and provides for transfer to the appropriate subsequent Condition.

and associated Completion Time

the

12

edit

F.1

If the Required Action and associated Completion Time of Conditions C or D are not met and Table 3.3.1-1 directs entry into Condition F, the unit must be brought to a MODE in which the requirements of this LCO do not apply. To

12

(continued)

**BASES**

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**ACTIONS**

**E.1 (continued)**

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.

INSERT  
B3.3-152A

**6.1**

At this unit, alternative means of monitoring Containment Area Radiation have been developed and tested. These alternative means may be temporarily installed if the normal PAM channel cannot be restored to OPERABLE status within the allowed time.

If these alternative means are used, the Required Action is not to shut the unit down, but rather to follow the directions of Specification 5.6.8, in the Administrative Controls section of the Technical Specifications. The report provided to the NRC should discuss the alternative means used, describe the degree to which the alternative 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.

In the case of reactor vessel level, Reference 4 determined that the appropriate Required Action was not to shut the unit down, but rather to follow the directions of Specification 5.6.8.

At this unit, the alternative monitoring provisions consist of the following:

28

**SURVEILLANCE  
REQUIREMENTS**

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

12

(continued)

**<INSERT B3.3-152A>**

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.

12

BASES

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.3.15.1

12

edit

provides reasonable assurance for prompt identification of

Performance of the CHANNEL CHECK once every 31 days for each required instrumentation channel that is normally energized ~~ensures that~~ a gross failure of instrumentation ~~has not occurred~~. 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. ~~If the radiation monitor uses keep alive sources or check sources OPERABLE from the control room,~~ the CHANNEL CHECK should also note the detector's response to the ~~sources~~. ~~keep alive~~

reactor building in-range

For

26

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 verified to be reading at the bottom of the range and not failed downscale. ~~keep alive~~

edit

, where practical,

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.

(continued)

12

BASES

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.3.15.2

12

edit

A CHANNEL CALIBRATION is performed every 18 months, approximately at every refueling. 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.

INSERT  
B3.3-154A

A Note clarifies that the neutron detectors are not required to be tested as part of the CHANNEL CALIBRATION. 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. Changes in detector sensitivity are compensated for by performing the daily calorimetric calibration and the monthly axial channel calibration.

26

Reactor Building

For the Containment 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.

INSERTS  
B3.3-154B  
B3.3-154C

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

at least

26

30

REFERENCES

1. [Unlabeled Specific Documents (e.g., FSAR, NRC Regulatory Guide 1.9, SER letter).] SAR, Table 7-11A.
2. Regulatory Guide 1.97.
3. NUREG-0737, 1979.
4. 32-117256-00, "Technical Basis for Reactor Vessel Level Indication System (RVLIS) Action Statement," April 10, 1990. SAR, Section 7.3.4.

edit

edit

5. 10 CFR 50.36.

33

**<INSERT B3.3-154A>**

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.

**<INSERT B3.3-154B>**

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

**<INSERT B3.3-154C>**

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