May 31, 2011

Comanche Peak Nuclear Power Plant, Units 3 & 4
COL Application

Part 4

Technical Specifications Revision 1

Update Tracking Report

Revision 2

Revision History

Revision	Date	Update Description
-	11/20/2009	COLA Revision 1 Transmittal See Luminant Letter no. TXNB-09074 Date 11/20/2009
-	11/11/2009	Updated Chapters: Introduction, Specifications, Bases See Luminant Letter no. TXNB-09064 Date 11/11/2009 Incorporated responses to following RAIs: No. 90, 91
-	12/16/2009	Updated Chapters: Specifications, Bases See Luminant Letter no. TXNB-09081 Date 12/16/2009 Incorporated responses to following RAIs: No. 121
0	1/8/2010	Updated Chapters: Introduction, Specifications, Bases
-	4/5/2010	Updated Chapters: Specifications, Bases See Luminant Letter no. TXNB-10028 Date 4/5/2010 Incorporated responses to following RAIs: No. 149
1	7/7/2010	Updated Chapters: Specifications, Bases
2	5/31/2011	Updated Chapters: Introduction, Specifications, Bases

Introduction

Introduction – Tracking Report Revision List

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL2_16-16	Section A	1, 2, 3, 5	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted COL Items CP COL 16.1_3.3.1 (1), CP COL 16.1_3.3.2(1), CP COL 16.1_3.3.5(1), and CP COL 16.1_3.3.6(1).	-
RCOL2_16-15	Section A	6	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added the additional justification for CP COL 16.1_3.3.5 (1).	-
RCOL2_16-16	Section A	14, 15	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added CP COL 16.1_5.5.21 (1) “Setpoint Control Program Methodology and Implementation”, replaced “CP SUP 16.1_5.5.21 (1)” with “CP SUP 16.1_5.5.22 (1)”, and replaced referred section 5.5.21 with 5.5.22.	-
MAP-16-201	Section A	6, 13, 16	Consistency with DCD Rev.2 Incorporate editorial relevant changes from Chapter 16 of DCD Revision 2	Deleted CP COL 16.1_3.4.17(1), CP COL 16.1_5.5.9(1), CP COL 16.1_5.6.7(1),	0
MAP-16-302	Section A	6	Consistency with DCD Revision 3	Indicated that LCO 3.7.9 and associated basis are conceptual design information	2
CTS-01273	Section A	7 [8]	Correction	Added description of adding PSTS wording regarding bases for MCREFS actuation and surveillance requirements.	2

MAP-16-301	Section A	8 [9]	Incorporate the DCD Chapter 16 changes that are relevant for Part 4 changes	Inserted sections to address the bracketed word [four] in specifications 3.9.4 and 3.9.5.	2
MAP-16-301	Section A	9 [10]	Incorporate the DCD Chapter 16 changes that are relevant to Part 4 changes	Delete description on COL_16.1_4.3.1(1)	2
CTS-01274	Section A	10 [12]	Erratum	Editorial correction	2
CTS-01275	Section A	11, 12 [13]	Correction	Corrected TS wording that were not consistent with the DCD TS.	2
MAP-16-302	Section A	14 [16]	Consistency with DCD Revision 3	Changed COL Applicant Item "CP COL 16.1 5.5.21(1)" to Supplementary Item "CP SUP 16.1 5.5.21(1)" to be consistent with DCD	2

*Page numbers for the attached marked-up pages may differ from the revision 1 page numbers due to text additions and deletions. When the page numbers for the attached pages do differ, the page number for the attached page is shown in brackets.

The purpose of loss of voltage protection is to protect voltage sensitive loads, such as motors, whenever the bus voltage drops below the acceptable value. For equipment protection, only a short time is allowed to give the grid a chance to recover. Since the transmission system for Units 3 and 4 is provided by the same Transmission Service Provider and associated with the same power pool as Units 1 and 2, the setting of loss of voltage protection of Units 1 and 2 was duplicated. RCOL2_16-15

The purpose of degraded voltage protection is to assure that the plant equipment is not impacted by voltage degradation in the local grid (no faults present). Therefore a longer time is allowed to give the grid a chance to recover. Since all Comanche Peak Units are equipped with similar plant equipment, the setting of degraded voltage protection of Units 1 and 2 was duplicated.

~~CP COL 16.1_3.4.17(1)~~
~~Steam Generator (SG) Tube Integrity~~ MAP-16-201

~~US-APWR TS Wording in DCD~~
~~LCO 3.4.17 and associated Bases discuss steam generator tube repairs in [ ].~~

~~PSTS Wording~~
~~The discussion of steam generator tube repairs specified in [ ] was deleted from LCO 3.4.17 and associated Bases.~~

~~Justification~~
~~Establishes consistency with changes to "5.5.9 Steam Generator (SG) Program".~~

CP COL 16.1_3.7.9(1)
Ultimate Heat Sink

US-APWR TS Wording in DCD
~~The bracketed information in LCO 3.7.9 of the US-APWR TS reads:~~ MAP-16-302
~~3.7.9 Ultimate Heat Sink (UHS)~~
~~[Not applicable to US-APWR Design Certification. Site-specific information to be provided by COL Applicant.]~~All of design data and description related site specific design are in CDI brackets.

~~The bracketed information in B 3.7.9 of the US-APWR TS reads:~~
~~B 3.7.9 Ultimate Heat Sink (UHS)~~
~~[Not applicable to US-APWR Design Certification. Site-specific information to be provided by COL Applicant.]~~

PSTS Wording
Delete or replace the bracketed information in LCO 3.7.10 and associated Bases to reflect the result of control room habitability analysis for CPNPP Units 3 and 4.

Add Bases for MCREFS actuation and Surveillance Requirements to reflect the result of control room habitability analysis for CPNPP Units 3 and 4 at the end of third paragraph of APPLICABLE SAFETY ANALYSES. CTS-01273

Justification:
LCO and Bases for 3.7.10, "Main Control Room HVAC System" was revised to incorporate the site-specific information.

CP COL 16.1_3.8.4(1)
DC Sources - Operating

US-APWR Wording in DCD
The value of battery float current placed in brackets [ ].

PSTS Wording
The brackets [ ] on the value of battery float current were removed.

Justification
The battery float current is decided in accordance with a specification of a vender. The battery which can satisfy this current specification will be installed.

CP COL 16.1_3.8.5(1)
DC Sources - Shutdown

US-APWR TS Wording in DCD
The value of battery float current placed in brackets [ ].

PSTS Wording
The brackets [ ] on the value of battery float current were removed.

Justification
The battery float current is decided in accordance with a specification of a vender. The battery which can satisfy this current specification will be installed.

CP COL 16.1_3.8.6(1)
Battery Parameters

US-APWR TS Wording in DCD
The values of battery float current placed in brackets [ ].

PSTS Wording
The brackets [ ] on the value of battery float current were removed.

Justification
The battery float current is decided in accordance with a specification of a vender. The battery which can satisfy this current specification will be installed.

CP SUP 16.1_3.9.4(1) MAP-16-301
Containment Penetrations

US-APWR TS Wording in DCD
The number of bolts placed in brackets [ ].

PSTS Wording
The brackets [ ] on the number of bolts were removed.

Justification
The number of bolts is determined in accordance with a site specific design. The bolts which can satisfy this current design will be installed.

CP SUP 16.1_3.9.5(1)
Residual Heat Removal (RHR) and Coolant Circulation - High Water Level

US-APWR TS Wording in DCD
The number of bolts placed in brackets [ ].

PSTS Wording
The brackets [ ] on the number of bolts were removed.

Justification
The number of bolts is determined in accordance with a site specific design. The bolts which can satisfy this current design will be installed.

CP COL 16.1_4.1(1)
Site Location

US-APWR TS Wording in DCD
The bracketed information in Section 4.1, “Site Location” of the US-APWR TS reads:
[Text description of site location.]

PSTS Wording
Replace the bracketed information in Section 4.1 of the US-APWR TS with the following:

The site area is approximately 7,700 acres located in Somerveil County in North Central Texas. Squaw Creek Reservoir extends into Hood County. The site is situated along Squaw Creek, a tributary of the Paluxy River, which is a tributary of the Brazos River. The site is over 30 miles southwest of the nearest point in Fort Worth and approximately 4.5 miles north-north-west of Glen Rose, the nearest community.

Justification:
Bracketed information is replaced to establish the site location for CPNPP Units 3 and 4 consistent with the site location identified in FSAR Chapter 2.

~~CP COL 16.1_4.3.1(1)~~ MAP-16-301
~~Fuel Storage~~

~~US-APWR TS Wording in DCD~~
~~The bracketed information in Section 4.3.1, "Criticality" of the US-APWR TS reads:~~
~~c. keff ≤ 0.95 if fully flooded with water borated to [200] ppm which includes an allowance for uncertainties, and~~

~~PSTS Wording~~
~~Removed the bracket in Section 4.3.1 of the US-APWR TS as the following:~~
~~c. keff ≤ 0.95 if fully flooded with water borated to 200 ppm which includes an allowance for uncertainties, and~~

~~Justification:~~
~~The boron concentration of 200 ppm was evaluated based on the spent fuel pit (SFP) specification described in FSAR Chapter 9.~~

CP COL 16.1_5.1.1(1)
Responsibility

US-APWR TS Wording in DCD
The bracketed information in Section 5.1.1 of the US-APWR TS reads:
The [plant manager] shall be responsible for overall unit operation and shall delegate in writing the succession to this responsibility during his absence.
The [plant manager] or his designee shall approve, prior to implementation, each proposed test, experiment or modification to systems or equipment that affect nuclear safety.

PSTS Wording
Removed the bracket in Section 5.1.1 of the US-APWR TS as the following:

US-APWR TS Wording in DCD

The bracketed information in Section 5.2.1.a of the US-APWR TS reads:

These requirements including the plant-specific titles of those personnel fulfilling the responsibilities of the positions delineated in these Technical Specifications shall be documented in the [FSAR/QA Plan],

b. The [plant manager] shall be responsible for overall safe operation of the plant and shall have control over those onsite activities necessary for safe operation and maintenance of the plant,

PSTS Wording

Replace the bracketed information in Section 5.2.1.a of the US-APWR TS with the following:

These requirements including the plant-specific titles of those personnel fulfilling the responsibilities of the positions delineated in these Technical Specifications shall be documented in the FSAR.~~,”~~ CTS-01274

b. The plant manager shall be responsible for overall safe operation of the plant and shall have control over those onsite activities necessary for safe operation and maintenance of the plant.~~,~~ CTS-01274

Justification:

These requirements are consistent with the organizational description in FSAR Chapter 13.

CP COL 16.1_5.2.2(1)
Unit Staff

US-APWR TS Wording in DCD

The information in Sections 5.2.2c and 5.2.2d of the US-APWR TS reads:

c. [A radiation protection technician] shall be on site when fuel is in the reactor. The position may be vacant for not more than 2 hours, in order to provide for unexpected absence, provided immediate action is taken to fill the required position.

~~d. Administrative procedures shall be developed and implemented to limit the working hours of personnel who perform safety-related functions (e.g., [licensed Senior Reactor Operators (SROs), licensed Reactor Operators (ROs), health physicists, auxiliary operators, and key maintenance personnel]).~~ CTS-01275

~~The controls shall include guidelines on working hours that ensure adequate shift coverage shall be maintained without routine heavy use of overtime.~~ CTS-01275

~~Any deviation from the above guidelines shall be authorized in advance by the [plant manager] or the [plant manager's] designee, in accordance with approved administrative procedures, and with documentation of the basis for granting the deviation. Routine deviation from the working hour guidelines shall not be authorized.~~

~~Controls shall be included in the procedures to require a periodic independent review be conducted to ensure that excessive hours have not been assigned.~~

~~e.~~d. The [operations manager or assistant operations manager] shall hold an SRO license.

PSTS Wording

Replace the information in Sections 5.2.2c and 5.2.2d of the US-APWR TS with the following:

c. A radiation protection technician and chemistry technician shall be on site when fuel is in the reactor. The positions may be vacant for not more than 2 hours, in order to provide for unexpected absence, provided immediate action is taken to fill the required positions.

~~d. Administrative procedures shall be developed and implemented to limit the working hours of personnel who perform safety-related functions (e.g., licensed Senior Reactor Operators (SROs), licensed Reactor Operators (ROs), radiation protection technicians, plant equipment operators, and key maintenance personnel).~~ CTS-01275

~~The controls shall include guidelines on working hours that ensure adequate shift coverage shall be maintained without routine heavy use of overtime.~~

~~Any deviation from the above guidelines shall be authorized in advance by the plant manager or the plant manager's designee, in accordance with approved administrative procedures, and with documentation of the basis for granting the deviation. Routine deviation from the working hour guidelines shall not be authorized.~~

~~Controls shall be included in the procedures to require a periodic independent review be conducted to ensure that excessive hours have not been assigned.~~

e. The ~~s~~Shift ~~o~~Operations ~~m~~Manager shall hold an SRO license.

CP SUP 16.1_5.5.21(1)
Setpoint Control Program Methodology and Implementation RCOL2_16-16 MAP-16-302

US-APWR TS Wording in DCD
US-APWR TS Section 5.5.21 includes bracketed references to the approved US-APWR Instrument Setpoint Methodology revision and the corresponding NRC Safety Evaluation date, as well as applicable ADAMS accession number.

PSTS Wording
The approved US-APWR Instrument Setpoint Methodology revision and corresponding NRC Safety Evaluation date, as well as applicable ADAMS accession number will be provided in a subsequent submittal to complete these brackets.

Justification
NRC approval of US-APWR Instrument Setpoint Methodology is pending.

CP SUP 16.1_5.5.~~21~~22(1)
Technical Requirements Manual (TRM)

US-APWR TS Wording in DCD
The US-APWR TS does not include an Administrative Control for the Technical Requirements Manual.

PSTS Wording
Administrative Control 5.5.~~21~~22 was added for the Technical Requirements Manual. RCOL2_16-16

Justification:
Establishes consistency with CPNPP Units 1 and 2 Technical Specifications.

CP COL 16.1_5.6.1(1)
Annual Radiological Environmental Operating Report

US-APWR TS Wording in DCD
In Section 5.6.1, the US-APWR TS does not include any notes.

PSTS Wording
In Section 5.6.1, a Note was added that states:

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Specifications

Specifications – Tracking Report Revision List

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL4_16-8	3.7.9	3.7.9-1	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Revised Completion Time of condition A to 72 hours.	-
RCOL4_16-4	3.7.9	3.7.9-1 3.7.9-2	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Condition B was divided into Condition B and new Condition C to address basin temperature and water level, respectively. Each Completion Time was revised respectively. In addition, the explanation of Condition B and new Condition C has been changed from "One or more UHS basins with …" to "One or more required UHS basins with …" Following Condition IDs were moved up due to new Condition C.	-
RCOL4_16-1	3.7.9	3.7.9-2	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Surveillance Requirement 3.7.9.5 was changed to verify start on manual actuation of each UHS transfer pump.	-
RCOL4_16-7	3.7.9	3.7.9-2	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Frequency of SR 3.7.9.5 was revised to "In accordance with the Surveillance Frequency Control Program".	-
RCOL4_16-5	3.7.9	3.7.9-2	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	SR 3.7.9.6 and SR 3.7.9.7 were newly added. The bases were also newly added.	-
RCOL4_16-9	4.1	4.0-1	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	The description of site location was revised to be consistent with FSAR subsection 2.1.1.1.	-
RCOL2_16-12	3.3.1	3.3.1-20 3.3.1-21	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Corrected the following editorial and reference errors in Note 1 and 2: 1. Overtemperature ΔT incorrectly specifies T and T' instead of T_{avg} and T_{avg0}, respectively. 2. Overpower ΔT incorrectly specifies T and T" instead of T_{avg} and T_{avg0}, respectively.	-

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev . of T/R
RCOL2_16-16	1.1	1.1-2	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added description about Channel Calibration.	-
RCOL2_16-16	3.1.9	3.1.9-3	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced "Table 3.3.1.1" with "Setpoint Control Program (SCP)"	-
RCOL2_16-16	3.3.1	3.3.1-13 through 3.3.1-18	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted "Allowance Values", "Trip Setpoint" and associated notes	-
RCOL2_16-16	3.3.1	3.3.1-19	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted "Allowance Value…[±9.4]% RTP (Core Exit Boiling Limit)"	-
RCOL2_16-16	3.3.1	3.3.1-21	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted "The Overpower…[±5.6]% RTP"	-
RCOL2_16-16	3.3.2	3.3.2-12 through 22	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted "Allowance Values" and "Trip Setpoint" and associated notes	-
RCOL2_16-16	3.3.5	3.3.5-2	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced "with Nominal Trip Setpoint and Allowance Value as follows" with "in accordance with the SCP with the following time delay" Deleted allowable value, setpoint and associated note.	-
RCOL2_16-16	3.3.6	3.3.6-4 through 3.3.6-5	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted "Allowance Values" and "Trip Setpoint" and associated notes	-

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL2_16-16	5.5	5.5-20 through 5.5-22	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added new Subsection 5.5.21 Setpoint Control Program (SCP)	-
RCOL2_16-16	5.5	5.5-22	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “5.5.21” with “5.5.22”	-
RCOL2_09.02.05-05	3.7.9	3.7.9-2	Response to RAI No. 121 Luminant Letter No. TXNB-09081 Date 12/16/2009	Revised surveillance requirement SR 3.7.9.1 and description for LCO to change the water level from 2,850,000 gallons to 2,800,000 gallons.	-
RCOL2_09.02.05-14	3.7.9	3.7.9-2	Response to RAI No. 121 Luminant Letter No. TXNB-09081 Date 12/16/2009	Revised water temperature for Surveillance Requirement SR 3.7.9.2 from 95 to 93 degrees F.	-
-	-	-	Consistency with DCD Rev.2 Incorporate editorial relevant changes from Chapter 16 of DCD Revision 2	Incorporate changes as describe in MHI Letter DCD Revision 2 # UAP-HF-09490 dated 10/27/2009	0
RCOL2_16-18	3.7.9	3.7.9-2	Response to RAI No. 149 Luminant Letter no.TXNB-10028 Date 4/5/2010	Reverted the surveillance frequency change for SR 3.7.9.5, which was made in Response to RAI No. 90 (RCOL2_16-7).	-
DCD_16-300	1.1	1.1-2 [1.1-3]	Reflect response to DCD RAI No. 520	Revised sentence to correct typographical error.	1
DCD_16-300	3.3.1	3.3.1-8	Reflect response to DCD RAI No. 520	Revised required action for condition T of RTS instrumentation.	1
MAP-16-202	3.3.3	3.3.3-4 3.3.3-5	Reflect responses to DCD Draft Open Items 16.4.6	Revised table regarding Post Accident Monitoring Instrumentation.	1

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
MAP-16-203	3.5.2	3.5.2-2	Reflect responses to DCD Draft Open Items 16.4.8	Added description about valves SIS-MOV-024A,B,C and D in SR 3.5.2.1	1
MAP-16-204	3.5.2	3.5.2-2	Reflect responses to DCD Draft Open Items 16.4.8	Incorporated surveillance requirement to verify the operability of ECCS valves which are manually activated during a design basis accident event.	1
CTS-01133	3.7.9	3.7.9-2	Erratum	Replaced "Condition A, B, or C …" with "Condition A, B, C, or D …" in description regarding CONDITION E.	1
MAP-16-205	3.8.1	3.8.1-1 3.8.1-2	Reflect responses to DCD Draft Open Items 16.4.11	Incorporated required action A.2	1
DCD_16-301	1.1 3.1.9 3.3.1 3.3.2 3.3.6 5.5	1.1-2 3.1.9-3 [3.1.9-2] 3.3.1-11 3.3.1-12 3.3.1-14 3.3.1-15 3.3.2-10 3.3.6-2 5.5-20 [5.5-21] [5.5-22]	Reflect response to DCD RAI No. 590	Incorporated changes as described in MHI Letter No. UAP-HF-09493	2
MAP-16-302	1.1 1.3 2.0 3.3.1 3.3.2 3.3.3 3.3.5 3.4.5 3.5.5 3.6.6 3.7.10	1.1-4 1.1-8 1.3-4 2.0-1 3.3.1-8 3.3.1-21 3.3.2-5 3.3.2-6 3.3.2-10 3.3.2-16 3.3.2-20 3.3.3-1 3.3.3-2 3.3.3-5 3.3.5-2 3.4.5-1 3.5.5-1 3.6.6-1 3.7.10-1	Consistency with DCD Revision 3	Editorial Changes	2

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
	3.8.1 3.8.9 3.9.5 4.0 5.2 5.5 5.6	3.8.1-9 3.8.1-10 3.8.1-13 3.8.1-15 3.8.4-2 3.8.9-3 3.9.5-1 4.0-1 5.2-1 5.5-1 5.5-3 5.5-21 5.5-22 5.6-1 5.6-5 5.7-3			
DCD_16-300	3.3.2	3.3.2-15 3.3.2-21	Reflect response to DCD RAI No. 520	Incorporated changes as described in MHI Letter No. UAP-HF-10048	2
DCD_19.01-1	3.4.8	3.4.8-1 3.4.8-2	Reflect response to DCD RAI No. 577	Incorporated changes as described in MHI Letter No. UAP-HF-10147	2
DCD_09.03.04-10	3.5.1 3.5.4	3.5.1-3 3.5.4-2	Reflect response to DCD RAI No.384	Incorporated changes as described in MHI Letter No.UAP-HF-09383	2
DCD_19.01-8	3.9.6	3.9.6-1 3.9.6-2 3.9.6-3	Reflect response to DCD RAI No.628	Incorporated changes as described in MHI Letter No. UAP-HF-10277	2
DCD_09.03.02-12	5.5	5.5-2	Reflect response to DCD RAI No.461	Incorporated changes as described in MHI Letter No. UAP-HF-09527	2
DCD_05.03.02	5.6	5.6-4	Reflect response to DCD RAI No. 588	Incorporated changes as described in MHI Letter No. UAP-HF-10169	2
CTS-01267	3.4.14 5.5	3.4.14-4 5.5-19	Erratum	Changed to correct editorial error	2
CTS-01276	3.4.12	3.4.12-3	Correction	SR 3.4.12.5 was changed to state the adoption of surveillance frequency control program	2

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev . of T/R
CTS-01277	3.6.3	3.6.3-7	Correction	SR 3.6.3.6 was changed to state the adoption of surveillance frequency control program	2

*Page numbers for the attached marked-up pages may differ from the revision 1 page numbers due to text additions and deletions. When the page numbers for the attached pages do differ, the page number for the attached page is shown in brackets.

1.1 Definitions

CHANNEL CALIBRATION

A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. The CHANNEL CALIBRATION shall encompass all devices in the channel required for channel OPERABILITY. CHANNEL CALIBRATION encompasses devices that are subject to drift between surveillance intervals and all input devices that are not tested through continuous automated self-testing. Refer to TADOT for output devices that are not tested through continuous automated self-testing.

The performance of a CHANNEL CALIBRATION shall be consistent with specification 5.5.2.1, “Setpoint Control Program” (SCP). RCOL2_16-16

For analog measurements on each Technical Specification required automatic protection instrumentation function implemented with a digital bistable function, CHANNEL CALIBRATION confirms the accuracy of the channel from sensor to digital Visual Display Unit (VDU) readout, as described in Topical Report, “Safety I&C System Description and Design Process,“ MUAP-07004 Section 4.4.2. CHANNEL CALIBRATION confirms the analog measurement accuracy at five calibration ~~setpoints~~settings corresponding to 0%, 25%, 50%, 75% and 100% of the instrument range. ~~The confirmed setpoint are monitored on the safety VDUs.~~During the calibration of the instrument, the analog signal generated by the instrument is confirmed via the calibration settings on any VDU (e.g., Operational VDU or Safety VDU). RCOL2_16-16 DCD_16-300 DCD_16-301

For analog measurements on each Technical Specification required automatic protection instrumentation function implemented with analog bistable function, the CHANNEL CALIBRATION confirms the accuracy of the channel from sensor to output device. For these channels, CHANNEL CALIBRATION confirms the analog measurement accuracy at the Nominal Trip Setpoint (NTSP). RCOL2_16-16

For binary measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel’s state change, as described in Topical Report, “Safety I&C System Description and Design Process,“ MUAP-07004 Section 4.4.1.

1.1 Definitions

CORE ALTERATION	CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.
CORE OPERATING LIMITS REPORT (COLR)	The COLR is the unit-specific document that provides cycle-specific parameter limits. These cycle-specific parameter limits shall be determined for each cycle in accordance with Specification 5.6.3. Plant operation within these limits is addressed in individual Specifications.
DOSE EQUIVALENT I-131	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same committed effective dose equivalent as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The dose conversion factors used for this calculation shall be those listed in Table 2.1 of EPA Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," EPA-520/1-88-020, September 1988.
DOSE EQUIVALENT XE-133	DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same effective dose equivalent as the quantity and isotopic mixture of noble gases (Kr-85m, Kr-85, Kr-87, Kr-88, Xe-133,- and Xe-135) actually present. The dose conversion factors used for this calculation shall be those listed in Table III.1 of EPA Federal Guidance Report No. 12, "External Exposure to Radionuclides in Air, Water, and Soil," EPA 402-R-93-081, September 1993.
ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME	The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include ~~c~~Class 1E GTG starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC. MAP-16-302

1.1 Definitions

TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT)

A TADOT shall consist of operating the trip actuating device and verifying the OPERABILITY of all devices in the channel required for trip actuating device OPERABILITY. The TADOT shall include adjustment, as necessary, of the trip actuating device so that it actuates at the required setpoint within the necessary accuracy. The TADOT may be performed by means of any series of sequential, overlapping, or total channel steps.

There are two types of binary devices - those that have no drift potential, such as Manual Initiation switches and Actuation Output, and those that have drift potential, such as UV relays, valve position limit switches and RTB trip devices. The operability of binary devices that have drift potential is confirmed through CHANNEL CALIBRATION and/or RESPONSE TIME testing. The operability of devices that have no drift potential is confirmed through TADOT. The CHANNEL CALIBRATION confirms the accuracy of the device's binary state change with regard to its trip setpoint requirement (i.e., the Allowable Value). The RESPONSE TIME test confirms the accuracy of the devices state change with regard to its trip timing requirement. The TADOT confirms only the state change operability (i.e., there is no setpoint or timing accuracy confirmation needed). The TADOT includes adjustments as necessary, based on manufacturer's recommendation, to maintain device reliability. For some binary devices with drift potential, a TADOT is specified in addition to the CHANNEL CALIBRATION and/or RESPONSE TIME test. The TADOT is specified on a more frequent basis than the CHANNEL CALIBRATION or RESPONSE TIME test, to confirm the state change operability of the devices, without checking its state change setpoint or timing accuracy. Checking the setpoint or timing accuracy more frequently than the CHANNEL CALIBRATION or RESPONSE TIME test interval is unnecessary, because the total channel uncertainty, including setpoint and/or timing drift between test intervals, is included in determination of the Nominal Setpoint, the Allowable Value and the response time requirement.

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1.3 Completion Times

EXAMPLES (continued)

When a second pump is declared inoperable while the first pump is still inoperable, Condition A is not re-entered for the second pump. LCO 3.0.3 is entered, since the ACTIONS do not include a Condition for more than one inoperable pump. The Completion Time clock for Condition A does not stop after LCO 3.0.3 is entered, but continues to be tracked from the time Condition A was initially entered.

While in LCO 3.0.3, if one of the inoperable pumps is restored to OPERABLE status and the Completion Time for Condition A has not expired, LCO 3.0.3 may be exited and operation continued in accordance with Condition A.

While in LCO 3.0.3, if one of the inoperable pumps is restored to OPERABLE status and the Completion Time for Condition A has expired, LCO 3.0.3 may be exited and operation continued in accordance with Condition B. The Completion Time for Condition B is tracked from the time the Condition A Completion Time expired.

~~On~~Upon restoring one of the pumps to OPERABLE status, the Condition A Completion Time is not reset, but continues from the time the first pump was declared inoperable. This Completion Time may be extended if the pump restored to OPERABLE status was the first inoperable pump. A 24 hour extension to the stated 7 days is allowed, provided this does not result in the second pump being inoperable for > 7 days. MAP-16-302

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the limits specified in the COLR; and the following SLs shall not be exceeded:

2.1.1.1 The departure from nucleate boiling ratio (DNBR) shall be maintained
≥ 1.35 for typical hot channel MAP-16-302
≥ 1.33 for thimble hot channel
with WRB-2 DNB correlation and revised thermal design procedure (RTDP) .

2.1.1.2 The peak fuel centerline temperature shall be maintained < 5072°F, decreasing by 58°F per 10,000 MWD/MTU of burnup.

2.1.2 Reactor Coolant System (RCS) Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained ≤ 2733.5 psig.

2.2 SAFETY LIMIT VIOLATIONS

2.2.1 If SL 2.1.1 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.9.1	Perform a CHANNEL CALIBRATION ~~TEST~~ on power range and intermediate range channels ~~per~~consistent with SR 3.3.1.10, and ~~Table 3.3.1-1~~Specification 5.5.21 Setpoint Control Program (SCP).	Prior to initiation of PHYSICS TESTS
SR 3.1.9.2	Verify the RCS lowest loop average temperature is ≥ 541°F.	In accordance with the Surveillance Frequency Control Program
SR 3.1.9.3	Verify THERMAL POWER is ≤ 5% RTP.	In accordance with the Surveillance Frequency Control Program
SR 3.1.9.4	Verify SDM is within the limits specified in the COLR.	In accordance with the Surveillance Frequency Control Program

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ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
S. Required Action and associated Completion Time for Condition N, Q, or R not met.	S.1 Be in MODE 3.	6 hours
T. Main Turbine Stop Valve Position channel inoperable	--------------------NOTE------------------- One channel may be bypassed for up to 12 hours for surveillance testing. --	
	T.1 Place channel in trip.	12 hours
	<u>OR</u>	
	T.2 Reduce thermal power to < P-7	18 hours

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SURVEILLANCE REQUIREMENTS

---NOTE---

Refer to Table 3.3.1-1 to determine which SRs apply for each RTS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1	Perform CHANNEL CHECK.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.2	-----------------------------NOTE-------------------------- ~~1.~~ Not required to be performed until 12 hours after THERMAL POWER is ≥ 15% RTP. -- Compare results of calorimetric heat balance calculation to power range channel output. Adjust power range channel output if calorimetric heat balance calculations results exceed power range channel output by more than +2% RTP.	In accordance with the Surveillance Frequency Control Program

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.8	Perform CHANNEL CHECK.	Within 4 hours after reducing power below P-6 AND In accordance with the Surveillance Frequency Control Program
SR 3.3.1.9	-----------------------------NOTE-------------------------- This Surveillance shall include verification that the time constants are adjusted to the prescribed values. --- Perform a CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.21, Setpoint Control Program (SCP).	In accordance with the Surveillance Frequency Control Program DCD_16-301
SR 3.3.1.10	-----------------------------NOTE-------------------------- Neutron detectors are excluded from CHANNEL CALIBRATION. --- Perform a CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.21, Setpoint Control Program (SCP).	In accordance with the Surveillance Frequency Control Program DCD_16-301

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.11	Perform a CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.21, Setpoint Control Program (SCP).	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.12	------------------------------NOTE--------------------------- Verification of setpoint is not required. --- Perform TADOT.	Prior to exceeding the P-7 interlock whenever the unit has been in MODE 3, if not performed within the previous 31 days
SR 3.3.1.13	------------------------------NOTE--------------------------- Neutron detectors are excluded from response time testing. --- Verify RTS RESPONSE TIME is within limits.	In accordance with the Surveillance Frequency Control Program

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Table 3.3.1-1 (page 2 of 9)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
5. High Source Range Neutron Flux	2[d]	2	I,J	SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.10 SR 3.3.1.13	~~±5% of span~~	~~1.0 E+5 cps~~
	3[a], 4[a], 5[a]	2	J,K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.13	~~±5% of span~~	~~1.0 E+5 cps~~
6. Overtemperature ΔT[j]	1,2	3	F	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.13	~~Refer to Note 1 after this table~~	~~Refer to Note 1 after this table~~

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(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(d) Below the P-6 (Intermediate Range Neutron Flux) interlocks.

(j) Refer to Note 1 after this table. DCD_16-301

Table 3.3.1-1 (page 3 of 9)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
7. Overpower ΔT(k)	1,2	3	F	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.13	~~Refer to Note 2 after this table~~	~~Refer to Note 2 after this table~~
8. Pressurizer Pressure						
a. Low Pressurizer Pressure	1(e)	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	~~±2.5% of span~~	~~1865 psig~~
b. High Pressurizer Pressure	1,2	3	F	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	~~±2.5% of span~~	~~2385 psig~~
9. High Pressurizer Water Level	1(e)	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	~~±3% of span~~	~~92% of span~~
10. Low Reactor Coolant Flow	1(e)	3 per loop	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9	~~±3% of rated flow~~	~~90% of rated flow~~
11. Low Reactor Coolant Pump (RCP) Speed	1(e)	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	~~±0.5% rated pump speed~~	~~95.5% rated pump speed~~

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(e) Above the P-7 (Low Power Reactor Trips Block) interlock.

(k) Refer to Note 2 after this table.

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Table 3.3.1-1 (page 9 of 9)
Reactor Trip System Instrumentation

Note 2: Overpower ΔT

~~The Overpower ΔT Function Allowable Value shall not exceed the following nominal Trip Setpoint by more than [±5.2]% RTP.~~ RCOL2_16-16

$$\cancel{\Delta T\frac{(1+T_{13}s)}{(1+T_{14}s)}\left(\frac{1}{1+T_{15}s}\right) \le K_7 + -K_8\frac{T_6 s}{1+T_6 s}T_{avg} - K_9(T_{avg} - T_{avg0}) - f_2(\Delta I)}$$

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$$\Delta T\frac{(1+T_{13}s)}{(1+T_{14}s)}\left(\frac{1}{1+T_{15}s}\right) \ge \Delta T_0\left(-K_8\frac{T_6 s}{1+T_6 s}T_{avg} - K_9\left(T_{avg} - T_{avg0}\right) - f_2(\Delta I)\right)$$

Where: ΔT is measured RCS ΔT,°F.

ΔT_0 is indicated RCS ΔT at RTP,°F. MAP-16-302

s is the Laplace transform operator, sec^{-1}.

T_{avg} is the measured RCS average temperature,°F.

T_{avg0} is the nominal T_{avg} at RTP, ≤ [*]°F.

K_7 ≤ [*]

K_8 ≥ [*]/°F for increasing T_{avg}
[*]/°F for decreasing T_{avg}

K_9 ≥ [*]/°F when $T_{avg} > T_{avg0}$
[*]/°F when $T_{avg} \le T_{avg0}$

T_6 ≥ [*] sec

T_{13} ≥ [*] sec

T_{14} ≤ [*] sec

T_{15} ≤ [*] sec

$f_2(\Delta I)$ = [*]

*These values denoted with [*] are specified in the COLR.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
K. One required Containment High Area Radiation monitoring channel inoperable.	K.1 Restore channel to OPERABLE status. OR K.2.1 Be in MODE 3. AND K.2.2 Be in MODE 5.	72 hours 78 hours 108 hours
L. One or more Actuation Logic and Actuation Output trains inoperable. OR Two or more Containment High Range Area Radiation Monitoring channels inoperable. OR Required Action and associated Completion Time of Condition K not met.	L.1 Enter applicable Conditions and Required Actions of LCO 3.6.3, "Containment Isolation Valves," for containment purge and exhaust isolation valves made inoperable by isolation instrumentation.	Immediately
M. One or more Functions with one channel or train inoperable.	M.1 Place one train of the ~~e~~affected subsystem(s) in the emergency mode, depending on the inoperable train. --------------------NOTE-------------------- Inoperable train A or D affects both subsytem MCREFS and subsystem MCRATCS, while inoperable train B or C affects only subsystem MCRATCS. --	7 days

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ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
N. One or more Functions with two channels or two trains inoperable.	N.1.1 Place the ~~e~~a<u>ffected</u> subsystem(s) in the emergency mode.	Immediately MAP-16-302
	<u>AND</u>	
	N.1.2 Enter applicable Conditions and Required Actions for the ~~e~~affected subsystem(s) made inoperable by inoperable actuation instrumentation, depending on inoperable trains.	Immediately MAP-16-302
	<u>OR</u>	
	N.2 Place all trains of the ~~e~~affected subsystem(s) in emergency mode.	Immediately MAP-16-302
	--------------------Note-------------------- Inoperable train A or D affects both subsystem MCREFS and subsytem MCRATCS, while inoperable train B or C affects only subsystem MCRATCS. ---	
O. Required Action and associated Completion Time for Condition M or N not met in MODE 1, 2, 3, or 4.	O.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	O.2 Be in MODE 5.	36 hours
P. Required Action and associated Completion Time for Condition M or N not met during movement of irradiated fuel assemblies.	P.1 Suspend movement of irradiated fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.2.7	-----------------------------NOTE-------------------------- This Surveillance shall include verification that the time constants are adjusted to the prescribed values. -- Perform a CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.21, Setpoint Control Program (SCP).	In accordance with the Surveillance Frequency Control Program DCD_16-301
SR 3.3.2.8	-----------------------------NOTE-------------------------- Not required to be performed for the turbine driven EFW pumps until 24 hours after SG pressure is ≥ 1000 psig. -- Verify ESFAS RESPONSE TIMES are within limit.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.9	-----------------------------NOTE-------------------------- Verification of setpoint not required. -- Perform TADOT.	Once per reactor trip breaker cycle

Table 3.3.2-1 (page 5 of 10)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~	
							RCOL2_16-16
5. Main Feedwater Isolation							
5A. Main Feedwater Regulation ~~v~~Valve Closure							DCD_16-300
a. Low T_{avg}	1,2 (j),3 (j)	3	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~±2°F~~	~~564°F~~	RCOL2_16-16
Coincident with Reactor Trip, P-4	Refer to Function 11.a for all P-4 requirements.						
5B. Main Feedwater Isolation							
a. Manual Initiation	1,2 (i),3 (i)	Trains A and D	F	SR 3.3.2.6	~~NA~~	~~NA~~	RCOL2_16-16
b. Actuation Logic and Actuation Outputs	1, 2 (i), 3(i)	Trains A and D	S,T	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~	
c. High-High SG Water Level	1,2 (i),3(a) (i)	3 per SG	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~±3% of span~~	~~70% of span~~	
d. ECCS Actuation	Refer to Function 1 (ECCS Actuation) for all initiation functions and requirements.						

(a) Above the P-11 (Pressurizer Pressure) interlock.
(i) Except when all MFIVs, MFRVs, MFBRVs, and SGWFCVs are closed.
(j) Except when all MFRVs are closed.

Table 3.3.2-1 (page 6 of 10)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
6. Emergency Feedwater Actuation						
a. Manual Initiation	1,2,3	3 trains	F	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Outputs	1,2,3	3 trains	J,T	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
c. Low SG Water Level	1,2,3	3 per SG	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~±3% of span~~	~~13% of span~~
d. ECCS Actuation	Refer to Function 1 (ECCS Actuation) for all initiation functions and requirements.					
e. LOOP Signal	1,2,3	3 per bus for each EFW train	F	SR 3.3.2.5 SR 3.3.2.7 SR 3.3.2.8	~~≥ 4830 V with a time delay of ≤ 2 second~~	~~4934 V(l) with ≤ 2 sec time delay~~
f. Trip of all Main Feedwater Pumps	1,2	1 per pump	H	SR 3.3.2.6 SR 3.3.2.8	~~NA~~	~~NA~~

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(l) Nominal Trip Setpoint

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(k) During movement of irradiated fuel assemblies ~~within containment~~. MAP-16-302

(m) Two trains of MCREFS are required to be operable (trains A and D); three trains of MCRATS are required to be operable (three out of four trains A, B, C, D).

Table 3.3.2-1 (page 10 of 10)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~	RCOL2_16-16
14. Block Turbine Bypass and Cooldown Valves							
a. Manual Initiation	1,2 (~~i~~h),3 (~~i~~h)	Trains A and D	F	SR 3.3.2.6	~~NA~~	~~NA~~	DCD_16-300
b. Actuation Logic and Actuation Outputs	1,2 (~~i~~h),3 (~~i~~h)	Trains A and D	S,T	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~	
c. Low-~~l~~Low T_{avg} Signal	1,2 (~~i~~h),3 (~~i~~h)	3	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~2.0°F~~	~~553°F~~	

(~~i~~h) Except when all MSIVs are closed. DCD_16-300

3.3 INSTRUMENTATION

3.3.3 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3 The PAM instrumentation for each Function in Table 3.3.3-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

---NOTE---

~~1.~~Separate Condition entry is allowed for each Function. MAP-16-302

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	---------------NOTE--------------- 1. For RCS Hot and Cold Leg Temperatures, this Condition is applicable only if at least one channel (Hot or Cold) is operable in each loop. Otherwise, go to Condition C. 2. For SG Water Level and EFW flow, this condition is applicable only if at least one channel (Level or flow) is operable in each loop. Otherwise, go to Condition C. -------------------------------------- Initiate action in accordance with Specification 5.6.5.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One or more Functions with two required channels inoperable.	C.1	---------------NOTE--------------- 1. For RCS Hot and Cold Leg Temperatures, this Condition is applicable only when both channels in the same loop are inoperable. 2. For SG Water Level and EFW flow, this condition is applicable only when both channels in the same loop are inoperable. -------------------------------------- Restore one channel to OPERABLE status.	7 days
	OR		
	C.2	--------------NOTE------------- This alternate action may be used only when the Emergency Feedwater Pit Level is inoperable. ------------------------------------ Apply the requirements of Specification 5.5.18.	7 days
D. Required Action and associated Completion Time of Condition C not met.	D.1	Enter the Condition referenced in Table 3.3.3-1 for the channel.	Immediately
E. As ~~required~~ by Required Action D.1 and referenced in Table 3.3.3-1.	E.1	Be in MODE 3.	6 hours
	AND		
	E.2	Be in MODE 4.	12 hours
F. As ~~require~~ by Required Action D.1 and referenced in Table 3.3.3-1.	F.1	Initiate action in accordance with Specification 5.6.5.	Immediately

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(c) A channel consists of two core exit thermocouples.

(d) ~~A~~ RCS hot leg temperature wide range and ~~a~~ RCS cold leg temperature wide range of the same ~~train~~loop are pair PAM functions. ~~A~~Similarly, SG water level wide range and an emergency feedwater flow of the same ~~train~~steam generator are pair PAM functions. ~~The idea is to treat~~Either parameter~~s~~ forming a pair ~~as one set and choose the number of required channels to be two, providing a basis for control~~can fulfill all PAM Requirements. Therefore, only 1 per loop/SG of either parameter of the pair is required. MAP-16-302 MAP-16-202

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY	
SR 3.3.5.1	Perform CHANNEL CHECK.	In accordance with the Surveillance Frequency Control Program	
SR 3.3.5.2	Perform TADOT for LOP undervoltage relays.	In accordance with the Surveillance Frequency Control Program	
SR 3.3.5.3	Perform CHANNEL CALIBRATION for LOP undervoltage relays ~~with Nominal Trip Setpoint and Allowable Value as follows~~with Specification 5.5.21, Setpoint Control Program (SCP), with following time delay: a. Loss of voltage ~~Allowable Value ≥ 4830~~ V with a time delay of ≤ 2 second ~~Loss of voltage Nominal Trip Setpoint 4934 V with a time delay of 2 second.~~ b. Degraded voltage ~~Allowable Value ≥ 6210 V~~ with a time delay of ≤ 10 seconds. ~~Degraded voltage Nominal Trip Setpoint 6314 V with a time delay of 10 seconds.~~	In accordance with the Surveillance Frequency Control Program	RCOL2_16-16 MAP-16-302 RCOL2_16-16 RCOL2_16-16

~~NOTE: In all case, the values specified for Setpoints will be confirmed following completion of the plant specific setpoint study. These values will be calculated in accordance with the setpoint methodology after selection of plant specific instrumentations.~~ RCOL2_16-16

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.6.1	Perform CHANNEL CHECK for each required channel.	In accordance with the Surveillance Frequency Control Program
SR 3.3.6.2	Perform ~~CHANNEL OPERATION TEST~~COT-analog.	In accordance with the Surveillance Frequency Control Program
SR 3.3.6.3	Perform a CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.21, Setpoint Control Program (SCP).	In accordance with the Surveillance Frequency Control Program
SR 3.3.6.4	Perform ACTUATION LOGIC TEST.	In accordance with the Surveillance Frequency Control Program

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3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.5 RCS Loops - MODE 3

LCO 3.4.5 Two RCS loops shall be OPERABLE and either:

a. Two RCS loops shall be in operation when the Rod Control System is capable of rod withdrawal or

b. One RCS loop shall be in operation when the Rod Control System is not capable of rod withdrawal.

---NOTE---
All reactor coolant pumps may be removed from operation for ≤ 1 hour per 8 hour period provided:

a. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1; and

b. Core outlet temperature is maintained at least 10°F below saturation temperature.

APPLICABILITY: MODE 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required RCS loop inoperable.	A.1 Restore required RCS loop to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 4.	12 hours

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3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 RCS Loops - MODE 5, Loops Not Filled

LCO 3.4.8 Three residual heat removal (RHR) loops shall be OPERABLE and two RHR loops shall be in operation, and low-pressure letdown line isolation valve shall be OPERABLE. DCD_19.01-1

--NOTES--

1. One CS/RHR pump may be removed from operation for ≤ 15 minutes when switching from one loop to another provided:

   a. The core outlet temperature is maintained > 10°F below saturation temperature,

   b. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1; and

   c. No draining operations to further reduce the RCS water volume are permitted.

2. One required RHR loop may be inoperable for ≤ 2 hours for surveillance testing provided that the other two RHR loops are OPERABLE and in operation.

APPLICABILITY: MODE 5 with RCS loops not filled.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required RHR loop inoperable.	A.1 Initiate action to restore RHR loop to OPERABLE status.	Immediately
B. One low-pressure letdown isolation valve inoperable.	B.1 Initiate action to restore low-pressure letdown line isolation valve to OPERABLE status.	Immediately

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ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME	
~~B~~C. Less than two required RHR loops OPERABLE. OR Less than two Required RHR loops in operation.	~~B~~C.1	Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet SDM of LCO 3.1.1.	Immediately	DCD_19.01-1
	AND			
	~~B~~C.2	Initiate action to restore two RHR loops to OPERABLE status and operation.	Immediately	DCD_19.01-1

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY	
SR 3.4.8.1	Verify required RHR loops are in operation.	In accordance with the Surveillance Frequency Control Program	
SR 3.4.8.2	------------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. --- Verify correct breaker alignment and indicated power are available to each required CS/RHR pump.	In accordance with the Surveillance Frequency Control Program	
SR 3.4.8.3	Perform a complete cycle of each low-pressure letdown line isolation valve.	In accordance with the Surveillance Frequency Control Program	DCD_19.01-1

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.12.1	Verify a maximum of two SI pumps are capable of injecting into the RCS.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.2	Verify a maximum of one charging pump is capable of injecting into the RCS.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.3	Verify each accumulator is isolated.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.4	Verify RHR suction valve is open for each required RHR suction relief valve.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.5	-------------------------------NOTE-------------------------- Only required to be performed when complying with LCO 3.4.12.b --- Verify required RCS vent ≥ 4.7 square inches open.	~~Unlocked open vent valve(s)~~ ~~AND~~ ~~other vent path(s)~~ ~~OR~~ ~~i~~In accordance with the Surveillance Frequency Control Program

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
	Verify leakage from each RCS PIV is equivalent to ≤ 0.5 gpm per nominal inch of valve size up to a maximum of 5 gpm at an RCS pressure ≥ 2215 psig and ≤ 2255 psig.	~~In accordance with the Inservice Testing Program, and~~ In accordance with the Surveillance Frequency Control Program CTS-01267 AND Prior to entering MODE 2 whenever the unit has been in MODE 5 for 7 days or more, if leakage testing has not been performed in the previous 9 months AND Within 24 hours following valve actuation due to automatic or manual action or flow through the valve
SR 3.4.14.2	------------------------------NOTE------------------------- Not required to be met when the RHR System suction valve interlock is disabled in accordance with SR 3.4.12.7. --- Verify RHR System suction valve interlock prevents the valves from being opened with a simulated or actual RCS pressure signal ≥ 425 psig.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.1.4	Verify boron concentration in each accumulator is ≥ 4000 ppm and ≤ 4200 ppm.	In accordance with the Surveillance Frequency Control Program AND --------NOTE-------- Only required to be performed for affected accumulators ------------------------ Once within 6 hours after each solution volume increase of ≥ 190 gallons that is not the result of addition from the refueling water storage pit
SR 3.5.1.5	Verify power is removed from each accumulator isolation valve operator when RCS pressure is ≥ 1920 psig.	In accordance with the Surveillance Frequency Control Program
SR 3.5.1.6	Verify isotopic concentration of B-10 in each accumulator is ≥ 19.9% (atom percent).	In accordance with the Surveillance Frequency Control Program

DCD_09.03.04-10

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.4.1	-----------------------------NOTE---------------------------- Only required to be performed when containment air temperature is < 32°F or > 120°F. --- Verify RWSP borated water temperature is ≥ 32°F and ≤ 120°F.	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.2	Verify RWSP borated water volume is ≥ 583,340 gallons.	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.3	Verify RWSP boron concentration is ≥ 4000 ppm and ≤ 4200 ppm.	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.4	Verify isotopic concentration of B-10 in the RWSP is ≥ 19.9% (atom percent).	In accordance with the Surveillance Frequency Control Program

DCD_09.03.04-10

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.5 pH Adjustment

LCO 3.5.5 The pH adjustment baskets shall contain ≥ 44,100 pounds of sodium tetraborate decahydrate (NaTB).

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. The mass of NaTB not within limit.	A.1 Restore mass of NaTB to within limit.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Be in MODE 5.	36 hours

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SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.5.1	Verify that the NaTB pH adjustment baskets contain at least 44,100 pounds of NaTB.	In accordance with the Surveillance Frequency Control Program
SR 3.5.5.2	Verify that a sample from the NaTB pH adjustment baskets provides adequate pH adjustment of the post-accident water.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.3.4	-------------------------------NOTE-------------------------- Valves and blind flanges in high radiation areas may be verified by use of administrative means. --- Verify each containment isolation manual valve and blind flange that is located inside containment and not locked, sealed, or otherwise secured and required to be closed during accident conditions is closed, except for containment isolation valves that are open under administrative controls.	Prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days
SR 3.6.3.5	Verify the isolation time of each automatic power operated containment isolation valve is within limits.	In accordance with the Inservice Testing Program
SR 3.6.3.6	Perform leakage rate testing for 36 inch high volume purge valves with resilient seals.	~~184 days~~In accordance with the Surveillance Frequency Control Program AND Within 92 days after opening the valve
SR 3.6.3.7	Verify each automatic containment isolation valve that is not locked, sealed or otherwise secured in position, actuates to the isolation position on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program

CTS-01277

3.6 CONTAINMENT SYSTEMS

3.6.6 Containment Spray System

LCO 3.6.6 Three containment spray (CS) trains shall be OPERABLE.

---NOTE~~S~~--
CS train may be considered OPERABLE during alignment and operation for decay heat removal as RHRS if capable of being manually realigned to the CS mode of operation.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required containment spray train inoperable.	A.1	Restore three containment spray trains to OPERABLE status.	72 hours
	<u>OR</u>		
	A.2	-------------NOTE~~S~~------------- This Required Action is not applicable in MODE 4. ----------------------------------- Apply the requirements of Specification 5.5.18	72 hours
B. Required Action and associated Completion Time of Condition A~~ or B~~ not met.	B.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	B.2	Be in MODE 5.	36 hours

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3.7 PLANT SYSTEMS

3.7.10 Main Control Room HVAC System (MCRVS)

---NOTE---
The MCRVS consists of two trains of main control room emergency filtration system (MCREFS) and four trains of main control room air temperature control system (MCRATCS).

LCO 3.7.10 The MCRVS shall be OPERABLE with:

a. Two MCREFS trains OPERABLE, and

b. Three MCRATCS trains OPERABLE.

---NOTE---
The control room envelope (CRE) boundary may be opened intermittently under administrative control.

APPLICABILITY: MODES 1, 2, 3~~,~~ and 4, MAP-16-302
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required MCREFS train inoperable.	A.1 Restore MCREFS train to OPERABLE status.	7 days
B. One required MCRATCS trains inoperable.	B.1 Restore three MCRATCS trains to OPERABLE status.	7 days
C. Required MCRVS inoperable due to inoperable CRE boundary in MODE 1, 2, 3, or 4.	C.1 Initiate action to implement mitigating actions.	Immediately
	AND	
	C.2 Verify mitigating actions to ensure CRE occupant exposures to radiological, chemical, and smoke hazards will not exceed limits.	24 hours
	AND	
	C.3 Restore CRE boundary to OPERABLE status.	90 days

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.10	------------------------------NOTE~~S~~------------------------- This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. --- Verify on an actual or simulated loss of offsite power signal: a. De-energization of emergency buses, b. Load shedding from emergency buses, c. Class 1E GTG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 100 seconds, 2. Energizes auto-connected shutdown loads through automatic load sequencer, 3. Maintains steady state voltage ≥ 6762 V and ≤ 7038 V, 4. Maintains steady state frequency ≥ 59.4 Hz and ≤ 60.6 Hz, and 5. Supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	 In accordance with the Surveillance Frequency Control Program

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	------------------------------NOTE~~S~~------------------------- This Surveillance shall not normally be performed in MODE 1 or 2. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. --- Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each Class 1E GTG auto-starts from standby condition and: a. In ≤ 100 seconds after auto-start and during tests, achieves voltage ≥ 6762 V and frequency ≥ 59.4 Hz, b. Achieves steady state voltage ≥ 6762 V and ≤ 7038 V and frequency ≥ 59.4 Hz and ≤ 60.6 Hz, c. Operates for ≥ 5 minutes, d. Permanently connected loads remain energized from the offsite power system, and e. Emergency loads are energized or auto-connected through the automatic load sequencer from the offsite power system.	In accordance with the Surveillance Frequency Control Program

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.14	------------------------------NOTE~~S~~------------------------- MAP-16-302 This Surveillance shall be performed within 5 minutes of shutting down the Class 1E GTG after the GTG has operated ≥ 2 hours loaded ≥ 4050 kW and ≤ 4500 kW. Momentary transients outside of load range do not invalidate this test. --- Verify each Class 1E GTG starts and achieves: a. In ≤ 100 seconds, voltage ≥ 6762 V and frequency ≥ 59.4 Hz and b. Steady state voltage ≥ 6762 V, and ≤ 7038 V and frequency ≥ 59.4 Hz and ≤ 60.6 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.15	------------------------------NOTE-------------------------- This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. --- Verify each Class 1E GTG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power, b. Transfers loads to offsite power source, and c. Returns to ready-to-load operation.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	------------------------------NOTE~~S~~------------------------ This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. --	
	Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal: a. De-energization of emergency buses, b. Load shedding from emergency buses, and c. Class 1E GTG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 100 seconds, 2. Energizes auto-connected emergency loads through load sequencer, 3. Achieves steady state voltage ≥ 6762 V and ≤ 7038 V, 4. Achieves steady state frequency ≥ 59.4 Hz and ≤ 60.6 Hz, and 5. Supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

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CONDITION		REQUIRED ACTION		COMPLETION TIME
C.	One of the required three dc electrical power subsystems inoperable for reasons other than Condition A or B.	C.1	Restore dc electrical power subsystems in three trains to OPERABLE status.	2 hours
D.	Required Action and associated Completion Time not met.	D.1	Be in MODE 3.	6 hours
		AND		
		D.2	Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is greater than or equal to the minimum established float voltage.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.2	Verify each battery charger supplies ≥ ~~800~~700 amps at greater than or equal to the minimum established float voltage for ≥ 8 hours. OR Verify each battery charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state.	In accordance with the Surveillance Frequency Control Program

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Table 3.8.9-1
Distribution System Operating Requirements

Distribution System	Requirements	Conditions	
1. 6.9 kV Class 1E, A, B, C, and D	3	A	
2. 480V Load Centers, A, B, C, and D	3	A	
3. 480 V Load Centers A1 and D1	2 (2)	A	MAP-16-302
4. 480V MCCs A, B, C, and D	3	A	
5. 480 V MCCs A1 and D1	2 (2)	A	MAP-16-302
6. 480V MOV MCCs	4 (~~a~~1)	A	MAP-16-302
7. 120 V Vital AC Buses A, B, C, and D	4	B	
8. 125 VDC Buses A, B, C, and D	3	C	
9. 125 VDC Buses A1 and D1	2(2)	C	MAP-16-302
10. 125 VDC Distribution Panels	3	C	

(~~a~~1)For 480V MOV MCCs A and D both MCC 1 and MCC 2 are required to be OPERABLE. MAP-16-302
(2) One of the two train buses may be removed from operation when switching from one train to another train.

3.9 REFUELING OPERATIONS

3.9.5 Residual Heat Removal (RHR) and Coolant Circulation - High Water Level

LCO 3.9.5 Two RHR loops shall be OPERABLE and in operation.

---NOTE---

~~1.~~ The required RHR loops may be removed from operation for ≤ 1 hour per 8 hour period, provided no operations are permitted that would cause introduction of coolant into the Reactor Coolant System with boron concentration less than that required to meet the minimum required boron concentration of LCO 3.9.1. MAP-16-302

APPLICABILITY: MODE 6 with the water level ≥ 23 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RHR loop requirements not met.	A.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the boron concentration of LCO 3.9.1.	Immediately
	<u>AND</u>	
	A.2 Suspend loading irradiated fuel assemblies in the core.	Immediately
	<u>AND</u>	
	A.3 Initiate action to satisfy RHR loop requirements.	Immediately
	<u>AND</u>	

3.9 REFUELING OPERATIONS

3.9.6 Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level

LCO 3.9.6 Three RHR loops shall be OPERABLE, and two RHR loops shall be in operation, and low-pressure letdown line isolation valve shall be OPERABLE. DCD_19.01-8

--NOTES--

1. All RHR pumps may be removed from operation for ≤ 15 minutes when switching from one train to another provided:

   a. The core outlet temperature is maintained > 10 degrees F below saturation temperature,

   b. No operations are permitted that would cause introduction of coolant into the Reactor Coolant System (RCS) with boron concentration less than that required to meet the minimum required boron concentration of LCO 3.9.1, and

   c. No draining operations to further reduce RCS water volume are permitted.

2. One required RHR loop may be inoperable for up to 2 hours for surveillance testing, provided that the other RHR loops are OPERABLE and in operation.

APPLICABILITY: MODE 6 with the water level < 23 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Less than the required number of RHR loops OPERABLE.	A.1 Initiate action to restore required RHR loops to OPERABLE status. <u>OR</u>	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME	
	A.2	Initiate action to establish ≥ 23 ft of water above the top of reactor vessel flange.	Immediately	
B. One low-pressure letdown isolation valve inoperable.	B.1	Initiate action to restore low-pressure letdown line isolation valve to OPERABLE status.	Immediately	DCD_19.01-8
~~B~~C. No RHR loop in operation.	~~B~~C.1	Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the boron concentration of LCO 3.9.1.	Immediately	DCD_19.01-8
	<u>AND</u>			
	~~B~~C.2	Initiate action to restore two RHR loops to operation.	Immediately	DCD_19.01-8
	<u>AND</u>			
	~~B~~C.3	Close equipment hatch and secure with four bolts.	4 hours	DCD_19.01-8
	<u>AND</u>			
	~~B~~C.4	Close one door in each air lock.	4 hours	DCD_19.01-8
	<u>AND</u>			

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME	
	~~B~~C.5.1 Close each penetrations providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, blind flange, or equivalent. OR ~~B~~C.5.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.	4 hours 4 hours	DCD_19.01-8 DCD_19.01-8

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY	
SR 3.9.6.1	Verify two RHR loops are in operation and circulating reactor coolant at a flow rate of ≥ 2645 gpm per pump.	In accordance with the Surveillance Frequency Control Program	
SR 3.9.6.2	Verify correct breaker alignment and indicated power available to the required RHR pump that is not in operation.	In accordance with the Surveillance Frequency Control Program	
SR 3.9.6.3	Perform a complete cycle of each low-pressure letdown line isolation valve.	In accordance with the Surveillance Frequency Control Program	DCD_19.01-8

4.0 DESIGN FEATURES

4.1 Site Location

The CPNPP site area is approximately ~~7,700~~7,950 acres located in rural Somervell and Hood Count~~y~~ies in North Central Texas. ~~Squaw Creek Reservoir extends into Hood County.~~ The site is situated along Squaw Creek Reservoir, which is located on Squaw Creek, a tributary of the Paluxy River, which is a tributary of the Brazos River. The site is approximately 40 miles southwest of~~over 30 miles southwest of the nearest point in~~ Fort Worth and approximately ~~4.5~~5.2 miles north~~-northwest~~ of Glen Rose, the nearest community. RCOL4_16-9 RCOL4_16-9

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 257 fuel assemblies. Each assembly shall consist of a matrix of fuel rods clad with ~~ZIRLO cladding~~NRC approved cladding material, which is a zirconium based alloy and containing an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium based alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions. MAP-16-302

4.2.2 Rod Cluster Control Assemblies

The reactor core shall contain 69 Rod Cluster Control Assemblies (RCCAs) each with 24 rods per assembly. The RCCA adsorber material shall be silver indium cadmium as approved by the NRC.

5.0 ADMINISTRATIVE CONTROLS

5.2 Organization

5.2.1 Onsite and Offsite Organizations

Onsite and offsite organizations shall be established for unit operation and corporate management, respectively. The onsite and offsite organizations shall include the positions for activities affecting safety of the nuclear power plant.

a. Lines of authority, responsibility, and communication shall be defined and established throughout the highest management levels, intermediate levels, and all operating organization positions. These relationships shall be documented and updated, as appropriate, in organization charts, functional descriptions of departmental responsibilities and relationships, and job descriptions for key personnel positions, or in equivalent forms of documentation. These requirements including the plant-specific titles of those personnel fulfilling the responsibilities of the positions delineated in these Technical Specifications shall be documented in the FSAR~~,~~. MAP-16-302

b. The plant manager shall be responsible for overall safe operation of the plant and shall have control over those onsite activities necessary for safe operation and maintenance of the plant~~,~~. MAP-16-302

c. A specified corporate officer shall have corporate responsibility for overall plant nuclear safety and shall take any measures needed to ensure acceptable performance of the staff in operating, maintaining, and providing technical support to the plant to ensure nuclear safety.~~, and~~ MAP-16-302

d. The individuals who train the operating staff, carry out health physics, or perform quality assurance functions may report to the appropriate onsite manager; however, these individuals shall have sufficient organizational freedom to ensure their independence from operating pressures.

5.2.2 Unit Staff

The unit staff organization shall include the following:

a. A non-licensed operator shall be assigned when the reactor contains fuel and an additional non-licensed operator shall be assigned for the control room from which a reactor is operating in MODES 1, 2, 3, or 4.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

The following programs shall be established, implemented, and maintained.

5.5.1 Offsite Dose Calculation Manual (ODCM)

a. The ODCM shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip setpoints, and in the conduct of the radiological environmental monitoring program, and

b. The ODCM shall also contain the radioactive effluent controls and radiological environmental monitoring activities, and descriptions of the information that should be included in the Annual Radiological Environmental Operating, and Radioactive Effluent Release Reports required by Specification 5.6.1 and Specification 5.6.2.

Licensee initiated changes to the ODCM:

a. Shall be documented and records of reviews performed shall be retained. This documentation shall contain:

1. Sufficient information to support the change(s) together with the appropriate analyses or evaluations justifying the change(s), and MAP-16-302

2. A determination that the change(s) maintain the levels of radioactive effluent control required by 10 CFR 20.1302, 40 CFR 190, 10 CFR 50.36a, and 10 CFR 50, Appendix I, and do not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations~~,~~. MAP-16-302

b. Shall become effective after the approval of the plant manager, and

c. Shall be submitted to the NRC in the form of a complete, legible copy of the entire ODCM as a part of or concurrent with the Radioactive Effluent Release Report for the period of the report in which any change in the ODCM was made. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed, and shall indicate the date (i.e., month and year) the change was implemented.

5.5 Programs and Manuals

5.5.2 Primary Coolant Sources Outside Containment

This program provides controls to minimize leakage from those portions of systems outside containment that could contain highly radioactive fluids during a serious transient or accident to levels as low as practicable. The systems include Containment Spray, Safety Injection, Chemical and Volume Control, Gaseous Waste Management and Sampling System. The program shall include the following: DCD_09.03.02-12

a. Preventive maintenance and periodic visual inspection requirements, and DCD_09.03.02-12

b. Integrated leak test requirements for each system at least once per 24 months.

The provisions of SR 3.0.2 are applicable.

5.5.3 Post Accident Sampling

This program provides controls that ensure the capability to obtain and analyze reactor coolant, radioactive gases, and particulates in plant gaseous effluents and containment atmosphere samples under accident conditions. The program shall include the following:

a. Training of personnel,

b. Procedures for sampling and analysis, and

c. Provisions for maintenance of sampling and analysis equipment.

5.5.4 Radioactive Effluent Controls Program

This program conforms to 10 CFR 50.36a for the control of radioactive effluents and for maintaining the doses to members of the public from radioactive effluents as low as reasonably achievable. The program shall be contained in the ODCM, shall be implemented by procedures, and shall include remedial actions to be taken whenever the program limits are exceeded. The program shall include the following elements:

5.5 Programs and Manuals

5.5.4 Radioactive Effluent Controls Program (continued)

a. Limitations on the functional capability of radioactive liquid and gaseous monitoring instrumentation including surveillance tests and setpoint determination in accordance with the methodology in the ODCM,

b. Limitations on the concentrations of radioactive material released in liquid effluents to unrestricted areas, conforming to ten times the concentration values in Appendix B, Table 2, Column 2 to 10 CFR 20.1001-20.2402,

c. Monitoring, sampling, and analysis of radioactive liquid and gaseous effluents in accordance with 10 CFR 20.1302 and with the methodology and parameters in the ODCM,

d. Limitations on the annual and quarterly doses or dose commitment to a member of the public from radioactive materials in liquid effluents released from each unit to unrestricted areas, conforming to 10 CFR 50, Appendix I,

e. Determination of cumulative dose contributions from radioactive effluents for the current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM at least every 31 days. Determination of projected dose contributions from radioactive effluents in accordance with the methodology in the ODCM at least every 31 days,

f. Limitations on the functional capability and use of the liquid and gaseous effluent treatment systems to ensure that appropriate portions of these systems are used to reduce releases of radioactivity when the projected doses in a period of 31 days would exceed 2% of the guidelines for the annual dose or dose commitment, conforming to 10 CFR 50, Appendix I,

g. Limitations on the dose rate resulting from radioactive material released in gaseous effluents from the site to areas at or beyond the site boundary shall be in accordance with the following:

    1. For noble gases: a dose rate ≤ 500 mrem/yr to the whole body and a dose rate ≤ 3000 mrem/yr to the skin, and MAP-16-302

    2. For ~~i~~Iodine-131, ~~i~~Iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days: a dose rate ≤ 1500 mrem/yr to any organ,

h. Limitations on the annual and quarterly air doses resulting from noble gases released in gaseous effluents from each unit to areas beyond the site boundary, conforming to 10 CFR 50, Appendix I,

5.5 Programs and Manuals

5.5.20 <u>Control Room Envelope Habitability Program</u>

A Control Room Envelope (CRE) Habitability Program shall be established and implemented to ensure that CRE habitability is maintained such that, with an OPERABLE Main Control Room Emergency Filtration System (MCREFS), CRE occupants can control the reactor safely under normal conditions and maintain it in a safe condition following a radiological event, hazardous chemical release, or a smoke challenge. The program shall ensure that adequate radiation protection is provided to permit access and occupancy of the CRE under design basis accident (DBA) conditions without personnel receiving radiation exposures in excess of 5 rem total effective dose equivalent (TEDE) for the duration of the accident. The program shall include the following elements:

a. The definition of the CRE and the CRE boundary.

b. Requirements for maintaining the CRE boundary in its design condition including configuration control and preventive maintenance.

c. Requirements for (i) determining the unfiltered air inleakage past the CRE boundary into the CRE in accordance with the testing methods and at the Frequencies specified in Sections C.1 and C.2 of Regulatory Guide 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," Revision 0, May 2003, and (ii) assessing CRE habitability at the Frequencies specified in Sections C.1 and C.2 of Regulatory Guide 1.197, Revision 0.

   The following are exceptions to Sections C.1 and C.2 of Regulatory Guide 1.197, Revision 0:

   1. C. – Section 4.3.2 “Periodic CRH Assessment” from NEI 99-03 Revision 1 will be used as input to a site-specific Self-Assessment procedure. CTS-01267

   2. C.1.2 – No peer reviews are required to be performed.

d. Measurement, at designated locations, of the CRE pressure relative to all external areas adjacent to the CRE boundary during the pressurization mode of operation by one train of the MCREFS, operating at the flow rate required by the VFTP, at a Frequency of 24 months on a STAGGERED TEST BASIS . The results shall be trended and used as part of the 24 month assessment of the CRE boundary.

5.5.20 Control Room Envelope Habitability Program (continued)

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.21 Setpoint Control Program (SCP) RCOL2_16-16

a. The Setpoint Control Program (SCP) implements the regulatory requirement of 10 CFR 50.36(c)(1)(ii)(A) that technical specifications will include items in the category of limiting safety system settings (LSSS), which are settings for automatic protective devices related to those variables having significant safety functions.

b. Nominal Trip Setpoint (NTSP), Allowable Value (AV), Performance Test Acceptance Criteria (PTAC), and Calibration Tolerance (CT) for each Technical Specification required automatic protection instrumentation function shall be calculated in conformance with the instrumentation setpoint methodology previously reviewed and approved by the NRC in [Title, Revision No., dated Month dd, yyyy, (MLxxxxxxxxx)] and the conditions stated in the associated NRC safety evaluation, [Letter to MHI from NRC, Title, dated Month, dd, yyyy, (MLxxxxxxxxx)]. DCD_16-301

c. For each Technical Specification required automatic protection instrumentation function implemented with a digital bistable function, performance of a CHANNEL CALIBRATION surveillance shall include the following:

1. If all as-found calibration setting values are inside the two-sided limits of (calibration setting ± pre-defined test acceptance criteria band (PTAC)), then the channel is fully operable.

2. If any as-found calibration setting value is outside the two-sided limits of (calibration setting ± PTAC), but inside the limits of ± AV, then the channel is operable but degraded, and corrective action is required to restore the channel to within specifications.

3. If any as-found calibration setting value is outside the two-sided limits of ± AV, then the channel is inoperable, and corrective action is required.

including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required. RCOL2_16-16

The Calibration Tolerance (CT) limits are applied to the calibration setting. The instrument channel calibration settings shall be set or confirmed to be within the specified CT around the five calibration settings (0, 25, 50, 75 and 100 percent) at the completion of each CHANNEL CALIBRATION surveillance. CT is a two-sided limit controlled by plant procedures, and is typically Sensor Calibration Accuracy (SCA), Rack Calibration Accuracy (RCA), or a combination of both. DCD_16-301

d. For each Technical Specification required automatic protection instrumentation function implemented with a binary sensor connected to a digital channel or an analog bistable function, performance of a CHANNEL CALIBRATION surveillance (binary sensors connected to digital channels) or a COT-analog surveillance (analog bistables) shall include the following: DCD_16-301

1. If the as-found trip setting differs from the specified NTSP by less than the PTAC, then the channel is fully operable.

2. If the as-found trip setting differs from the specified NTSP by more than the PTAC, but less than the specified AV, then the channel is operable but degraded, and corrective action is required to restore the channel to within specifications.

3. If the as-found trip setting is differs from the specified NTSP by more than the specified AV, then the channel is inoperable, and corrective action is required, including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

The CT limits are applied to NTSP. The instrument channel trip setting shall be set or confirmed to be within the specified CT around the NTSP at the completion of each COT-analog surveillance. CT is a two-sided limit controlled by plant procedures, and is typically a function of SCA, RCA or a combination of both. DCD_16-301

For each Technical Specification required automatic protection instrumentation function implemented with a binary sensor (e.g., pressure switches, UV relays), the difference between the instrument channel trip settings as-found value and the as-left trip setting value or the specified NTSP shall be trended and evaluated to verify that the instrument channel is functioning in accordance with its design basis.

For each Technical Specification required automatic protection instrumentation function implemented with a digital bistable function, the difference between the instrument channel calibration setting (0, 25, 50, 75 and 100 percent) as-found and as-left values shall be trended and evaluated to verify that the instrument channel is functioning in accordance with its design basis.

e. For each Technical Specification required automatic protection instrumentation function implemented with an analog bistable function, the difference between the instrument channel trip setting as-found value and the as-left trip setting value or DCD_16-301 the specified NTSP shall be trended and evaluated to verify that the instrument channel is functioning in accordance with its design basis.

f. The SCP shall establish a document containing the current values of the specified NTSP, AV, PTAC, and CT for each Technical Specification required automatic protection instrumentation function, and references to the calculation documentation. Changes to this document shall be governed by the regulatory requirements of 10 CFR 50.59. In addition, changes to the specified NTSP, AV, PTAC, and CT values shall be governed by the approved setpoint methodology. This document including any midcycle revisions or supplements shall be provided upon issuance for each reload cycle to the NRC. DCD_16-301

~~-----------------------------REVIEWER'S NOTE--------------------------~~ RCOL2_16-16

~~The referenced NRC approved setpoint methodology shall meet the following guidance, and shall be applicable to Technical Specification required automatic protection instrumentation function surveillances that require verification that setpoints (or channel outputs) are within the necessary range and accuracy (e.g., CHANNEL CALIBRATIONS):~~ DCD_16-302

1. ~~The methodology allows little variation in the values calculated by different analysts using identical input values (such as uncertainties and channel calibration drift).~~

2. ~~For each Technical Specification required automatic protection instrumentation function implemented with an analog bistable function, the as-left value of the instrument channel trip setting shall be the value at which the channel was set at the completion of the surveillance with no additional adjustment of the instrument channel.~~

3. ~~For each Technical Specification required automatic protection instrumentation function implemented with an analog bistable function, the as-found value of the instrument channel trip setting shall be the trip setting value measured during the subsequent performance of the surveillance before making any adjustment to the instrument channel that could change the trip setting value.~~

4. ~~If the requirements of 5.5.21.c. or 5.5.21.d include an allowance for the as-found value to be compared with the specified calibration setting or NTSP, the following conditions shall be applied:~~

    a. ~~The setting tolerance band (i.e., the specified CT) must be less than or equal to the square root of the sum of the squares of reference accuracy, measurement and test equipment errors, and readability uncertainties;~~

    b. ~~The setting tolerance band (i.e., the specified CT) must be included in the total loop uncertainty; and~~

    c. ~~The pre-defined test acceptance criteria band (i.e., the specified PTAC) for the as found value must include either the setting tolerance band (the specified CT) or the uncertainties associated with the setting tolerance band (the specified CT), but not both of these~~

5.0 ADMINISTRATIVE CONTROLS

5.6 Reporting Requirements

The following reports shall be submitted in accordance with 10 CFR 50.4.

5.6.1 Annual Radiological Environmental Operating Report

---NOTE---
A single submittal may be made for a multiple unit station. The submittal should combine sections common to all units at the station.

The Annual Radiological Environmental Operating Report covering the operation of the unit during the previous calendar year shall be submitted by May 15 of each year. The report shall include summaries, interpretations, and analyses of trends of the results of the Radiological Environmental Monitoring Program for the reporting period. The material provided shall be consistent with the objectives outlined in the Offsite Dose Calculation Manual (ODCM), and in 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C.

The Annual Radiological Environmental Operating Report shall include the results of analyses of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in the tables and figures in the ODCM, as well as summarized and tabulated results of these analyses and measurements in a format similar to the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted in a supplementary report as soon as possible. MAP-16-302

5.6.2 Radioactive Effluent Release Report

---NOTE---

A single submittal may be made for a multiple unit station. The submittal shall combine sections common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

The Radioactive Effluent Release Report covering the operation of the unit in the previous year shall be submitted prior to May 1 of each year in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR Part 50, Appendix I, Section IV.B.1.

5.6 Reporting Requirements

5.6.4 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

a. RCS pressure and temperature limits for heat up, cooldown, low temperature operation, criticality, and hydrostatic testing, as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

3.4.3, “RCS Pressure and Temperature (P/T) Limits”
3.4.12, “Low Temperature Overpressure Protection System”

b. The analytical methods used to determine the RCS pressure and temperature limits shall be those previously reviewed and approved by the NRC, specifically those described in the ~~FSAR Chapter 5.~~MUAP-09016, “Pressure and Temperature Limits Report” DCD_05.03.02

c. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto.

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B of LCO 3.3.3, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Prestressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with ~~the~~ Specification 5.5.9, "Steam Generator (SG) Program." The report shall include: MAP-16-302

a. The scope of inspections performed on each SG,

b. Active degradation mechanisms found,

c. Nondestructive examination techniques utilized for each degradation mechanism,

d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,

e. Number of tubes plugged during the inspection outage for each active degradation mechanism,

f. Total number and percentage of tubes plugged to date,

g. The results of condition monitoring, including the results of tube pulls and in-situ testing, and

h. The effective plugging percentage for all plugging in each SG.

5.7 High Radiation Area

5.7.2 High Radiation Areas with Dose Rates Greater than 1.0 rem/hour at 30 Centimeters from the Radiation Source or from any Surface Penetrated by the Radiation, but less than 500 rads/hour at 1 Meter from the Radiation Source or from any Surface Penetrated by the Radiation (continued)

d. Each individual or group entering such an area shall possess:

1. A radiation monitoring device that continuously integrates the radiation rates in the area and alarms when the device's dose alarm setpoint is reached, with an appropriate alarm setpoint, or

2. A radiation monitoring device that continuously transmits dose rate and cumulative dose information to a remote receiver monitored by radiation protection personnel responsible for controlling personnel radiation exposure within the area with the means to communicate with and control every individual in the area, or

3. A self-reading dosimeter (e.g., pocket ionization chamber or electronic dosimeter) and,

(a). Be under surveillance, as specified in the radiation work permit or equivalent, while in the area, of an individual qualified in radiation protection procedures, equipped with a radiation monitoring device that continuously displays radiation dose rates in the area; who is responsible for controlling personnel exposure within the area, or

(b). Be under surveillance as specified in the radiation work permit or equivalent, while in the area, by means of closed circuit television, or personnel qualified in radiation protection procedures, responsible for controlling personnel radiation exposure in the area, and with the means to communicate with and control every individual in the area.

4. In those cases where options (2) and (3), above, are impractical or determined to be inconsistent with the "As Low As is Reasonably Achievable" principle, a radiation monitoring device that continuously ~~displaces~~displays radiation dose rates in the area. MAP-16-302

e. Except for individuals qualified in radiation protection procedures, or personnel continuously escorted by such individuals, entry into such areas shall be made only after dose rates in the area have been determined and entry personnel are knowledgeable of them.

Bases

Bases – Tracking Report Revision List

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL4_16-8	B 3.7.9	B3.7.9-2 B3.7.9-3	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Revised bases for Completion Time of condition A.	-
RCOL4_16-4	B 3.7.9	B3.7.9-3 B3.7.9-4	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Bases for Condition B was divided into Condition B and new Condition C to address basin temperature and water level, respectively. Each Bases for Completion Time was revised in accordance with the change of specification. Following Condition IDs were moved up due to new Condition C.	-
RCOL4_16-1	B 3.7.9	B3.7.9-5	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	The Bases for Surveillance Requirement 3.7.9.5 was changed in accordance with the change of Surveillance Requirement.	-
RCOL4_16-7	B 3.7.9	B3.7.9-5	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	The Bases for SR 3.7.9.5 was revised in accordance with the change of SR 3.7.9.5 Frequency.	-
RCOL4_16-5	B 3.7.9	B3.7.9-5	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Bases for SR 3.7.9.6 and SR 3.7.9.7 were newly added.	-
RCOL4_16-2	B 3.7.9	B3.7.9-1	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added the following sentence: “The stored water level provides adequate net positive suction head (NPSH) to the ESW pump during a 30-day period of operation following the design basis LOCA without makeup.”	-
RCOL4_16-3	B 3.7.9	B3.7.9-4	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added justification for the selected Completion Time of 7 days for Required Actions D.1 and D.2.1.	-
RCOL4_16-2	B 3.7.9	B3.7.9-4	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added the following sentence to the bases of SR 3.7.9.1: “Plant procedures provide the corresponding water level to be verified to assure a usable volume of 2,850,00	-

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
				gallons, accounting for unusable volume and measurement uncertainty."	
RCOL4_16-7	B 3.7.9	B3.7.9-5	Response to RAI No. 90 Luminant Letter no.TXNB-09064 Date 11/11/2009	REFERENCES, first reference: "FSAR Chapter 9" was revised to "FSAR Subsection 9.2.5."	-
RCOL2_16-13	B 3.3.2	B 3.3.2-56	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Revised Bases for SR 3.3.2.4 in accordance with the addition of the following statement to SR 3.3.2.4. "The Actuation Outputs are solid state devices."	-
RCOL2_16-14	B 3.3.2	B 3.3.2-5	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Corrected the following editorial error: The Comanche Peak Units 3 and 4 Bases, BACKGROUND, page B 3.3.2-5 (second paragraph), misspells the word "self-tested" in the first sentence.	-
RCOL2_16-16	B 3.3.1	B 3.3.1-2	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced "specified" with "administered" Replaced "Table 3.3.1" with "the Setpoint Control Program (SCP) Replaced "channel" with "measured" Replaced "setpoints" with "setting"	-
RCOL2_16-16	B 3.3.1	B 3.3.1-5	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced "specified" with "administered" Replaced "Table 3.3.1-1" with "the SCP" Deleted "digital"	-
RCOL2-16-16	B 3.3.1	B 3.3.1-6	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added "Normal" for "Trip Setpoint" in three portions. Replaced "band for CHANNEL CALIBRATION uncertainty allowance" with "established Calibration Tolerance (CT) band, in accordance with the methods and assumptions in the SCP" Added "NOTE: The Allowance Value…limit is reached"	-

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL2_16-16	B 3.3.1	B 3.3.1-7	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “accuracy value” with “value measured during surveillance testing” Added “For digital functions Allowable Values are defined …to the Nominal Trip Setpoint” Replaced “Nominal” with “Limiting”	-
RCOL2_16-16	B 3.3.1	B 3.3.1-8	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added “or train” in four portions. Deleted “In Table 3.3.1-1, the value…specific instrumentations”	-
RCOL2_16-16	B 3.3.1	B 3.3.1-41	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “the assumptions used in analytically calculating the required channel accuracies” with “Section 5.5.21 SCP”	-
RCOL2_16-16	B 3.3.1	B 3.3.1-49	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replace “the assumptions of…values methodology” with “the methods and assumptions in Section 5.5.21 SCP”	-
RCOL2_16-16	B 3.3.2	B 3.3.2-2	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “an output from a digital bistable” with “a bistable output”	-
RCOL2_16-16	B 3.3.2	B 3.3.2-3	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “specified” with “administered” Replace “Table 3.3.2.1” with “the SCP” Deleted “digital”	-

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL2_16-16	B 3.3.2	B 3.3.2-4	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added “Normal” for “Trip Setpoint in two portions” Deleted “digital” Replaced “band for CHANNEL CALIBRATION uncertainty allowance” with “established Calibration Tolerance (CT) band, in accordance with the methods and assumptions in the SCP”	-
RCOL2_16-16	B 3.3.2	B 3.3.2-5	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted “digital”	-
RCOL2_16-16	B 3.3.2	B 3.3.2-6	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted 4th paragraph of Section “Applicable Safety Analyses, LCO, and Applicability”	-
RCOL2_16-16	B 3.3.2	B 3.3.2-34	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted “with which to associate a trip Setpoint and Allowance Value”	-
RCOL2_16-16	B 3.3.2	B 3.3.2-54	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “the assumptions used in analytically calculating the required channel accuracies” with “Section 5.5.21, SCP”	-
RCOL2_16-16	B 3.3.2	B 3.3.2-57	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “defined by the Allowance Value” with “described in Section 5.5.21 SCP” Replaced “the assumptions of…setpoint methodology” with “the methods and assumptions in Section 5.5.21 SCP”	-

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL2_16-16	B 3.3.5	B 3.3.5-1	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “uncertainty assumptions…terms assigned” with “Section 5.5.21 SCP” Replaced “the Allowable Value” with “Section 5.5.21 SCP” Added “The time delay of the Class…in Chapter 15” Deleted “Allowable Values…in SR 3.3.5.3”	-
RCOL2_16-16	B 3.3.5	B 3.3.5-5	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted “In SR 3.3.5.3, the value…specific instrumentations” Replaced “the assumptions of the unit…setpoint methodology” with “the methods and assumptions in Section 5.5.21 SCP”	-
RCOL2_16-16	B 3.3.5	B 3.3.5-6	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Deleted “In SR 3.3.5.3, the values specified…specific instrumentations”	-
RCOL2_16-16	B 3.3.6	B 3.3.6-3	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “specified” with “administered” Replaced “Table 3.3.6-1” with “the SCP”	-
RCOL2_16-16	B 3.3.6	B 3.3.6-5	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Added “Nominal” and “Limiting”	-
RCOL2_16-16	B 3.3.6	B 3.3.6-6	Response to RAI No. 91 Luminant Letter no.TXNB-09064	Deleted “In Table 3.3.6.1, the values…specific instrumentations”	-

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
			Date 11/11/2009		
RCOL2_16-16	B 3.3.6	B 3.6.6-10	Response to RAI No. 91 Luminant Letter no.TXNB-09064 Date 11/11/2009	Replaced “specified” with “administered” Replaced “Table 3.3.5” with “the SCP” Replaced “the assumptions of…setpoint methodology” with “the methods and assumptions in Section 5.5.21 SCP”	-
RCOL2_09.02.05-05	3.7.9	B3.7.9-2 B3.7.9-4	Response to RAI No. 121 Luminant Letter No. TXNB-09081 Date 12/16/2009	Revised surveillance requirement SR 3.7.9.1 and description for LCO to change the water level from 2,850,000 gallons to 2,800,000 gallons.	-
RCOL2_09.02.05-14	3.7.9	B3.7.9.2 B3.7.9.5	Response to RAI No. 121 Luminant Letter No. TXNB-09081 Date 12/16/2009	Revised water temperature for Surveillance Requirement SR 3.7.9.2 from 95 to 93 degrees F.	-
RCOL2_09.02.05-14	3.7.9	B3.7.9-2	Response to RAI No. 121 Luminant Letter No. TXNB-09081 Date 12/16/2009	Revised second paragraph of Applicable Safety Analysis to provide description that the operating limits are based on shutdown with LOOP. Revised LCO section to provide clarification that the ESWS will remove heat during a shutdown with LOOP and also revised the temperature from 95 to 93 degrees F.	-
-	-	-	Consistency with DCD Rev.2 Incorporate editorial relevant changes from Chapter 16 of DCD Revision 2	Incorporate changes as describe in MHI Letter DCD Revision 2 # UAP-HF-09490 dated 10/27/2009	0

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL2_16-18	3.7.9	B 3.7.9-6	Response to RAI No. 149 Luminant Letter no.TXNB-10028 Date 4/5/2010	Reverted the surveillance frequency change for SR 3.7.9.5, which was made in Response to RAI No. 90 (RCOL2_16-7).	-
DCD_16-300	B 3.3.1	B 3.3.1-34	Reflect response to DCD RAI No. 520	Revised sentence to correct typographical error.	1
DCD_16-300	B 3.3.1	B 3.3.1-34	Reflect response to DCD RAI No. 520	Added “time limit” to last sentence.	1
DCD_16-300	B 3.3.1	B 3.3.1-37	Reflect response to DCD RAI No. 520	Deleted description as follows: “, and Turbine Trip – main Turbine Stop Valve Position”	1
DCD_16-300	B 3.3.1	B 3.3.1-40	Reflect response to DCD RAI No. 520	Added description about completion time of RTS channels.	1
DCD_16-300	B 3.3.1	B 3.3.1-40 B 3.3.1-41 B 3.3.1-44	Reflect response to DCD RAI No. 520	Revised sentence to correct typographical error.	1
DCD_16-300	B 3.3.1	B 3.3.1-44	Reflect response to DCD RAI No. 520	Replaced “(3) The Manual Reactor Trip hardware switches” with “(3) The Manual Reactor Trip Test for verification of RTB operability using the hardware switches”.	1
DCD_16-300	B 3.3.1	B 3.3.1-45 B 3.3.1-46	Reflect response to DCD RAI No. 520	Replaced "RTS" with "PSMS"	1
DCD_16-300	B 3.3.1	B 3.3.1-47	Reflect response to DCD RAI No. 520	Deleted "over"	1
MAP-16-206	B 3.3.1	B 3.3.1-50	Reflect responses to DCD Draft Open Items 16.4.6	Added description about time response variation of the dynamic transfer functions.	1

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
MAP-16-207	B 3.3.1 B 3.3.2	B 3.3.1-51 B 3.3.2-59	Reflect responses to DCD Draft Open Items 16.4.6	Added description about technical reports that provide information on response time.	1
DCD_16-300	B 3.3.2	B 3.3.2-28	Reflect response to DCD RAI No. 520	Capitalized "Coincident" and "No"	1
DCD_16-300	B 3.3.2	B 3.3.2-33	Reflect response to DCD RAI No. 520	Capitalized "Level" and "No"	1
DCD_16-300	B 3.3.2	B 3.3.2-37	Reflect response to DCD RAI No. 520	Replaced “without” with “including”	1
DCD_16-300	B 3.3.2	B 3.3.2-40	Reflect response to DCD RAI No. 520	Capitalized second low in "Low-Low"	1
MAP-16-208	B 3.3.2	B 3.3.2-58	Reflect responses to DCD Draft Open Items 16.4.6	Added description about time response variation of the dynamic transfer functions.	1
MAP-16-209	B 3.3.3	B 3.3.3-4	Reflect responses to DCD Draft Open Items 16.4.6	Added description about PAM function of RCS Hot Leg and Cold Leg Wide Range.	1
MAP-16-210	B 3.3.3	B 3.3.3-6	Reflect responses to DCD Draft Open Items 16.4.6	Added description about PAM function of Steam Generator Water Level Wide Range.	1
MAP-16-211	B 3.3.3	B 3.3.3-10	Reflect responses to DCD Draft Open Items 16.4.6	Deleted description about alternate means of temperature, level, and flow measurement.	1
DCD_16-300	B 3.3.5	B 3.3.5-6	Reflect response to DCD RAI No. 520	Replaced “Channel” with “CHANNEL”	1
DCD_16-300	B 3.3.6	B 3.3.6-5 B 3.3.6-6	Reflect response to DCD RAI No. 520	Revised sentence to correct typographical error.	1

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
DCD_14.02-120	B 3.4.13 B 3.4.15	B 3.4.13-5 B 3.4.15-6	Reflect response to DCD RAI No. 521	Updated RG 1.45 reference.	1
MAP-16-204	B 3.5.2	B 3.5.2-7	Reflect responses to DCD Draft Open Items 16.4.8	Incorporated bases for SR 3.5.2.4.	1
DCD_09.04.01-12A	B 3.7.10	B 3.7.10-10	Reflect response to DCD RAI No. 475	Replaced “the system” with “all potential operating configurations of two trains of 50% capacity MCRATCS air handling units”.	1
MAP-16-205	B 3.8.1	B 3.8.1-5 [B 3.8.1-6]	Reflect responses to DCD Draft Open Items 16.4.11	Incorporated bases for required action A.2	1
MAP-16-212	B 3.8.1	B 3.8.1-18 [B 3.8.1-19]	Reflect responses to DCD Draft Open Items 16.4.11	Clarified power factor discussion.	1
MAP-16-213	B 3.8.3	B 3.8.3-6 B 3.8.3-8	Reflect responses to DCD Draft Open Items 16.4.6	Deleted descriptions related to ASTM D4176-04.	1
CTS-01278	B3.0	B3.0-14	Correction	Deleted reviewers’ note	2
DCD_16-301	B3.1.9 B3.3.1 B3.3.2 B3.3.6	B3.1.9-7 B3.3.1-2 B3.3.1-5 B3.3.1-6 B3.3.1-7 B3.3.1-41 B3.3.2-4 B3.3.2-5 B3.3.2-54 B3.3.6-3 B3.3.6-5 B3.3.6-10	Reflect response to DCD RAI No. 590	Incorporated changes as described in MHI Letter No. UAP-HF-09493	2

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev . of T/R
MAP-16-302	B3.1.1 B3.1.6 B3.1.8 B3.3.1 B3.3.2 B3.3.3 B3.4.8 B3.4.10 B3.4.11 B3.4.14 B3.5.5 B3.6.1 B3.6.6 B3.7.11 B3.7.14 B3.8.1 B3.8.3 B3.8.4 B3.8.9 B3.8.9 B3.9.3	B 3.1.1-2 B 3.1.6-2 B3.1.8-1 B3.1.8-7 B3.3.1-2 B3.3.1-4 B3.3.1-45 B3.3.1-50 B3.3.1-51 B3.3.2-3 B3.3.2-10 B3.3.2-25 B3.3.2-44 B3.3.2-49 B3.3.2-50 B3.3.2-55 B3.3.2-56 B3.3.2-57 B3.3.2-58 [B3.3.2-59] B3.3.3-12 B3.4.8-2 B3.4.10-2 B3.4.11-5 B3.4.14-6 B3.5.5-3 B3.6.1-1 B3.6.1-2 B3.6.1-4 B3.6.3-12 B3.6.6-2 B3.7.11-6 B3.7.14-2 B3.8.1-17 [B3.8.1-18] B3.8.3-1 B3.8.4-1 B3.8.4-4	Consistency with DCD Revision 3	Editorial Changes	2
DCD_07.02-4	B3.3.1	B3.3.1-3	Reflect response to DCD RAI No.672	Incorporated changes as described in MHI Letter No.UAP-HF-11001	2

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev . of T/R
DCD_19.01 -1	B3.4.8	B3.4.8-2 B3.4.8-3 [B3.4.8-4]	Reflect response to DCD RAI No. 577	Incorporated changes as described in MHI Letter No. UAP-HF-10147	2
CTS-01276	B3.4.12	B3.4.12-8 [B3.4.12-9]	Correction	SR 3.4.12.5 was change to state the adoption of surveillance frequency control program	2
DCD_09.03 .04-10	B3.5.1 B3.5.4	B3.5.1-1 [B3.5.1-2] B3.5.1-3 [B3.5.1-4] B3.5.1-7 [B3.5.1-8] B3.5.4-1 [B3.5.4-2] B3.5.4-5	Reflect response to DCD RAI No.384	Incorporated changes as described in MHI Letter No.UAP-HF-09383	2
CTS-01279	B3.5.4	B3.5.4-4	Correction	Basis for SR 3.5.4.1 was corrected to state the adoption of surveillance frequency control program	2
CTS-01277	B3.6.3	B3.6.3	Correction	SR 3.6.3.6 was change to state the adoption of surveillance frequency control program	2
CTS-01268	B3.6.6 B3.8.1 B3.8.4 B3.8.7 B3.8.9 B3.9.3	B3.6.6-6 B3.8.1-5 [B3.8.1-6] B3.8.1-7 [B3.8.1-8] B3.8.1-9 [B3.8.1-10] B3.8.1-10 [B3.8.1-11] B3.8.1-11 [B3.8.1-12] B3.8.4-6 B3.8.7-3 B3.8.9-3 B3.8.9-8 B3.9.3-1	Erratum	Changed to correct editorial error	2
CTS-01280	B3.7.9	B3.7.9-4	Correction	Corrected required UHS basin water level from 2,850,000 to 2,800,000	2

Change ID No.	Section	TS Rev 1 Page*	Reason for change	Change Summary	Rev. of T/R
DCD_19.01-8	B3.9.6	B3.9.6-1 B3.9.6-2 B3.9.6-3 B3.9.6-4 [B3.9.6-5]	Reflect response to DCD RAI No.628	Incorporated changes as described in MHI Letter No. UAP-HF-10277	2

*Page numbers for the attached marked-up pages may differ from the revision 1 page numbers due to text additions and deletions. When the page numbers for the attached pages do differ, the page number for the attached page is shown in brackets.

LCO 3.0.9 (continued)

~~Reviewer's Note~~
~~LCO 3.0.9 may be expanded to other initiating event categories provided plant-specific analysis demonstrates that the frequency of the additional initiating events is bounded by the generic analysis or if plant-specific approval is obtained from the NRC.~~

CTS-01278

- Loss of coolant accidents;
- High energy line breaks;
- Feedwater line breaks;
- Internal flooding;
- External flooding;
- Turbine missile ejection; and
- Tornado or high wind.

The risk impact of the barriers which cannot perform their related support function(s) must be addressed pursuant to the risk assessment and management provision of the Maintenance Rule, 10 CFR 50.65 (a)(4), and the associated implementation guidance, Regulatory Guide 1.182, “Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants.” Regulatory Guide 1.182 endorses the guidance in Section 11 of NUMARC 93-01, “Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.” This guidance provides for the consideration of dynamic plant configuration issues, emergent conditions, and other aspects pertinent to plant operation with the barriers unable to perform their related support function(s). These considerations may result in risk management and other compensatory actions being required during the period that barriers are unable to perform their related support function(s).

LCO 3.0.9 may be applied to one or more trains or subsystems of a system supported by barriers that cannot provide their related support function(s), provided that risk is assessed and managed (including consideration of the effects on Large Early Release and from external events). If applied concurrently to more than one train or subsystem of a multiple train or subsystem supported system, the barriers supporting each of these trains or subsystems must provide their related support function(s) for different categories of initiating events. For example, LCO 3.0.9 may be applied for up to 30 days for more than one train of a multiple train supported system if the affected barrier for one train protects against internal flooding and the

APPLICABLE SAFETY ANALYSES (continued)

The acceptance criteria for the SDM requirements are that specified acceptable fuel design limits are maintained. This is done by ensuring that:

a. The reactor can be made subcritical from all operating conditions, transients, and Design Basis Events,

b. The reactivity transients associated with postulated accident conditions are controllable within acceptable limits (departure from nucleate boiling ratio (DNBR), fuel centerline temperature limits for AOOs, and below 230 cal/gm energy deposition for the rod ejection accident), and MAP-16-302

c. The reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

The most limiting accident for the SDM requirements is based on a main steam line break (MSLB), as described in the accident analysis (Ref. 2). The increased steam flow resulting from a pipe break in the main steam system causes an increased energy removal from the affected steam generator (SG), and consequently the RCS. This results in a reduction of the reactor coolant temperature. The resultant coolant shrinkage causes a reduction in pressure. In the presence of a negative moderator temperature coefficient, this cooldown causes an increase in core reactivity. As RCS temperature decreases, the severity of an MSLB decreases until the MODE 5 value is reached. The most limiting MSLB, with respect to potential fuel damage before a reactor trip occurs, is a guillotine break of a main steam line inside containment initiated at the end of core life. The positive reactivity addition from the moderator temperature decrease will terminate when the affected SG boils dry, thus terminating RCS heat removal and cooldown. Following the MSLB, a post trip return to power may occur; however, no fuel damage occurs as a result of the post trip return to power, and THERMAL POWER does not violate the Safety Limit (SL) requirement of SL 2.1.1.

In addition to the limiting MSLB transient, the SDM requirement must also protect against:

a. Inadvertent boron dilution,

b. An uncontrolled rod withdrawal from subcritical or low power condition, and

BASES

BACKGROUND (continued)

The control banks are used for precise reactivity control of the reactor. The positions of the control banks are normally controlled automatically by the Rod Control System, but can also be manually controlled. They are capable of adding reactivity very quickly (compared to borating or diluting).

The power density at any point in the core must be limited, so that the fuel design criteria are maintained. Together, LCO 3.1.4, "Rod Group Alignment Limits," LCO 3.1.5, "Shutdown Bank Insertion Limits," LCO 3.1.6, "Control Bank Insertion Limits," LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)," and LCO 3.2.4, "QUADRANT POWER TILT RATIO (QPTR)," provide limits on control component operation and on monitored process variables, which ensure that the core operates within the fuel design criteria. MAP-16-302

The shutdown and control bank insertion and alignment limits, AFD, and QPTR are process variables that together characterize and control the three dimensional power distribution of the reactor core. Additionally, the control bank insertion limits control the reactivity that could be added in the event of a rod ejection accident, and the shutdown and control bank insertion limits ensure the required SDM is maintained.

Operation within the subject LCO limits will prevent fuel cladding failures that would breach the primary fission product barrier and release fission products to the reactor coolant in the event of a loss of coolant accident (LOCA), loss of flow, ejected rod, or other accident requiring termination by a Reactor Trip System (RTS) trip function.

APPLICABLE SAFETY ANALYSES

The shutdown and control bank insertion limits, AFD, and QPTR LCOs are required to prevent power distributions that could result in fuel cladding failures in the event of a LOCA, loss of flow, ejected rod, or other accident requiring termination by an RTS trip function.

The acceptance criteria for addressing shutdown and control bank insertion limits and inoperability or misalignment are that:

a. There be no violations of:

   1. Specified acceptable fuel design limits or

   2. Reactor Coolant System pressure boundary integrity and

b. The core remains subcritical after accident transients.

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.8 PHYSICS TESTS Exceptions - MODE 1

BASES

BACKGROUND

The primary purpose of the MODE 1 PHYSICS TESTS exceptions is to permit relaxations of existing LCOs to allow the performance of instrumentation calibration tests and special PHYSICS TESTS. The exceptions to LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)," and LCO 3.2.4, "QUADRANT POWER TILT RATIO (QPTR)" are most often appropriate for xenon stability tests. The exceptions to LCO 3.1.4, "Rod Group Alignment Limits", LCO 3.1.5, "Shutdown Bank Insertion Limit", and LCO 3.1.6, "Control Bank Insertion Limits," may be required in the event that it is necessary or desirable to do special PHYSICS TESTS involving abnormal rod or bank configurations. MAP-16-302

Section XI of 10 CFR 50, Appendix B (Ref. 1), requires that a test program be established to ensure that structures, systems, and components will perform satisfactorily in service. All functions necessary to ensure that the specified design conditions are not exceeded during normal operation and anticipated operational occurrences must be tested. This testing is an integral part of the design, construction, and operation of the plant. Requirements for notification of the NRC, for the purpose of conducting tests and experiments, are specified in 10 CFR 50.59 (Ref. 2).

The key objectives of a test program are to (Ref. 3):

a. Ensure that the facility has been adequately designed,

b. Validate the analytical models used in the design and analysis,

c. .Verify the assumptions used to predict unit response,

d. Ensure that installation of equipment at the facility has been accomplished, in accordance with the design, and

e. Verify that the operating and emergency procedures are adequate.

To accomplish these objectives, testing is performed prior to initial criticality, during startup, low power, power ascension, and at power

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.8.2

Verification of the Power Range Neutron Flux – High trip setpoints within 8 hours prior to initiation of the PHYSICS TESTS will ensure that the RTS is properly set to perform PHYSICS TESTS.

SR 3.1.8.3

The performance of SR 3.2.1.1 and SR 3.2.2.1 measures the core $F_Q(Z)$ and the $F^N_{\Delta H}$, respectively. If the requirements of these LCOs are met, the core has adequate protection from exceeding its design limits, while other LCO requirements are suspended. The Frequency of 12 hours is based on operating experience and the practical amount of time that it may take to run an incore flux map and calculate the hot channel factors.

SR 3.1.8.4

The SDM is verified by performing a reactivity balance calculation, considering the following reactivity effects:

a. Reactor Coolant System (RCS) boron concentration,

b. Control bank position,

c. RCS average temperature,

d. Fuel burnup based on gross thermal energy generation,

e. Xenon concentration, MAP-16-302

f. Samarium concentration,

g. Moderator defect, and

h. Doppler defect.

The frequency of 24 hours is based on the generally slow change in required boron concentration and on the low probability of an accident without the required SDM.

SURVEILLANCE REQUIREMENTS

SR 3.1.9.1

The power range and intermediate range neutron detectors must be verified to be OPERABLE in MODE 2 by LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation." A CHANNEL CALIBRATION ~~TEST~~ is performed on each power range and intermediate range channel prior to initiation of the PHYSICS TESTS. This will ensure that the RTS is properly aligned to provide the required degree of core protection during the performance of the PHYSICS TESTS. DCD_16-301

SR 3.1.9.2

Verification that the RCS lowest loop T_{avg} is ≥ 541°F will ensure that the unit is not operating in a condition that could invalidate the safety analyses. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.1.9.3

Verification that the THERMAL POWER is ≤ 5% RTP will ensure that the plant is not operating in a condition that could invalidate the safety analyses. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.1.9.4

The SDM is verified by performing a reactivity balance calculation, considering the following reactivity effects:

a. RCS boron concentration,

b. Control bank position,

c. RCS average temperature,

BASES

BACKGROUND (continued)

Technical Specifications contain measured accuracy values related to the OPERABILITY of equipment required for safe operation of the facility. The measured accuracy value accommodates expected drift in the analog components of the channel that would have been specifically accounted for in the setpoint methodology for calculating the Trip Setpoint and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" settings of the protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to recalibrate the device to account for further drift during the next surveillance interval. MAP-16-302

However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the devices and is designated as the Allowable Value. ~~The Allowable Value is another important component of the LSSS.~~ MAP-16-302

The Allowable Value ~~specified in Table 3.3.1-1 serves as the LSSS such~~recorded and maintained in a document established by the Setpoint Control Program (SCP) demonstrates that a channel is OPERABLE if the measured accuracy is found not to exceed the Allowable Value during CHANNEL CALIBRATION (protection functions implemented with digital bistable functions) or COT (protection functions implemented with analog bistable functions). The CHANNEL CALIBRATION verifies the instrument at five calibration ~~setpoints~~settings corresponding to 0%, 25%, 50%, 75% and 100% of the instrument range. As such, the Allowable Value accounts for the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. Note that, although the channel is "OPERABLE" under these circumstances, the channel should be left adjusted to a value within the established channel calibration tolerance band, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned. If the actual accuracy of the device is found to have exceeded the Allowable Value the device would be considered inoperable from a technical specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required. RCOL2_16-16 DCD_16-301 DCD_16-301 RCOL2_16-16

BACKGROUND (continued)

During AOOs, which are those events expected to occur one or more times during the unit life, the acceptable limits are:

1. The Departure from Nucleate Boiling Ratio (DNBR) shall be maintained above the Safety Limit (SL) value to prevent departure from nucleate boiling (DNB),

2. Fuel centerline melt shall not occur, and

3. The RCS pressure SL of 2733.5 psig shall not be exceeded.

Operation within the SLs of Specification 2.0, "Safety Limits (SLs)," also maintains the above values and assures that offsite dose will be within the 10 CFR 50 and 10 CFR 100 criteria during AOOs.

Accidents are events that are analyzed even though they are not expected to occur during the unit life. The acceptable limit during accidents is that offsite dose shall be maintained within an acceptable fraction of 10 CFR 100 limits. Different accident categories are allowed a different fraction of these limits, based on probability of occurrence. Meeting the acceptable dose limit for an accident category is considered having acceptable consequences for that event.

The RTS instrumentation is segmented into ~~three~~four distinct but interconnected modules as illustrated in FSAR Chapter 7 (Ref. 2), and as identified below: DCD_07.02-4

1. Field transmitters, process sensors or field contacts: provide a measurable electronic signal based upon the physical characteristics of the parameter being measured,

2. The RPS, including Nuclear Instrumentation System (NIS): provides signal conditioning, analog to digital conversion, bistable setpoint comparison, process algorithm actuation, compatible electrical signal output to the reactor trip breakers (RTBs), and digital output to control board/control room/miscellaneous VDUs, and

3. Reactor trip breakers (RTBs): provide the means to interrupt power to the control rod drive mechanisms (CRDMs) and allows the rod cluster control assemblies (RCCAs), or "rods," to fall into the core and shut down the reactor.

4. Manual Reactor Trip switches: provide the manual reactor trip initiation in the control room. DCD_07.02-4

BASES

BACKGROUND (continued)

Field Transmitters or Sensors

To meet the design demands for redundancy and reliability, more than one, and often as many as four, field transmitters or sensors are used to measure unit parameters. To account for the calibration tolerances and instrument drift, which are assumed to occur between calibrations, statistical allowances are provided in the Trip Setpoint and Allowable Values. The OPERABILITY of each transmitter or sensor is determined by either "as-found" calibration data evaluated during the CHANNEL CALIBRATION or by qualitative assessment of field transmitter or sensor as related to the channel behavio~~u~~r observed during performance of the CHANNEL CHECK. MAP-16-302

Protection and Safety Monitoring System

Generally, four channels of process control equipment are used for the signal processing of unit parameters measured by the field instruments. Four channels provides the capability for unlimited bypass of one channel while maintaining single failure criteria, therefore generally allowing a requirement for only three channels to be OPERABLE. The process control equipment provides signal conditioning, analog to digital conversion, comparable digital output signals for VDUs located on the main control board, and comparison of measured input signals with setpoints established by safety analyses. These setpoints are defined in FSAR Chapter 7 (Ref. 2). If the measured value of a unit parameter exceeds the predetermined setpoint, an output from a digital bistable is processed for decision evaluation. Channel separation is maintained throughout the PSMS. Some unit parameters provide input only to the PSMS, while others are use by the PSMS and are retransmitted to the PCMS for use in one or more control systems.

Generally, if a parameter is used only for input to the protection circuits, three channels with a two-out-of-three logic are sufficient to provide the required reliability and redundancy. If one channel fails in a direction that would not result in a partial Function trip, the Function is still OPERABLE with a two-out-of-two logic. If one channel fails, such that a partial Function trip occurs, a trip will not occur and the Function is still OPERABLE with a one-out-of-two logic.

BASES

BACKGROUND (continued)

Generally, if a parameter is used for input to the protection circuits and a control function, three channels with a two-out-of-three logic are also sufficient to provide the required reliability and redundancy. The Signal Selection Algorithm (SSA) within the PCMS ensures the control systems can withstand an input failure to the control system without causing erroneous control system operation which would otherwise require the protection function actuation. Since the input failure does not cause an erroneous control system action that challenges the protection function, the input failure is considered a single failure in the RTS and the RTS remains capable of providing its protective function with the remaining two operable channels. Again, a single failure will neither cause nor prevent the protection function actuation. These requirements are described in IEEE-603-1991 (Ref. 4). The actual number of channels required for each unit parameter is specified in Reference 2.

The RTB trains are arranged in a two out of four configuration. Therefore, three logic trains are required to ensure no single random failure of a logic train will disable the RTS. The logic trains are designed such that testing required while the reactor is at power may be accomplished without causing trip. Provisions allow removing logic trains from service during maintenance.

Allowable Values and RTS Setpoints

The Trip Setpoints used in the digital bistables are based on the Analytical Limits defined in the accident analysis and the channel uncertainty. The selection of these Trip Setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment errors for those RTS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 5), the Trip Setpoints ~~specified in Table 3.3.1-1~~recorded and maintained in a document established by the SCP in the accompanying LCO are conservative with respect to the Analytical Limits. The methodology used to calculate the Allowable Values and Trip Setpoints incorporates all of the known uncertainties applicable to each channel (Ref. 2). The magnitudes of these uncertainties are factored into the determination of each Trip Setpoint and corresponding Allowable Value. The Trip Setpoint entered into the ~~digital~~ bistable is more conservative than that specified by the Analytical Limit (LSSS) to account for measurement errors detectable by the CHANNEL CALIBRATION. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CHANNEL CALIBRATION. One example of such a change in measurement error is drift during the surveillance interval. If the measured accuracy does not exceed the Allowable Value, the channel is considered OPERABLE.

RCOL2_16-16
DCD_16-301

RCOL2_16-16

BASES

BACKGROUND (continued)

The Nominal Trip Setpoint is the value at which the bistable is set. The Nominal Trip Setpoint value ensures the LSSS and the safety analysis limits are met for surveillance interval selected when a channel is adjusted based on the stated channel uncertainties. Any channel is considered to be properly adjusted when the "as left" accuracy value is within the ~~band for CHANNEL CALIBRATION uncertainty allowance (i.e. ± instrument, signal conditioning, and A/D converter uncertainties).~~established Calibration Tolerance (CT) band, in accordance with the methods and assumptions in the SCP. The Trip Setpoint value (i.e. expressed as a value without inequalities) is used for the purposes of COT. RCOL2_16-16 RCOL2_16-16

Nominal Trip Setpoints consistent with the requirements of the Allowable Value ensure that SLs are not violated during AOOs (and that the consequences of PAs will be acceptable, providing the unit is operated from within the LCOs at the onset of the AOO or PA and the equipment functions as designed). RCOL2_16-16

Digital Trip Setpoints are maintained in non-volatile software memory within each RPS train. Each train of the process control equipment is self-tested continuously on line to verify that the digital Trip Setpoint settings are correct. Trip Setpoints are also verified periodically through a diverse software memory integrity test, which may be conducted with the RTS train out of service. A designated instrument channel is taken out of service for periodic calibration. SRs for the channels and trains are specified in the SRs section.

NOTE: The Allowable Value ~~in Table 3.3.1-1~~recorded and maintained in a document established by the SCP is the maximum deviation at the calibration setpoints that can be measured during CHANNEL CALIBRATION. This value is included in the calculations that determined the TRIP SETPOINT ~~in Table 3.3.1-1~~recorded and maintained in a document established by the SCP. The “expected as-found value” shall be as specified in the plant-specific setpoint analysis. The expected as-found value reflects the expected normal drift of actual plant equipment, so that a degraded device can be identified before the Allowable Value limit is reached. RCOL2_16-16 DCD_16-301 RCOL2_16-16 DCD_16-301

Reactor Trip Breakers

The RTBs are in the electrical power supply line from the control rod drive motor generator set power supply to the CRDMs. Opening of the RTBs interrupts power to the CRDMs, which allows the shutdown rods and control rods to fall into the core by gravity. There are eight RTBs, two from each of four RTB trains, arranged in a two out of four configuration.

BASES

BACKGROUND (continued)

During normal operation the output from the RPS is a voltage signal that energizes the undervoltage coils in the RTBs. When protective action is required, the RPS output voltage signal is removed, the undervoltage coils are de-energized, the breaker trip lever is actuated by the de-energized undervoltage coil, and the RTBs are tripped open. This allows the shutdown rods and control rods to fall into the core. In addition to the de-energization of the undervoltage coils, each breaker is also equipped with a shunt trip device that is energized to trip the breaker open upon receipt of a reactor trip signal from the RPS. Either the undervoltage coil or the shunt trip mechanism is sufficient by itself, thus providing a diverse trip mechanism.

The decision logic matrix Functions are described in the functional diagrams included in Reference 2. In addition to the reactor trip or ESF, these diagrams also describe the various "permissive interlocks" that are associated with unit conditions. Each train has built in self-testing that automatically tests the decision logic Functions while the unit is at power. When any one or two trains are taken out of service for testing, the other two trains are capable of providing unit monitoring and protection until the testing has been completed.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The RTS functions to maintain the SLs during all AOOs and mitigates the consequences of PAs in all MODES in which the Rod Control System is capable of rod withdrawal or one or more rods are not fully inserted.

Each of the analyzed accidents and transients can be detected by one or more RTS Functions. The accident analysis described in Reference 3 and 9 takes credit for most RTS trip Functions. RTS trip Functions not specifically credited in the accident analysis are qualitatively credited in the safety analysis and the NRC staff approved licensing basis for the unit. These RTS trip Functions may provide protection for conditions that do not require dynamic transient analysis to demonstrate Function performance. They may also serve as backups to RTS trip Functions that were credited in the accident analysis.

The LCO requires all instrumentation performing an RTS Function, listed in Table 3.3.1-1 in the accompanying LCO, to be OPERABLE. A channel is OPERABLE provided the "as-found" value, measured during surveillance testing, does not exceed its associated Allowable Value. For digital functions Allowable Values are defined in terms pertinent to the channel calibration ~~setpoints~~settings. For analog functions Allowable Values are defined in terms pertinent to the Nominal Trip Setpoint. A Nominal Trip Setpoint may be set more conservative than the ~~Nominal~~Limiting Trip Setpoint as necessary in response to plant conditions. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

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RCOL2_16-16

BASES

ACTIONS (continued)

next 6 hours. The 6 hours allowed for reducing power is consistent with other power reduction action completion times.

The Required Actions are modified by a Note that allows placing one channel in bypass for up to 12 hours while performing routine surveillance testing. These times are justified because this is an anticipatory trip that is not~~e~~ credited in the safety analysis, and a diverse turbine trip is also initiated from the Turbine Emergency Oil Pressure. DCD_16-300 DCD_16-301

SURVEILLANCE REQUIREMENTS

The SRs for each RTS Function are identified by the SRs column of Table 3.3.1-1 for that Function.

A Note has been added to the SR Table stating that Table 3.3.1-1 determines which SRs apply to which RTS Functions.

Note that each channel of process protection supplies all trains of the RTS. However, when testing a Channel, it is only necessary to manually verify that the channel is OPERABLE in its respective train. This is because the interface to other trains is continuously verified through self-testing. Self-testing is confirmed through periodic COT and ACTUATION LOGIC TEST. The CHANNEL CALIBRATION is performed in a manner that is consistent with ~~the assumptions used in analytically calculating the required channel accuracies~~the method and assumptions of Section 5.5.21, Setpoint Control Program (SCP). RCOL2_16-16 DCD_16-301

SR 3.3.1.1

Performance of the CHANNEL CHECK ensures that 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. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined based on a combination of the channel instrument uncertainties. 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.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.1.5

SR 3.3.1.5 is the performance of an ACTUATION LOGIC TEST. The ~~RTS~~PSMS is self-tested on a continuous basis from the digital side of all input modules to the digital side of all output modules. Self-testing also encompasses all data communications within a PSMS train, between PSMS trains and between the PSMS and PCMS. The self-testing is described in Reference 6 and 7. The ACTUATION LOGIC TEST is a check of the RTS software memory integrity to ensure there is no change to the internal RTS software that would impact its functional operation or the continuous self-test function. The software memory integrity test is described in Reference 6 and 7. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. DCD_16-300

The complete continuity check from the input device to the output device is performed by the combination of the continuous CHANNEL CHECK, the 24 month CHANNEL CALIBRATION for the non digital side of the input module, the continuous self-testing for the digital side, the 24 month COT, the 24 month ACTUATION LOGIC TEST and the STAGGERED 62 days TADOT for the non-digital side of the output module. The CHANNEL CALIBRATION, COT, ACTUATION LOGIC TEST and TADOT, which are manual tests, overlap with the CHANNEL CHECK and self-testing and confirm the functioning of the self-testing. MAP-16-302

The ACTUATION LOGIC TEST interval of 24 months with the self test capability is justified in the PSMS reliability analysis. For detailed information, refer to the US-APWR Technical Report MUAP-07030 PRA, Attachment 6A.12. The result of the PSMS reliability analysis is evaluated and confirmed in the US-APWR PRA Chapter 19. MAP-16-302

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.13

SR 3.3.1.13 verifies that the response times for all RTS functions are less than or equal to the maximum values assumed in the accident analysis. Accident analysis response time values are defined in Reference 2. Individual component response times are not modeled in the analyses.

The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the Trip Setpoint value at the sensor to the point at which the equipment reaches the required functional state (i.e. control and shutdown rods fully inserted in the reactor core).

The PSMS dynamic transfer functions employ time constants that are installed as digital values and processed through digital algorithms. Therefore, the time response of the dynamic transfer functions has no potential for variation due to time or environmental drift or component aging. The COT confirms the integrity of the time constants and algorithms through the periodic software memory integrity check. The complete PSMS response time is determined one time by analysis and confirmed one time in the factory test. The response times of analog instruments that provide input to the dynamic transfer functions are periodically checked in Surveillance 3.3.1.13, because they do have the potential for response time variation. RTBs and RTDs are known to have aging or wear-out mechanisms that can impact response time and require response time measurement. Response time for other components can be affected by random failures or calibration discrepancies, which can be detected by other testing and calibration methods required by other surveillances. MAP-16-206 MAP-16-302

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor, signal conditioning, and actuation logic response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications. MUAP-09021-P “Response Time of safety I&C System” provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. Section 4.4 of MUAP-07005, “Safety System Digital Platform - MELTAC-” describes how response times of each individual MELTAC module are combined to determine the total digital system response time. MAP-16-302

BASES

SURVEILLANCE REQUIREMENTS (continued)

The allocations for sensor, signal conditioning, and actuation logic response times must be verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. One example where response time could be affected is replacing the sensing assembly of a transmitter.

~~MUAP-09021-P "Response time of safety I&C System" provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. Section 4.4 of MUAP-07005, "Safety System Digital Platform -MELTAC-" describes how response times of each individual MELTAC module are combined to determine the total digital system response time.~~ MAP-16-207 MAP-16-302

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.1.13 is modified by a Note stating that neutron detectors are excluded from RTS RESPONSE TIME testing. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response.

REFERENCES

1. Regulatory Guide 1.105, Revision 3, "Setpoints for Safety Related Instrumentation."

2. FSARSection 7.2.

3. FSAR Chapter 15.

4. IEEE-603-1991.

5. 10 CFR 50.49.

6. MUAP-07004-P (Proprietary) and MUAP-07004-NP (Non-Proprietary), “Safety I&C System Description and Design Process.”

7. MUAP-07005-P (Proprietary) and MUAP-07005-NP (Non-Proprietary), “Safety System Digital Platform – MELTAC.”

8. 10 CFR 50.36.

9. FSAR Section 6.2.1.

BACKGROUND (continued)

Generally, if a parameter is used for input to the protection circuits and a control function, three channels with a two-out-of-three logic are also sufficient to provide the required reliability and redundancy. The Signal Selection Algorithm (SSA) within the PCMS ensures the control systems can withstand an input failure to the control system without causing erroneous control system operation which would otherwise require the protection function actuation. Since the input failure does not cause an erroneous control system action that challenges the protection function, the input failure is considered a single failure in the ESFAS and the ESFAS remains capable of providing its protective function with the remaining two operable channels. Again, a single failure will neither cause nor prevent the protection function actuation.

These requirements are described in IEEE-603-1991 (Ref. 4). The actual number of channels required for each unit parameter is specified in Reference 2.

Allowable Values and ESFAS Setpoints

The Trip Setpoints used in the digital bistables are based on the Analytical Limits defined in the accident analysis and the channel uncertainty. The selection of these Trip Setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment errors for those ESFAS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 5), the Allowable Values and Trip Setpoints ~~specified in Table 3.3.2-1~~recorded and maintained in a document established by the SCP in the accompanying LCO are conservative with respect to the Analytical Limits. The SCP methodology used to calculate the Allowable Values and ESFAS setpoints incorporates all of the known uncertainties applicable to each channel (Ref. 7). The magnitudes of these uncertainties are factored into the determination of each ESFAS Trip Setpoint and corresponding Allowable Value. The ESFAS Trip Setpoint entered into the ~~digital~~ bistable is more conservative than that specified by the Analytical Limit to account for measurement errors detectable by the CHANNEL CALIBRATION. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CHANNEL CALIBRATION. One example of such a change in measurement error is drift during the surveillance interval. If the measured accuracy does not exceed the Allowable Value, the channel is considered OPERABLE.

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BASES

BACKGROUND (continued)

The ESFAS Nominal Trip Setpoints are the values at which the ~~digital~~ bistables are set. The ESFAS Trip Setpoint value ensures the safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on stated channel uncertainties. Any channel is considered to be properly adjusted when the "as-left" ~~accuracy~~ value is within the ~~band for CHANNEL CALIBRATION uncertainty allowance (i.e. instrument and signals conditioning uncertainties).~~ established Calibration Tolerance (CT) band, in accordance with the methods and assumptions in the SCP. The ESFAS Trip Setpoint value (i.e. expressed as a value without inequalities) is used for the purposes of the COT. RCOL2_16-16 DCD_16-301 RCOL2_16-16

ESFAS Nominal Trip Setpoints consistent with the requirements of the Allowable Value ensure that the consequences of Postulated Accidents (PAs) will be acceptable, providing the unit is operated from within the LCOs at the onset of the PA and the equipment functions as designed. RCOL2_16-16

Digital Trip Setpoints are maintained in non-volatile software memory within each RPS train. Each train is self-tested continuously on line to verify that the digital Trip Setpoint settings are correct. ESFAS Trip Setpoints are also verified periodically through a diverse software memory integrity test, which is conducted with the RPS train out of service. A designated instrument channel is taken out of service for periodic calibration. SRs for the channels and trains are specified in the SR section.

ESFAS and SLS

The ESFAS and SLS equipment is used for the decision logic processing of outputs from the RPS. To meet the redundancy requirements, four trains of ESFAS-SLS, each performing the same functions, are provided. If one train is taken out of service for maintenance or test purposes, the remaining trains will provide ESF actuation for the unit. Each train is packaged in its own cabinet for physical and electrical separation to satisfy separation and independence requirements. In addition, each train provides qualified features, such as separate function processors and communication processors, to ensure communications independence.

The ESFAS-SLS performs the decision logic for most ESF equipment actuation; generates the electrical output signals that initiate the required actuation; and provides the status, permissive, and annunciator output signals to the main control room of the unit.

BASES

BACKGROUND (continued)

The ~~digital~~ bistable outputs from all trains of the RPS are sensed by each ESFAS train and combined into logic that represent combinations indicative of various transients. If a required logic combination is completed, the ESFAS train will send actuation signals via the Safety Bus to its respective SLS train. The SLS actuates those components whose aggregate Function best serves to alleviate the condition and restore the unit to a safe condition. Examples are given in the Applicable Safety Analyses, LCO, and Applicability sections of this Bases. RCOL2_16-16

The ESFAS and SLS are continuously automatically ~~sel~~self-tested while the unit is at power. When any one train is taken out of service for manual testing, the remaining trains are capable of providing unit monitoring and protection until the testing has been completed. RCOL2_16-14

The actuation of ESF components is accomplished through solid state Actuation Outputs. The SLS energizes the Actuation Outputs appropriate for the condition of the unit. Each Actuation Output energizes one plant component. Actuation Outputs are tested in conjunction with their respective plant components. This test overlaps with the continuous automatic self-testing.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

Each of the analyzed accidents can be detected by one or more ESFAS Functions. One of the ESFAS Functions is the primary actuation signal for that accident. An ESFAS Function may be the primary actuation signal for more than one type of accident. An ESFAS Function may also be a secondary, or backup, actuation signal for one or more other accidents. For example, Low Pressurizer Pressure is a primary actuation signal for small loss of coolant accidents (LOCAs) and a backup actuation signal for steam line breaks (SLBs) outside containment. Functions such as manual initiation, not specifically credited in the accident safety analysis, are qualitatively credited in the safety analysis and the NRC staff approved licensing basis for the unit. These Functions may provide protection for conditions that do not require dynamic transient analysis to demonstrate Function performance. These Functions may also serve as backups to Functions that were credited in the accident analysis (Ref. 3).

The LCO requires all instrumentation performing an ESFAS Function, listed in Table 3.3.2-1 in the accompanying LCO, to be OPERABLE. A channel is OPERABLE provided the "as-found" ~~accuracy~~ value does not exceed its associated Allowable Value. A trip setpoint may be set more conservative than the Trip Setpoint as necessary in response to plant conditions. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions. DCD_16-301

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

This Function must be OPERABLE in MODES 1, 2, and 3 (above P-11) to mitigate the consequences of an HELB inside containment. This signal may be manually blocked by the operator below the P-11 setpoint. Automatic ECCS actuation below this pressure setpoint is then performed by the High Containment Pressure signal.

This Function is not required to be OPERABLE in MODE 3 below the P-11 setpoint. Other ESF functions are used to detect accident conditions and actuate the ESF systems in this MODE. In MODES 4, 5, and 6, this Function is not needed for accident detection and mitigation.

e. <u>ECCS Actuation - Low Main Steam Line Pressure</u>

Low Main Steam Line Pressure provides protection against the following accidents:

- SLB,
- Feed line break, and
- Inadvertent opening of an SG relief or an SG safety valve.

Low Main Steam Line Pressure provides no input to any control functions. There are four Low Main Steam Line Pressure channels on each steam line in a two-out-of-four logic configuration. Three OPERABLE channels on each steam line are sufficient to satisfy the protective requirements with a two-out-of-three logic on each steam line.

This Function is anticipatory ~~in nature~~ and has a typical lead/lag ratio of 50/5. MAP-16-302

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

break. The LCO requires three OPERABLE EFW trains. The normal source of water for the EFW System is the Emergency Feedwater pit (EFW pit). This pit has a sufficient capacity to lead the plant safe shutdown. If the water level of EFW pit reached low-low level, operators are given alarm in main control room. Then the EFW pumps will be stopped or the water source will be switched to Deminera~~r~~lized Water Storage Tank manually to keep the sufficient EFW if necessary. MAP-16-302

a. Emergency Feedwater Actuation - Manual Initiation

Manual initiation of Emergency Feedwater Actuation can be accomplished from the main control room. There are four switches in the main control room, one for each train. Each switch actuates its own train directly. A signal from each switch is also interfaced to all other trains via internal PSMS communication links. In addition to direct actuation by its own train switch, each train is also actuated by two out of three Manual Initiation signals received from the other trains. The LCO requires three trains to be OPERABLE.

b. Emergency Feedwater Actuation - Actuation Logic and Actuation Outputs

Actuation Logic and actuation outputs consist of the same features and operate in the same manner as described for ESFAS Function 1.b. Three trains must be OPERABLE.

c. Emergency Feedwater Actuation - Low Steam Generator Water Level

Low SG Water Level provides protection against a loss of heat sink. A feed line break, inside or outside of containment, or a loss of MFW, would result in a loss of SG water level. There are four Low SG Water Level channels in a two-out-of-four logic configuration. Low SG Water Level provides input to the SG Level Control System. The interface from the safety channels in the PSMS to the PCMS is through the Signal Selector Algorithm (SSA). The SSA ensures an input failure to the control system does not result in erroneous control system action that would require the protection function actuation. Therefore, the protection function requires only two additional channels to provide the protection

BASES

ACTIONS (continued)

The initial completion time of 72 hours is justified in the PSMS reliability analysis, considering that the remaining operable channels have continuous self-testing. For detail information, refer to the US-APWR Technical Report MUAP-07030 PRA, Attachment 6B.12. The result of the PSMS reliability analysis is evaluated and confirmed in the US-APWR PRA Chapter 19.

~~One channel may be bypassed for up to 12 hours for surveillance testing.~~ MAP-16-302

One channel may be bypassed for up to 12 hours for surveillance testing. The 12 hours bypass limit is justified in the PSMS reliability analysis, considering that the remaining operable channels have continuous self-testing. For detail information, refer to the US-APWR Technical Report MUAP-07030 PRA, Attachment 6B.12. The result of the PSMS reliability analysis is evaluated and confirmed in the US-APWR PRA Chapter 19. This bypass is not allowed for the other functions because these channels are also used for control. If a failure were to occur in one of the two remaining control channels, a plant transient could occur that would require a plant trip, but a plant trip would not occur with only one remaining operable channel.

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

Condition E applies to:

- Containment Spray - High-3 Containment Pressure, and
- Containment Phase B Isolation - High-3 Containment Pressure.

This LCO requires three operable channels. None of these signals has input to a control function. Two-out-of-three logic is necessary to meet acceptable protective requirements. However, a two-out-of-three design would require tripping a failed channel. This is undesirable because a single failure would then cause spurious containment spray initiation. Spurious spray actuation is undesirable because of the cleanup problems presented.

Restoring the channel to OPERABLE status within 72 hours is sufficient because of the low probability of an event occurring during this interval because the remaining two OPERABLE channels have automatic self-testing (as described for COT), and automatic CHANNEL CHECKS.

ACTIONS (continued)

Failure to restore the inoperable channel to OPERABLE status or place it in the tripped condition within 72 hours requires the unit be placed in MODE 3 within the following 6 hours and MODE 5 within the next 30 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. In MODE 5, these Functions are no longer required OPERABLE.

The initial completion time of 72 hours is justified in the PSMS reliability analysis, considering that the remaining operable channels have continuous self-testing. For detail information, refer to the US-APWR Technical Report MUAP-07030 PRA, Attachment 6B.12. The result of the PSMS reliability analysis is evaluated and confirmed in the US-APWR PRA Chapter 19.

L.1

Condition L applies to the Containment Purge Isolation - Actuation Logic and Actuation Output Function and addresses the train orientation of the Engineered Safety Features Actuation System (ESFAS). It also addresses the failure of multiple Containment Purge Isolation - Containment Radiation Monitoring channels, or the inability to restore a single failed channel to OPERABLE status in the time allowed for Required Action K.1.

If an Actuation Logic and Actuation Output train is inoperable, multiple Containment Radiation Monitoring channels are inoperable, or the Required Action and associated Completion Time of Condition K are not met, operation may continue as long as the Required Action for the applicable Conditions of LCO 3.6.3 is met for each valve made inoperable by failure of isolation instrumentation.

M.1

Condition M applies to the Actuation Logic and Actuation Outputs Function of the MCR Isolation, the Main Control Air monitor Functions, and the Manual Initiation Functions.

If one Actuation Logic and Actuation Outputs train is inoperable, one Main Control Room Radiation channel is inoperable in one or more Functions, or one Manual Initiation train is inoperable, 7 days are permitted to restore it to OPERABLE status. The 7 day Completion Time is the same as is allowed if one train of the mechanical portion of the system is inoperable. The basis for this Completion Time is the same as provided in LCO 3.7.10. If the channel/train cannot be restored to OPERABLE status, one train of the ~~e~~affected subsystem(s) must be placed in the emergency MAP-16-302

ACTIONS (continued)

mode of operation. This accomplishes the actuation instrumentation Function and places the unit in a conservative mode of operation.

~~E~~Affected subsystems depend on inoperable train, as follows. MAP-16-302

- If train A or D is inoperable, MCREFS doesn't satisfy the single failure criterion. Therefore, one train MCREFS is placed on emergency mode. MCRATCS is unaffected, since three required trains remain operable.

- If train B or C is inoperable, MCREFS is unaffected and three required trains of MCRATCS remain operable. Therefore, no action is required.

N.1.1, N.1.2, and N.2

Condition N applies to the failure of two MCR Isolation Actuation Logic and Actuation Outputs trains, two Main Control Room Radiation channels, or two Manual Initiation trains for one or more Functions. The first Required Action is to place the ~~e~~affected subsystem(s) in the emergency mode of operation immediately. For MCREFS this requires one train, since each is 100% capacity. Two trains of MCRATCS are required since each is 50% capacity. This accomplishes the actuation instrumentation Function that may have been lost and places the unit in a conservative mode of operation. The applicable Conditions and Required Actions of LCO 3.7.10 must also be entered for the MCRVS train made inoperable by the inoperable actuation instrumentation. This ensures appropriate limits are placed upon train inoperability as discussed in the Bases for LCO 3.7.10. MAP-16-302

Alternatively, all trains of the ~~e~~affected subsystem(s)may be placed in the emergency mode. This ensures the MCR Isolation function is performed even in the presence of a single failure. MAP-16-302

~~E~~Affected subsystems depend on inoperable train, as follows. MAP-16-302

- If trains A and D are inoperable, MCREFS is completely inoperable. Therefore, one train of MCREFS is placed on emergency mode and the required action of MCRVS is appled (to restore in 7 days). Or two trains of MCREFS are placed on emergency mode. And one train of MCRATCS is placed on emergency mode, since MCRATCS does not satisfy the single failure criterion.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Note that each channel of process protection supplies all trains of the ESFAS. However, when testing a channel, it is only necessary to manually verify that the channel is OPERABLE in its respective division. This is because the interface to other divisions is automatically verified through self-testing. Self-testing is confirmed through periodic COT and ACTUATION LOGIC TEST. The CHANNEL CALIBRATION is performed in a manner that is consistent with ~~the assumptions used in analytically calculating the required channel accuracies~~the methods and assumptions of Section 5.5.21, Setpoint Control Program (SCP). RCOL2_16-16 DCD_16-301

SR 3.3.2.1

Performance of the CHANNEL CHECK 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. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined based on a combination of the channel instrument uncertainties. 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.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

A CHANNEL CHECK may be conducted manually or automatically. For the US-APWR an automated CHANNEL CHECK is normally conducted continuously. Where the CHANNEL CHECK is conducted automatically, an alarm shall be generated when the agreement criteria is not met.

The equipment that performs the automated CHANNEL CHECK, and automatic self-testing described for COT and ACTUATION LOGIC TEST, shall be confirmed OPERABLE including the capability to generate fault alarms.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.2

SR 3.3.2.2 is the performance of an ACTUATION LOGIC TEST. The PSMS is self-tested on a continuous basis from the digital side of all input modules to the digital side of all output modules. Self-testing also encompasses all data communications within a PSMS train, between PSMS trains and between the PSMS and PCMS. The self-testing is described in Reference 6 and Reference 7. The ACTUATION LOGIC TEST is a check of the ESFAS software memory integrity to ensure there is no change to the internal ESFAS software that would impact its functional operation or the continuous self-test function. The software memory integrity test is described in Reference 6 and Reference 7. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

The complete continuity check from the input device to the output device is performed by the combination of the continuous CHANNEL CHECK, and the 24 month CHANNEL CALIBRATION for the non digital side of the input module, the continuous self-testing for the digital side, the 24 month COT, the 24 month ACTUATION LOGIC TEST and the 24 month ESFAS and SLS TADOT for the non-digital side of the output module. The Channel CALIBRATION, COT, ACTUATION LOGIC TEST and TADOT, which are manual tests, overlap with the CHANNEL CHECK and self-testing and confirm the functioning of the self-testing. MAP-16-302

The ACTUATION LOGIC TEST interval of 24 months with the self test capability is justified in the PSMS reliability analysis. For detail information, refer to the US-APWR Technical Report MUAP-07030 PRA, Attachment 6B.12. The result of the PSMS reliability analysis is evaluated and confirmed in the US-APWR PRA Chapter 19. MAP-16-302

SR 3.3.2.3

SR 3.3.2.3 is the performance of a COT.

The PSMS is self-tested on an automatic basis from the digital side of all input modules to the digital side of all output modules. Self-testing encompasses all Trip Setpoints and trip functions. The self-testing is described in Reference 6 and Reference 7. ESFAS setpoint and bistable functions are implemented within the RPS. Therefore, the COT is a check of the RPS software memory integrity to ensure there is no change to the internal RPS software that would impact its functional operation, including digital Trip Setpoint values or the continuous self-test function. The software memory integrity test is described in Reference 6 and Reference 7.

SURVEILLANCE REQUIREMENTS (continued)

A COT ensures the entire channel will perform the intended Function.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

The complete continuity check from the input device to the output device is performed by the combination of the continuous CHANNEL CHECK, the 24 month CHANNEL CALIBRATION for the non digital side of the input module, the continuous self-testing for the digital side, the 24 month COT and the 24 month TADOT for the non-digital side of the output module. The Channel CALIBRATION, COT and TADOT, which are manual tests, overlap with the CHANNEL CHECK and self-testing and confirm the functioning of the self-testing. MAP-16-302

The COT interval of 24 months with the self test capability is justified in the PSMS reliability analysis. For detail information, refer to the US-APWR Technical Report MUAP-07030 PRA, Attachment 6B.12. The result of the PSMS reliability analysis is evaluated and confirmed in the US-APWR PRA Chapter 19. MAP-16-302

SR 3.3.2.4

SR 3.3.2.4 is the performance of a TADOT for the Actuation Outputs of all ESFAS functions. This function actuates the outputs of the SLS.

Therefore, this test is typically conducted in conjunction with testing the plant process components. The Actuation Outputs are solid state devices. RCOL2_16-13 The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.2.5

SR 3.3.2.5 is the performance of a TADOT for the Loss of Offsite Power, Function. The LOP inputs to the ESFAS are tested up to, and including, the signal status readout on a digital display.

The SR is modified by a Note that excludes verification of setpoints for relays. Relay setpoints require elaborate bench calibration and are verified during CHANNEL CALIBRATION. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.6

SR 3.3.2.6 is the performance of a TADOT for all Manual Initiation Functions and EFW pump start on trip of all MFW pumps. Each Manual Initiation Function is tested up to, and including, the signal status readout on a digital display. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. The SR is modified by a Note that excludes verification of setpoints during the TADOT for manual initiation Functions. The manual initiation Functions have no associated setpoints.

SR 3.3.2.7

SR 3.3.2.7 is the performance of a CHANNEL CALIBRATION.

CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to measured parameter within the necessary range and accuracy, as ~~defined by the Allowable Value~~described in Section 5.5.21, SCP. RCOL2_16-16 MAP-16-302

For analog measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel from sensor to VDU as described in Reference 6. CHANNEL CALIBRATION confirms the analog measurement accuracy conforms to the Allowable Value at multiple points over the entire measurement channel span, encompassing all reactor trip and interlock Trip Setpoint values. Digital reactor trip and interlock Trip Setpoint values are confirmed through COT.

For binary measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel's state change, as described in Reference 6. The state change must occur within the Allowable Value of the Trip Setpoint.

CHANNEL CALIBRATIONS must be performed consistent with ~~the assumptions of the unit specific setpoint methodology. The difference between the current "as found" values and the previous test "as left" values must be consistent with the drift allowance used in the setpoint methodology.~~the methods and assumptions in Section 5.5.21, SCP. RCOL2_16-16 MAP-16-302

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note stating that this test should include verification that the time constants are adjusted to the prescribed values where applicable.

SR 3.3.2.8

This SR ensures the response times for all ESFAS functions are less than or equal to the maximum values assumed in the accident analysis. Accident analysis response time values are defined in Reference 2. Individual component response times are not modeled in the analyses.

The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the Trip Setpoint value at the sensor, to the point at which the equipment in all trains reaches the required functional state (e.g., pumps at rated discharge pressure, valves in full open or closed position).

The PSMS dynamic transfer functions employ time constants that are installed as digital values and processed through digital algorithms. Therefore, the time response of the dynamic transfer functions has no potential for variation due to time or environmental drift or component aging. The COT confirms the integrity of the time constants and algorithms through the periodic software memory integrity check. The complete PSMS response time is determined one time by analysis and confirmed one time in the factory test. The response times of analog instruments that provide input to the dynamic transfer functions are periodically checked in Surveillance 3.3.2.8, because they do have the potential for response time variation. MAP-16-208 MAP-16-302

Electro-mechanical components in the ESFAS have aging or wear-out mechanisms that can impact response time. Response time for other components may be affected by random failures or calibration discrepancies, which are detectable by other testing and calibration methods required by other surveillances.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor, signal conditioning and actuation logic response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications. MUAP-09021-P "Response Time of Safety I&C System" provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. Section 4.4 of MUAP-07005, "Safety System Digital Platform -MELTAC-" describes how response times of each individual MELTAC module are combined to determine the total digital system response time. MAP-16-302 MAP-16-207

The allocations for sensor, signal conditioning, and actuation logic response times must be verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. One example where response time could be affected is replacing the sensing assembly of a transmitter.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that clarifies that the tests for the turbine driven EFW pumps are conducted within 24 hours after reaching 1000 psig in the SGs.

SR 3.3.2.9

SR 3.3.2.9 is the performance of a TADOT for the P-4 Reactor Trip Interlock, and the Frequency is once per RTB cycle. Each RTB status contact is tested up to, and including, the signal status readout on a digital display. This Frequency is based on operating experience demonstrating that undetected failure of the P-4 interlock sometimes occurs when the RTB is cycled.

The SR is modified by a Note that excludes verification of setpoints during the TADOT. The Function tested has no associated setpoint.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.3.2

CHANNEL CALIBRATION is a complete check of the instrument loop, from sensor to VDU as described in Reference 3. The test verifies that the channel responds to measured parameter with the necessary range and accuracy. This SR is modified by a Note that excludes neutron detectors. The calibration method for neutron detectors is specified in the Bases of LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation." Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION of the Core Exit thermocouple sensors is accomplished by an ~~inplace~~in situ cross calibration that compares the other sensing elements with the recently installed sensing element. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. MAP-16-302

REFERENCES

1. Regulatory Guide 1.97, Rev. 4.

2. NUREG-0737, “Clarification of TMI Action Plan Requirements.”

3. MUAP-07004-P (Proprietary) and MUAP-07004-NP (Non-Proprietary), “Safety I&C System Description and Design Process.”

4. FSAR Section 7.5.

5. IEEE 497-2002.

BASES

BACKGROUND (continued)

Allowable Values and DAS Setpoints

The trip setpoints used in the DAAC bistables are based on the analytical limits stated in the D3 Coping Analysis. These setpoints are generally less conservative than corresponding setpoints in the PSMS to allow the PSMS to actuate first. If the PSMS actuates, DAS actuation is block.

The selection of these trip setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment errors for those DAS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 4), the Allowable Values ~~specified in Table 3.3.6-1~~recorded and maintained in a document established by the SCP in the accompanying LCO are conservative with respect to the analytical limits. A detailed description of the methodology used to calculate the Allowable Values and trip setpoints, incorporates the known uncertainties applicable to each channel. The magnitudes of these uncertainties are factored into the determination of each trip setpoint and corresponding Allowable Value. The trip setpoint entered into the bistable is more conservative than that specified by the Allowable Value to account for measurement errors detectable by the COT-analog. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the COT-analog. One example of such a change in measurement error is drift during the surveillance interval. If the measured setpoint does not exceed the Allowable Value, the bistable is considered OPERABLE.

RCOL2_16-16
DCD_16-301
DCD_16-301
DCD_16-301

The trip setpoint is the value at which the bistable is set and is the expected value to be achieved during calibration. The trip setpoint value ensures the D3 Coping Analysis (Ref. 2) limits are met for surveillance interval selected when a channel is adjusted based on stated channel uncertainties. Any bistable is considered to be properly adjusted when the "as left" setpoint value is within the band for CHANNEL CALIBRATION uncertainty allowance (i.e., ± rack calibration + comparator setting uncertainties). The trip setpoint value is therefore considered a "nominal" value (i.e., expressed as a value without inequalities) for the purposes of COT-analog and CHANNEL CALIBRATION.

DCD_16-301

Trip setpoints consistent with the requirements of the Allowable Value ensure that the consequences of AOOs and PAs will be acceptable, providing the unit is operated from within the LCOs at the onset of the AOO or PA and the equipment functions as designed.

BASES

BACKGROUND (continued)

Rod Drive Motor-Generator sets

The Rod Drive Motor-Generator sets are the electrical power supply for the CRDMs. Tripping the Rod Drive Motor-Generator sets trip devices interrupts power to the CRDMs, which allows the control rod shutdown banks and control banks to fall into the core by gravity. There are two Rod Drive Motor-Generator sets operating in parallel. The DAS trips both Rod Drive Motor-Generator sets trip devices.

The DAS interface to the Rod Drive Motor-Generator sets is via hardwired circuit. This interface may be tested, with no reactor trip, as described in subsection 7.8.2.4. Actual tripping of the Rod Drive Motor-Generator set may be tested from the DAS. Rod Drive Motor-Generator sets may be tripped one at a time for testing.

Diverse Human System Interface Panel (DHP)

The DHP provides Manual Initiation switches for all DAS automatic actuation functions and for additional functions that are required, per the D3 Coping Analysis, to control all critical safety functions. Manual Initiation switches are not redundant. To prevent spurious actuation due to a failure of any of the above switches, a separate manual actuation permissive switch is provided. This is referred to as the “Permissive Switch for DAS HSI.”

The DHP also provides indications, per the D3 Coping Analysis, to monitor all critical safety functions.

The DHP also provides indications, per the D3 Coping Analysis, to monitor RCS Leakage.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The DAS is required to provide a diverse capability to trip the reactor and actuate the specified safety-related equipment. The DAS is not credited for mitigating accidents in the FSAR Chapter 15 safety analyses. The DAS ~~satisfy~~satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) (Ref. 5). DCD_16-300

The DAS LCO provides the requirements for the OPERABILITY of the DAS necessary to place the reactor in a shutdown condition and to remove decay heat in the event that required PSMS components do not function due to CCF.

A channel is OPERABLE provided the "as-found" ~~accuracy~~ value does not exceed its associated Allowable Value. A Nominal ~~t~~Trip ~~s~~Setpoint may be set more conservative than the Limiting Trip Setpoint as necessary in response to plant conditions. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions. DCD_16-301 RCOL2_16-16

BASES

SURVEILLANCE REQUIREMENTS (continued)

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.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.6.2

A COT-analog is performed on each required channel to ensure the entire channel will perform the intended Function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of single contact of the relay. This clarifies what is an acceptable COT of a relay. This is acceptable because all of the other required contacts of relay are verified by Technical Specifications and Non-Technical Specifications test at least once per refueling interval with applicable extensions. DCD_16-301

Setpoints must be within the Allowable Value ~~specified~~administered in ~~Table 3.3.6-1~~the SCP. RCOL2_16-16

~~The difference between the current “as found” value and the previous test “as left” value must be consistent with the drift allowance used in the setpoint methodology.~~ The setpoint shall be left set consistent with the assumptions of the current unit specific setpoint methodology. DCD_16-301

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.6.3

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

CHANNEL CALIBRATION must be performed consistent with ~~the assumptions of the unit specific setpoint methodology. The difference between the current “as found” values and the previous test “as left” values must be consistent with the drift allowance used in the setpoint methodology.~~the methods and assumptions in Section 5.5.21 SCP. RCOL2_16-16

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.8 RCS Loops - MODE 5, Loops Not Filled

BASES

BACKGROUND

In MODE 5 with the RCS loops not filled, the primary function of the reactor coolant is the removal of decay heat generated in the fuel, and the transfer of this heat to the component cooling water via the residual heat removal (CS/RHR) heat exchangers. The steam generators (SGs) are not available as a heat sink when the loops are not filled. The secondary function of the reactor coolant is to act as a carrier for the soluble neutron poison, boric acid.

In MODE 5 with the RCS loops not filled, only CS/RHR pumps can be used for coolant circulation. The number of pumps in operation can vary to suit the operational needs. The intent of this LCO is to provide forced flow from at least two CS/RHR pumps for decay heat removal and transport and to require that three paths be available to provide redundancy for heat removal. In MODE 5 with the RCS loops not filled, low-pressure letdown line isolation valves are automatically closed upon detection of RCS loop lowlevel signal to prevent loss of RCS inventory. DCD_19.01-1

The function is effective to prevent core damage during plant shutdown, based on probabilistic risk assessment.

APPLICABLE SAFETY ANALYSES

In MODE 5, RCS circulation is considered in the determination of the time available for mitigation of the accidental boron dilution event. The RHR loops provide this circulation. The flow provided by two RHR loops is adequate for heat removal and for boron mixing.

RCS loops in MODE 5 (loops not filled) satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

LCO

The purpose of this LCO is to require that at least three RHR loops be OPERABLE and two of these loops be in operation. An OPERABLE loop is one that has the capability of transferring heat from the reactor coolant at a controlled rate. Heat cannot be removed via the RHR System unless forced flow is used. A minimum of two running CS/RHR pumps meets the LCO requirement for two loops in operation. An additional RHR loop is required to be OPERABLE to meet single failure considerations.

The LCO requires the low-pressure letdown line isolation valves to be OPERABLE to mitigate the effects associated with loss of RCS inventory. DCD_19.01-1

BASES

LCO (continued)

Note 1 permits one CS/RHR pump to be removed from operation for ≤ 15 minutes when switching from one loop to another. The circumstances for stopping one CS/RHR pump is to be limited to situations when the outage time is short and core outlet temperature is maintained > 10°F below saturation temperature. The Note prohibits boron dilution with coolant at boron concentrations less than required to assure SDM of LCO 3.1.1 is maintained or draining operations when RHR forced flow is stopped.

Note 2 allows one RHR loop to be inoperable for a period of ≤ 2 hours, provided that the other two required loops are OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible.

An OPERABLE RHR loop is comprised of an OPERABLE CS/RHR pump capable of providing forced flow to an OPERABLE CS/RHR heat exchanger. CS/RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required.

APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the RHR System.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2,"

LCO 3.4.5, "RCS Loops - MODE 3,"

LCO 3.4.6, "RCS Loops - MODE 4,"

LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled,"

LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level~~"~~ (MODE 6)," and MAP-16-302

LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level~~"~~ (MODE 6)."~~,~~ MAP-16-302

ACTIONS

A.1

If one required RHR loop is inoperable, redundancy for RHR is lost. Action must be initiated to restore a third loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of three paths for heat removal.

BASES

ACTIONS (continued)

DCD_19.01-1

B.1

If one low-pressure letdown isolation valve is inoperable, the automatic isolation function to prevent loss of RCS inventory is lost. Action must be initiated to restore the valve to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of three paths for heat removal.

~~B~~C.1 and ~~B~~C.2

If less than two required loops are OPERABLE or less than two required loops in operation, except during conditions permitted by Note 1, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action must be initiated immediately to restore two RHR loops to OPERABLE status and operation. The required margin tocriticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS of coolant with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Time reflects the importance of maintaining operation for heat removal. The action to restore must continue until two loops are restored to OPERABLE status and operation.

BASES

SURVEILLANCE REQUIREMENTS	SR 3.4.8.1 This SR requires verification that the required loops are in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. SR 3.4.8.2 Verification that each required CS/RHR pump is OPERABLE ensures that an additional pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to each required pump. Alternatively, verification that a CS/RHR pump is in operation also verifies proper breaker alignment and power availability. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation. SR 3.4.8.3 DCD_19.01-1 SR 3.4.8.3 requires a complete cycle of each low-pressure letdown isolation valve. This requirements mean confirmation of OPERABILITY of Instrumentation and its control (Setpoints, Channel Checks, Channel Calibrations) and valve. Operating a low-pressure letdown isolation valve through one complete cycle ensures that the low-pressure letdown isolation valve can be automatically actuated to mitigate the effects from loss of RCS inventory. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.
REFERENCES	None.

APPLICABLE SAFETY ANALYSES

All accident and safety analyses that require safety valve actuation assume operation of four pressurizer safety valves to limit increases in RCS pressure. Accidents that could result in overpressurization if not properly terminated include:

a. Loss of external electrical load,

b. Loss of normal feedwater flow,

c. Reactor coolant pump shaft break,

d. Uncontrolled rod cluster control assembly bank withdrawal from a subcritical or low-power startup condition~~, and~~ MAP-16-302

e. Spectrum of rod cluster control assembly ejection accidents, and

f. Feedwater line break

Detailed analyses of the above transients are contained in FSAR Chapter 15 (Ref. 2). Safety valve actuation is required in events a, b, and d (above) to limit the pressure increase. Compliance with this LCO is consistent with the design bases and accident analyses assumptions (Ref. 2 and 3).

Pressurizer safety valves satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The four pressurizer safety valves are set to open at the RCS design pressure 2485 psig, and within the ASME specified tolerance, to avoid exceeding the maximum design pressure SL, to maintain accident analyses assumptions, and to comply with ASME requirements. The upper and lower pressure tolerance limits are based on the ± 1% tolerance requirements (Ref. 1) for lifting pressures above 1000 psig. The limit protected by this Specification is the reactor coolant pressure boundary (RCPB) SL of 110% of design pressure. Inoperability of one or more valves could result in exceeding the SL if a transient were to occur. The consequences of exceeding the ASME pressure limit could include damage to one or more RCS components, increased leakage, or additional stress analysis being required prior to resumption of reactor operation.

APPLICABILITY

In MODES 1, 2, and 3, and portions of MODE 4 above the LTOP arming temperature, OPERABILITY of four valves is required because the combined capacity is required to keep reactor coolant pressure below 110% of its design value during certain accidents. MODE 3 and portions of MODE 4 are conservatively included, although the listed accidents may not require the safety valves for protection.

ACTIONS (continued)

F.1

If more than one block valve is inoperable, it is necessary to restore at least one block valves within 2 hours. The Completion Time is reasonable, based on the small potential for challenges to the system during this time and provide the operator time to correct the situation.

G.1 and G.2

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

SURVEILLANCE REQUIREMENTS

SR 3.4.11.1

Block valve cycling verifies that the valve(s) can be opened and closed if needed. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note stating that it is not required to be performed with the block valve closed in accordance with the Required Actions of this LCO.

SR 3.4.11.2

SR 3.4.11.2 requires a complete cycle of each SDV. Operating a SDV through one complete cycle ensures that the SDV can be manually actuated for mitigation of an SGTR. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. Regulatory Guide 1.32, ~~February 1977~~Rev 3, March 2004. MAP-16-302

2. ASME Code for Operation and Maintenance of Nuclear Power Plants.

SURVEILLANCE REQUIREMENTS

SR 3.4.12.1, SR 3.4.12.2, and SR 3.4.12.3

To minimize the potential for a low temperature overpressure event by limiting the mass input capability, a maximum of two safety injection pumps and a maximum of one charging pump are verified incapable of injecting into the RCS and the accumulator discharge isolation valves are verified closed and locked out.

The safety injection pumps and charging pump are rendered incapable of injecting into the RCS through removing the power from the pumps by racking the breakers out under administrative control. An alternate method of LTOP control may be employed using at least two independent means to prevent a pump start such that a single failure or single action will not result in an injection into the RCS. This may be accomplished through the pump control switch being placed in pull to lock and at least one valve in the discharge flow path being closed.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.12.4

Each required RHR suction relief valve shall be demonstrated OPERABLE by verifying both RHR suction isolation valves are open. This Surveillance is only required to be performed if the RHR suction relief valve is being used to meet this LCO.

The RHR suction isolation valves are verified to be opened. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.12.5

The RCS vent of ≥ 4.7 square inches is proven OPERABLE by verifying its open condition ~~either~~in accordance with the Surveillance Frequency Control Program: CTS-01276

~~a. A valve that is not locked (valves that are sealed or secured in the open position are considered "locked" in this context) or~~

~~b. Other vent path(s) (e.g., a vent valve that is locked, sealed, or secured in position). A removed pressurizer safety valve or open manway also fits this category.~~

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

be performed on the RHR System when the RHR System is aligned to the RCS in the shutdown cooling mode of operation. PIVs contained in the RHR shutdown cooling flow path must be leakage rate tested after RHR is secured and stable unit conditions and the necessary differential pressures are established.

SR 3.4.14.2

Verifying that the RHR suction valve interlock is OPERABLE ensures that RCS pressure will not pressurize the RHR system beyond its design pressure of900 psig. The interlock setpoint is set so the actual RCS pressure must be < 425 psig to open the valves. This setpoint ensures the RHR design pressure will not be exceeded and the RHR relief valves will not lift. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50.2.
2. 10 CFR 50.55a(c).
3. 10 CFR 50, Appendix A, Section V, GDC 55.
4. WASH-1400 (NUREG-75/014), Appendix V, October 1975.
5. NUREG-0677, May 1980.
6. FSAR Subsection 3.9.6.3.4.
7. ASME Code for Operation and Maintenance of Nuclear Power Plants.
8. 10 CFR 50.55a(g). MAP-16-302

BASES

BACKGROUND (continued)

The B-10 isotopic concentration of the reactor coolant in the RCS is depleted very slowly with reactor operation due to the neutron flux in the core. When the boron recycle subsystem is used, the reactor coolant containing depleted B-10 is recycled and returned to the RCS. After being recycled numerous times, the isotopic concentration of B-10 in the boric acid solution being returned to the RCS gradually decreases. During refueling outages, the reactor coolant in the RCS is mixed with the refueling water stored in the RWSP. With the repeated mixing of each cycle, the isotopic concentration of B-10 of the refueling water in the RWSP can gradually decrease over a long period of time. Since the RWSP water may be used to add water inventory to the accumulators, the isotopic B-10 concentration in the accumulators may also gradually decrease over a long period of time. The depleted B-10 of the boric acid solution in the accumulators can be recovered by increasing the overall boron concentration or the B-10 isotopic concentration itself. The requirement to verify the B-10 isotopic concentration is only required if the boron recycle subsystem is used. DCD_09.03.04-10

BASES

APPLICABLE SAFETY ANALYSES (continued)

a. Maximum fuel element cladding temperature is ≤ 2200°F,

b. Maximum cladding oxidation is ≤ 0.17 times the total cladding thickness before oxidation,

c. Maximum hydrogen generation from a zirconium water reaction is ≤ 0.01 times the hypothetical amount that would be generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react, and

d. Core is maintained in a coolable geometry.

Since the accumulators discharge during the blowdown phase and core reflooding phase of a LOCA, they do not contribute to the long term cooling requirements of 10 CFR 50.46.

The safety analysis assumes values of 19,338 gallons and 19,734 gallons.

For both the large and small break LOCA analyses, a nominal contained accumulator water volume is used. The contained water volume is 3434 gallons larger than the deliverable volume for the accumulators, since the flow damper is near the bottom of the accumulators and the dead volume in each accumulator is 3434 gallons. For small breaks, an increase in water volume is a peak clad temperature penalty. For large breaks, an increase in water volume can be either a peak clad temperature penalty or benefit, depending on downcomer filling and subsequent spill through the break during the core reflooding portion of the transient. The safety analysis treats the volume of water from the accumulator to the RCS isolation check valves as accumulator injection line.

The minimum boron concentration setpoint is used in the post LOCA boron concentration calculation. The calculation is performed to assure reactor subcriticality in a post LOCA environment. Of particular interest is the large break LOCA, since no credit is taken for control rod assembly insertion. A reduction in the accumulator minimum boron concentration would produce a subsequent reduction in the available containment sump concentration for post LOCA shutdown and an increase in the maximum sump pH. The safety analysis assumes that the boron has the isotopic concentration of B-10 found in natural boron (19.9 atom percent). The maximum boron concentration is used in determining the cold leg to hot leg recirculation injection switchover time and minimum sump pH. The upper limit of boron concentration is not related to reactivity and is not dependent on the B-10 isotopic concentration.

DCD_09.03.04-10

DCD_09.03.04-10

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.1.4

The boron concentration should be verified to be within required limits for each accumulator since the static design of the accumulators limits the ways in which the concentration can be changed. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. Sampling the affected accumulator within 6 hours after a 1% volume increase will identify whether inleakage has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water inventory is from the refueling water storage Pit (RWSP), because the water contained in the RWSP is within the accumulator boron concentration requirements. This is consistent with the recommendation of NUREG-1366 (Ref. 5).

SR 3.5.1.5

Verification that power is removed from each accumulator isolation valve operator when the RCS pressure is ≥ 1920 psig ensures that an active failure could not result in the undetected closure of an accumulator motor operated isolation valve. If this were to occur, only two accumulators would be available for injection given a single failure coincident with a LOCA. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR allows power to be supplied to the motor operated isolation valves when RCS pressure is < 1920 psig, thus allowing operational flexibility by avoiding unnecessary delays to manipulate the breakers during plant startups or shutdowns.

SR 3.5.1.6 DCD_09.03.04-10

Periodic verification every 24 months that the isotopic concentration of B-10 in each accumulator is ≥ 19.9% (atom percent) ensures that the B-10 isotopic concentration assumed in the accident analysis is available. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

B 3.5.4 Refueling Water Storage Pit (RWSP)

BASES

BACKGROUND

The RWSP supplies borated water to the Safety Injection System (SIS) and the Containment Spray (CS) System during accident conditions.

The RWSP supplies four trains of the SIS and four trains of the CS System through separate, redundant supply headers. A motor operated isolation valve is provided in each header to allow isolation of the RWSP from its associated SIS or CS train if required for maintenance. Use of a single RWSP to supply all four trains of the SI system and CS System is acceptable since the RWSP is a passive component, and passive failures are not required to be assumed to occur coincidentally with Design Basis Events.

Design ensures that during a design basis event, the RWSP is replenished with water which has been released to the containment from the RCS sufficient to maintain adequate net positive suction head to the SI and containment spray/ residual heat removal (CS/RHR) pumps throughout the event.

During normal operation in MODES 1, 2, and 3, the SI and CS/RHR pumps are aligned to take suction from the RWSP.

The SIS and CS system pumps are provided with recirculation lines that ensure each pump can maintain minimum flow requirements when operating at or near shutoff head conditions.

This LCO ensures that:

a. Sufficient borated water volume exists to support continued operation of the SI and CS/RHR pumps and

b. The reactor remains subcritical following a LOCA.

Insufficient water in the RWSP could result in insufficient suction head for the SI and CS/RHR pumps. Improper boron concentrations could result in a reduction of SDM or excessive boric acid precipitation in the core following the LOCA, as well as excessive caustic stress corrosion of mechanical components and systems inside the containment.

The B-10 isotopic concentration of the reactor coolant in the RCS is depleted very slowly with reactor operation due to the neutron flux in the core. When the boron recycle subsystem is used, the reactor coolant containing depleted B-10 is recycled and returned to the RCS. After being recycled numerous times, the isotopic concentration of B-10 in the boric acid solution being returned to the RCS gradually decreases. During refueling outages, the reactor coolant in the RCS is mixed with the refueling water stored in the RWSP. With the repeated mixing of each cycle, the DCD_09.03.04-10

BACKGROUND (continued)

isotopic concentration of B-10 of the refueling water in the RWSP can gradually decrease over a long period of time. The depleted B-10 of the boric acid solution in the RWSP can be recovered by increasing the overall boron concentration or the B-10 isotopic concentration itself. The requirement to verify the B-10 isotopic concentration is only required if the boron recycle subsystem is used. DCD_09.03.04-10

APPLICABLE SAFETY ANALYSES

During accident conditions, the RWSP provides a source of borated water to the SI and CS System pumps. As such, it provides containment cooling and depressurization, core cooling, and replacement inventory and is a source of negative reactivity for reactor shutdown (Refs. 1 and 2). The design basis transients and applicable safety analyses concerning each of these systems are discussed in the Applicable Safety Analyses section of B 3.5.2, "Safety Injection System (SIS) - Operating," B 3.5.3, " Safety Injection System (SIS) - Shutdown," and B 3.6.6, "Containment Spray Systems." These analyses are used to assess changes to the RWSP in order to evaluate their effects in relation to the acceptance limits in the analyses.

The RWSP must also meet volume, boron concentration, and temperature requirements for non-LOCA events. The volume is not an explicit assumption in non-LOCA events since the required volume is a small fraction of the available volume. The deliverable volume limit is set by the LOCA and containment analyses. For the RWSP, the deliverable volume is different from the total volume contained since, due to the design of the tank, more water can be contained than can be delivered. The minimum boron concentration of 4000 ppm is an explicit assumption in the main steam line break (MSLB) analysis to ensure the required shutdown capability. The safety analysis assumes that the boron has the isotopic concentration of B-10 found in natural boron (19.9 atom percent). DCD_09.03.04-10 DCD_09.03.04-10

The maximum temperatureis an assumption in the steam generator tube rupture analysis; the minimum is an assumption in the MSLB

For a large break LOCA analysis, the minimum water volume limit of 329,150 gallons and the lower boron concentration limit of 4000 ppm (at the natural B-10 isotopic concentration) are used to compute the post LOCA boron concentration necessary to assure subcriticality. To secure this minimum water volume in the accident, RWSP needs to store boric acid water ≥ 583,340 gallons during normal operation. This water volume also bounds the ECCS and CSS pump NPSH Requirements. The large break LOCA is the limiting case since the safety analysis assumes that all control rods are out of the core. DCD_09.03.04-10

The upper limit on boron concentration of 4200 ppm is used to determine the maximum allowable time to switch to hot leg recirculation following a LOCA. The purpose of switching from direct vessel injection to hot leg injection is to avoid boron precipitation in the core following the accident. The upper limit of boron concentration is not related to reactivity and is not dependent on the B-10 isotopic concentration. DCD_09.03.04-10

ACTIONS (continued)

B.1

With the RWSP inoperable for reasons other than Condition A (e.g., water volume), it must be restored to OPERABLE status within 1 hour.

In this Condition, neither the SIS nor the Containment Spray System can perform its design function. Therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the plant in a MODE in which the RWSP is not required. The short time limit of 1 hour to restore the RWSP to OPERABLE status is based on this condition simultaneously affecting redundant trains.

C.1 and C.2

If the RWSP cannot be returned to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.4.1

The RWSP borated water temperature should be verified to be within the limits assumed in the accident analyses band. ~~[The Frequency of 24 hours is sufficient to identify a temperature change that would approach either limit and has been shown to be acceptable through operating experience. OR~~ The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.~~]~~ CTS-01279

The SR is modified by a Note that eliminates the requirement to perform this Surveillance when containment air temperatures are within the operating limits of the RWSP. With containment air temperatures within the band, the RWSP temperature should not exceed the limits.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.4.2

The RWSP water volume should be verified to be above the required minimum level in order to ensure that a sufficient initial supply is available for injection and to support continued SI pump and CS/RHR pump operation on recirculation. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.5.4.3

The boron concentration of the RWSP should be verified to be within the required limits. This SR ensures that the reactor will remain subcritical following a LOCA. Further, it assures that the resulting RWSP pH will be maintained in an acceptable range so that boron precipitation in the core will not occur and the effect of chloride and caustic stress corrosion on mechanical systems and components will be minimized. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.5.4.4 DCD_09.03.04-10

Periodic verification that the isotopic concentration of B-10 in the RWSP is ≥ 19.9% (atom percent) ensures that the B-10 isotopic concentration assumed in the accident analysis is available. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR Subsection 6.2.2.
2. FSAR Subsection 15.6.5.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

The minimum mass of NaTB is 44,100 pounds. This mass is based on providing sufficient NaTB to buffer the post accident containment water to a minimum pH of 7.0. Additionally, the NaTB mass is based on treating the maximum volume of post accident water (879,740 gallons) containing the maximum amount of boron (4200 ppm) as well as other sources of acid.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.5.5.2

Testing must be performed to ensure the solubility and buffering ability of the NaTB after exposure to the containment environment. A representative sample of 5.71 grams of NaTB from one of the baskets in containment is submerged in ≥ 1liter of water at a boron concentration of 4200 ppm. At the standard temperature of 120 ± 5°F,without agitation, the solution must be left to stand for 12 hours. The liquid is then decanted and mixed, the temperature is adjusted to 77 ± 2°F. At this point, the pH must be ≥ 7.0. MAP-16-302

The minimum required amount of NaTB is sufficient to buffer the maximum amount of boron 4200 ppm, the maximum amount of other acids, and the maximum amount of water 879,740 gallons that can exist in the containment following an accident and achieve a minimum pH of 7.0.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR Section 6.3.

2. FSAR Subsection 15.6.5.5.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.1 Containment

BASES

BACKGROUND

The containment consists of the concrete reactor building, its steel liner, and the penetrations through this structure. The structure is designed to contain radioactive material that may be released from the reactor core following a design basis loss of coolant accident (LOCA). Additionally, this structure provides shielding from the fission products that may be present in the containment atmosphere following accident conditions.

The containment is a prestressed, post-tensioned, reinforced concrete structure with a cylindrical wall, hemispherical dome, and a flat, reinforced concrete foundation slab. The inside surface of the containment is lined with a carbon steel liner to ensure a high degree of leak tightness during operating and accident conditions.

The cylinder wall is prestressed with an ungrouted post tensioning system in the vertical and horizontal directions, and the containment dome is prestressed using two way, hoop and ~~inversed~~inverted U-shape vertical, post tensioning system. MAP-16-302

The concrete reactor building is required for structural integrity of the containment under Design Basis Accident (DBA) conditions. The steel liner and its penetrations establish the leakage limiting boundary of the containment. Maintaining the containment OPERABLE limits the leakage of fission product radioactivity from the containment to the environment. SR 3.6.1.1 leakage rate requirements comply with 10 CFR 50, Appendix J, Option B (Ref. 1), as modified by approved exemptions.

The isolation devices for the penetrations in the containment boundary are a part of the containment leak tight barrier. To maintain this leak tight barrier:

a. All penetrations required to be closed during accident conditions are either:

   1. Capable of being closed by an OPERABLE automatic containment isolation system or

   2. Closed by manual valves, blind flanges, or de-activated automatic valves secured in their closed positions, except as provided in LCO 3.6.3, "Containment Isolation Valves,"

BACKGROUND (continued)

b. Each airlock is OPERABLE, except as provided in LCO 3.6.2, "Containment Airlocks,"

c. All equipment hatches are closed~~, and~~. MAP-16-302

APPLICABLE SAFETY ANALYSES

The safety design basis for the containment is that the containment must withstand the pressures and temperatures of the limiting Design Basis Accident (DBA) without exceeding the design leakage rate.

The DBAs that result in a challenge to containment OPERABILITY from high pressures and temperatures are a LOCA and steam line break accidents (Ref. 2). In addition, release of significant fission product radioactivity within containment can occur from a LOCA. In the DBA analyses, it is assumed that the containment is OPERABLE such that, for the DBA involving release of fission product radioactivity, release to the environment is controlled by the rate of containment leakage. The containment is designed with an allowable leakage rate of 0.1% of containment air weight per day (Ref. 3). This leakage rate, used to evaluate offsite doses resulting from accidents, is defined in 10 CFR 50, Appendix J, Option B (Ref. 1), as L_a: the maximum allowable containment leakage rate at the calculated peak containment internal pressure (P_a) resulting from the limiting design basis LOCA. The allowable leakage rate represented by L_a forms the basis for the acceptance criteria imposed on all containment leakage rate testing. In the safety analysis the assumed leakage is 0.15% per day at P_a = 59.5 psig (Ref. 3).

Satisfactory leakage rate test results are a requirement for the establishment of containment OPERABILITY.

The containment satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Containment OPERABILITY is maintained by limiting leakage to~~.~~ $\leq$ 1.0 L_a, except prior to the first startup after performing a required Containment Leakage Rate Testing Program leakage test. At this time the applicable leakage limits must be met. MAP-16-302

Compliance with this LCO will ensure a containment configuration, including equipment hatch, that is structurally sound and that will limit leakage to those leakage rates assumed in the safety analysis.

SURVEILLANCE REQUIREMENTS

SR 3.6.1.1

Maintaining the containment OPERABLE requires compliance with the visual examinations and leakage rate test requirements of the Containment Leakage Rate Testing Program.

Failure to meet personnel airlock leakage limits specified in LCO 3.6.2 does not invalidate the acceptability of these overall leakage determinations unless their contribution to overall Type A, B, and C leakage causes that to exceed limits. As left leakage prior to the first startup after performing a required Containment Leakage Rate Testing Program leakage test is required to be < 0.6 L_a for combined Type B and C leakage, and < 0.75 L_a for overall Type A leakage (Ref. 5). At all other times between required leakage rate tests, the acceptance criteria is based on an overall Type A leakage limit of $\leq$ 1.0 L_a. At $\leq$ 1.0 L_a the offsite dose consequences are bounded by the assumptions of the safety analysis. MAP-16-302

SR Frequencies are as required by the Containment Leakage Rate Testing Program. These periodic testing requirements verify that the containment leakage rate does not exceed the leakage rate assumed in the safety analysis.

SR 3.6.1.2

For ungrouted, post tensioned tendons, this SR ensures that the structural integrity of the containment will be maintained in accordance with the provisions of the Containment Tendon Surveillance Program. Testing and Frequency are in accordance with the ASME Code, Section XI, Subsection IWL (Ref. 4), and applicable addenda as required by 10 CFR 50.55a.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.3.6

For containment purge valves with resilient seals, additional leakage rate testing beyond the test requirements of 10 CFR 50, Appendix J, Option B, is required to ensure OPERABILITY. Operating experience has demonstrated that this type of seal has the potential to degrade in a shorter time period than do other seal types. ~~Based on this observation and the importance of maintaining this penetration leak tight (due to the direct path between containment and the environment), a Frequency of 184 days was established as part of the NRC resolution of Generic Issue B-20, "Containment Leakage Due to Seal Deterioration" (Ref. 4).~~ The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01277

Additionally, this SR must be performed within 92 days after opening the valve. The 92 day Frequency was chosen recognizing that cycling the valve could introduce additional seal degradation (beyond that occurring to a valve that has not been opened). Thus, decreasing the interval (from 184 days) is a prudent measure after a valve has been opened.

SR 3.6.3.7

Automatic containment isolation valves close on a containment isolation signal to prevent leakage of radioactive material from containment following a DBA. This SR ensures that each automatic containment isolation valve will actuate to its isolation position on a containment isolation signal. This surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR Subsection 15.6.5.5.
2. FSAR Subsection 6.2.4.
3. Standard Review Plan 6.2.4.

BASES

BACKGROUND (continued)

The Containment Spray System is actuated either automatically by a High-3 containment pressure signal or manually. An automatic actuation opens the containment spray pump discharge valves and starts the containment spray pumps. A manual actuation of the Containment Spray System requires the operator to actuate two separate switches on the main control board to begin the same sequence. The Containment Spray System maintains an equilibrium temperature between the containment atmosphere and RWSP water.

APPLICABLE SAFETY ANALYSES

The Containment Spray System limits the temperature and pressure that could be experienced following a DBA. The limiting DBAs considered relative to Containment integrity are the loss of coolant accident (LOCA) and the steam line break (SLB). The LOCA and SLB are analyzed using computer codes designed to predict the resultant containment pressure and temperature transients. No DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed with regard to containment ESF systems, assuming one Class 1E bus is out of service and the loss of another Class 1E bus ~~bus~~, which is the worst case single active failure and results in two trains of Containment Spray System being inoperable. MAP-16-302

The analysis and evaluation show that, under the worst case scenario, the highest peak containment pressure is 59.5 psig experienced during a LOCA. The analysis shows that the peak containment temperature is 355°F experienced during an SLB. Both results meet the intent of the design basis. See the Bases for LCO 3.6.4, "Containment Pressure," and LCO 3.6.5, “Containment Temperature” for a detailed discussion. The analyses and evaluations assume a unit specific power level of 100%, two containment spray trains operating, and initial (pre-accident) containment conditions of 120°F and 2 psig. The analyses also assume a response time delayed initiation in order to provide conservative peak calculated containment pressure and temperature responses.

For certain aspects of transient accident analyses, maximizing the calculated containment pressure is not conservative. In particular, the effectiveness of the Emergency Core Cooling System during the core reflood phase of a LOCA analysis increases with increasing containment backpressure. For these calculations, the containment backpressure is calculated in a manner designed to conservatively minimize, rather than maximize, the calculated transient containment pressures in accordance with 10 CFR 50, Appendix K (Ref. 2).

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6.3 and SR 3.6.6.4

These SRs require verification that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated High-3 containment pressure signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.6.6.5

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment during an accident is not degraded. ~~[~~The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01268

REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40.
2. 10 CFR 50, Appendix K.
3. FSAR Subsection 15.6.5.5.
4. FSAR Subsection 6.2.1.
5. ASME Code for Operation and Maintenance of Nuclear Power Plants.

BASES

ACTIONS (continued)

~~C~~D.1, ~~C~~D.2.1, and ~~C~~D.2.2 RCOL4_16-4

If one or more required UHS transfer pump(s) are inoperable, action must be taken to restore the pump(s) to OPERABLE status or implement an alternate method of transferring the affected basin within 7 days. If an alternate method is utilized, action still must be taken to restore the transfer pump(s) to OPERABLE status within 31 days.

The Completion Times are reasonable based on the low probability of an accident occurring during the time allowed to restore the pump(s) or implement an alternate method, the availability of alternate methods, and the amount of time available to transfer the water from one basin to the other under the worst case accident assumptions. Furthermore, the inoperability of all required transfer pumps leaves only two cooling tower basins with a combined design heat removal capacity of approximately 20 days. This cooling period bounds and justifies the 7-day completion time to restore the transfer pumps to operable status. RCOL4_16-3

~~D~~E.1 and ~~D~~E.2 RCOL4_16-4

If the Required Actions and Completion Times of Condition A, B, or C are not met, or the UHS is inoperable for reasons other than Condition A, B, or C, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 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 3.7.9.1

This SR verifies that adequate long term (30 day) cooling can be maintained. The specified level also ensures that sufficient NPSH is available to operate the ESWS pumps. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. This SR verifies that each required UHS basin water level is ≥ ~~2,850,000~~2,800,000 gallons. Plant procedures provide the corresponding water level to be verified to assure a usable volume of 2,800,000 gallons, accounting for unusable volume and measurement uncertainty. RCOL2_09.02.05-5 RCOL4_16-2 CTS-01280

BASES

SURVEILLANCE REQUIREMENTS (continued)

The filters have a certain pressure drop at the design flow rate when clean. The magnitude of the pressure drop indicates acceptable performance, and is based on manufacturers' recommendations for the filter at the design flow rate. An increase in pressure drop or a decrease in flow indicates that the filter is being loaded or that there are other problems with the system.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR Subsection 6.5.1.
2. FSAR Subsection 9.4.5.
3. FSAR Subsection 15.6.5.5.
4. 10 CFR 50.34.
5. Regulatory Guide 1.52, Rev. 3.
6. NUREG-0800, Section 6.5.1, Rev. 3, March 2007.

MAP-16-302

BASES

APPLICABLE SAFETY ANALYSES (continued)

In the evaluation of the radiological consequences of this accident, the activity released from the steam generator connected to the failed steam line is assumed to be released directly to the environment. The unaffected steam generator is assumed to discharge steam and any entrained activity through the MSSVs and MSRVs during the event. Since no credit is taken in the analysis for activity plateout or retention, the resultant radiological consequences represent a conservative estimate of the potential integrated dose due to the postulated steam line failure.

Secondary specific activity limits satisfy Criterion 2 of 10 CFR 50.36(~~d~~c)(2)(ii). MAP-16-302

LCO

As indicated in the Applicable Safety Analyses, the specific activity of the secondary coolant is required to be ≤ 0.10 μCi/gm DOSE EQUIVALENT I-131 to limit the radiological consequences of a Design Basis Accident (DBA) to a small fraction of the required limit (Ref. 1).

Monitoring the specific activity of the secondary coolant ensures that when secondary specific activity limits are exceeded, appropriate actions are taken in a timely manner to place the unit in an operational MODE that would minimize the radiological consequences of a DBA.

APPLICABILITY

In MODES 1, 2, 3, and 4, the limits on secondary specific activity apply due to the potential for secondary steam releases to the atmosphere.

In MODES 5 and 6, the steam generators are not being used for heat removal. Both the RCS and steam generators are depressurized, and primary to secondary LEAKAGE is minimal. Therefore, monitoring of secondary specific activity is not required.

ACTIONS

A.1 and A.2

DOSE EQUIVALENT I-131 exceeding the allowable value in the secondary coolant, is an indication of a problem in the RCS and contributes to increased post accident doses. If the secondary specific activity cannot be restored to within limits within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 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.

BASES

ACTIONS (continued)

A.~~2~~3.1 and A.~~2~~3.2 MAP-16-205

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in ~~Condition A~~one required offsite circuit inoperable for a period that should not exceed 72 hours. With one offsite circuit inoperable, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the unit safety systems. In this Condition, however, the remaining OPERABLE offsite circuit and Class 1E GTGs are adequate to supply electrical power to the onsite Class 1E distribution system. MAP-16-302

Required Action A.~~2~~3.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). MAP-16-205

The 72 hour Completion Time takes into account the capacity and capability of the remaining ac sources, a reasonable time for repairs, and the low probability of PA occurring during this period.

B.1

To ensure a highly reliable power source remains with an inoperable Class 1E GTG, it is necessary to verify the availability of the offsite circuits on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a circuit fails to pass SR 3.8.1.1, it is inoperable. Upon offsite circuit inoperability, additional Conditions and Required Actions must then be entered.

B.2

Required Action B.2 is intended to provide assurance that a loss of offsite power, during the period that Class 1E GTGs in two trains are inoperable, does not result in a complete loss of safety function of critical systems. These features are designed with redundant safety related trains. This includes motor driven emergency feedwater pumps. Two train systems, such as turbine driven emergency feedwater pumps, are not included. Redundant required feature failures consist of inoperable features associated with a train, redundant to the train that has an inoperable Class 1E GTG.

~~The Completion Time for Required Action B.2 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:~~ CTS-01268

ACTIONS (continued)

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of OPERABLE Class 1E GTG(s). If it can be determined that the cause of the inoperable Class 1E GTG does not exist on the OPERABLE Class 1E GTG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other Class 1E GTG(s), the other Class 1E GTG(s) would be declared inoperable upon discovery and Condition E of LCO 3.8.1 would be entered. Once the failure is repaired, the common cause failure no longer exists, and Required Action B.3.1 is satisfied. If the cause of the initial inoperable Class 1E GTG cannot be confirmed not to exist on the remaining Class 1E GTG(s), performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of that Class 1E GTG.

In the event the inoperable Class 1E GTG is restored to OPERABLE status prior to completing either B.3.1 or B.3.2, the plant corrective action program will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer under the 24 hour constraint imposed while in Condition B.

According to Generic Letter 84-15 (Ref. 7), 24 hours is reasonable to confirm that the OPERABLE Class 1E GTGs are not affected by the same problem as the inoperable Class 1E GTGs.

B.4.1 and B.4.2

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition B for a period that should not exceed 72 hours.

Required Action B.4.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Required Action is not applicable in MODE 4. CTS-01268

In Condition B, the remaining OPERABLE Class 1E GTG and offsite circuits are adequate to supply electrical power to the onsite Class 1E distribution systems. The 72 hour Completion Time takes into account the capacity and capability of the remaining ac sources, a reasonable time for repairs, and the low probability of PA occurring during this period.

C.1, C.2.1 and C.2.2

Required Action C.1, which applies when two offsite circuits are inoperable, is intended to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required safety functions.

BASES

ACTIONS (continued)

With both of the required offsite circuits inoperable, sufficient onsite ac sources are available to maintain the unit in a safe shutdown condition in the event of AOO or PA. In fact, a simultaneous loss of offsite ac sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the offsite circuits commensurate with the importance of maintaining an ac electrical power system capable of meeting its design criteria.

According to Reference 6, with the available offsite ac sources, two less than required by the LCO, operation may continue for 24 hours. If two offsite sources are restored within 24 hours, unrestricted operation may continue. If only one offsite source is restored within 24 hours, power operation continues in accordance with Condition A. The Class 1E GTGs connect to Class 1E buses when other all ac power sources are unavailable, until one required offsite circuit is restored to OPERABLE status. COMPLETION TIME of subsequent CONDITION is limited by maximum COMPLETION TIME in accordance with administrative control.

Required Action C.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Required Action is not applicable in MODE 4. CTS-01268

D.1, D.2 and D.3

Pursuant to LCO 3.0.6, the distribution system ACTIONS would not be entered even if all ac sources to it were inoperable, resulting in de-energization. Therefore, the Required Actions of Condition D are modified by a Note to indicate that when Condition D is entered with no ac source to any train, the Conditions and Required Actions for LCO 3.8.9, "Distribution Systems - Operating," must be immediately entered. This allows Condition D to provide requirements for the loss of one offsite circuit and one or two Class 1E GTG, without regard to whether a train is de-energized. LCO 3.8.9 provides the appropriate restrictions for a de-energized train.

ACTIONS (continued)

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition D for a period that should not exceed 12 hours.

In Condition D, individual redundancy is lost in both the offsite electrical power system and the onsite ac electrical power system. Since power system redundancy is provided by two diverse sources of power, however, the reliability of the power systems in this Condition may appear higher than that in Condition C (loss of both required offsite circuits). This difference in reliability is offset by the susceptibility of this power system configuration to a single bus or switching failure. The 12 hour Completion Time takes into account the capacity and capability of the remaining ac sources, a reasonable time for repairs, and the low probability of PA occurring during this period.

Required Action D.3 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Required Action is not applicable in MODE 4. CTS-01268

E.1

With three or four Class 1E GTGs inoperable, there is only one or no remaining standby ac sources. Thus, with an assumed loss of offsite electrical power, insufficient standby ac sources are available to power the minimum required ESF functions. Since the offsite electrical power system is the only source of ac power for this level of degradation, the risk associated with continued operation for a very short time could be less than that associated with an immediate controlled shutdown (the immediate shutdown could cause grid instability, which could result in a total loss of ac power). Since any inadvertent generator trip could also result in a total loss of offsite ac power, however, the time allowed for continued operation is severely restricted. The intent here is to avoid the risk associated with an immediate controlled shutdown and to minimize the risk associated with this level of degradation.

According to Reference 6, with three of four Class 1E GTGs inoperable, operation may continue for a period that should not exceed 2 hours.

BASES

ACTIONS (continued)

F.1 and F.2

The sequencer(s) is an essential support system to both the offsite circuit and the Class 1E GTG associated with a given Class 1E 6.9kV bus. Furthermore, the sequencer is on the primary success path for most major ac electrically powered safety systems powered from the associated Class 1E 6.9kV bus. Therefore, loss of a Class 1E 6.9kV bus sequencer affects every major Class 1E 6.9kV system in the affected train. The 12 hour Completion Time for Required Action F.1 provides a period of time to correct the problem commensurate with the importance of maintaining sequencer OPERABILITY. This time period also ensures that the probability of an accident (requiring sequencer OPERABILITY) occurring during periods when the sequencer is inoperable is minimal.

Required Action F.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Required Action is not applicable in MODE 4. CTS-01268

G.1 and G.2

If the inoperable ac electric power sources cannot be restored to OPERABLE status 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 5 within 36 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 plant systems.

H.1

Condition H corresponds to a level of degradation in which all redundancy in the ac electrical power supplies has been lost. At this severely degraded level, any further losses in the ac electrical power system will cause a loss of function. Therefore, no additional time is justified for continued operation. The unit is required by LCO 3.0.3 to commence a controlled shutdown.

SURVEILLANCE REQUIREMENTS

The ac sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, in accordance with 10 CFR 50, Appendix A, GDC 18 (Ref. 8). Periodic component tests are supplemented by extensive functional tests during refueling outages (under simulated accident conditions). The SRs for demonstrating the OPERABILITY of the Class 1E GTGs are in accordance with the recommendations of Regulatory Guide 1.9 (Ref. 3), and Regulatory Guide 1.137 (Ref. 9).

BASES

SURVEILLANCE REQUIREMENTS (continued)

Note 2 ensures that the Class 1E GTG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ 0.9. This power ~~factor is representative of the actual inductive loading a Class 1E GTG would see under design basis accident conditions.~~factor should be maintained as close as practicable to actual power factor which a Class 1E GTG would see under design basis accident conditions, such as 0.85. MAP-16-302
Under certain conditions, however, Note 2 allows the Surveillance to be conducted at a power factor other than ≤ 0.9. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.9 results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to 0.9 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the Class 1E GTG excitation levels needed to obtain a power factor of 0.9 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the Class 1E GTG. In such cases, the power factor shall be maintained as close as practicable to 0.9 without exceeding the Class 1E GTG excitation limits.

SR 3.8.1.9

This Surveillance demonstrates the Class 1E GTG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The Class 1E GTG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the Class 1E GTG experiences following a full load rejection and verifies that the Class 1E GTG does not trip upon loss of the load. These acceptance criteria provide for Class 1E GTG damage protection. While the Class 1E GTG is not expected to experience this transient during an event and continues to be available, this response ensures that the Class 1E GTG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.3 Class 1E Gas Turbine Fuel Oil, Lube Oil, and Starting Air

BASES

BACKGROUND	Each Class 1E Gas Turbine Generator (GTG) is provided with a storage tank having a fuel oil capacity sufficient to operate that gas turbine for a period of 7 days while the Class 1E GTG is supplying maximum post loss of coolant accident load demand discussed in FSAR Subsection 9.5.4 (Ref. 1). The maximum load demand is calculated using the assumption that a minimum of any four Class 1E GTGs is available. This onsite fuel oil capacity is sufficient to operate the Class 1E GTGs for longer than the time to replenish the onsite supply from outside sources. Fuel oil is transferred from the storage tank to the day tank by either of two transfer pumps associated with each storage tank. ~~All outside tanks, pumps, and piping are located underground.~~ MAP-16-302 For proper operation of the standby Class 1E GTGs, it is necessary to ensure the proper quality of the fuel oil. Regulatory Guide 1.137 (Ref. 2) addresses the recommended fuel oil practices as supplemented by ANSI N195 (Ref. 3). The fuel oil properties governed by these SRs are the water and sediment content, the kinematic viscosity, specific gravity (or API gravity), and impurity level. The Class 1E GTG lubrication system is designed to provide sufficient lubrication to permit proper operation of its associated Class 1E GTG under all loading conditions. The system is required to circulate the lube oil to the gas turbine engine working surfaces and to remove excess heat generated by friction during operation. The engine oil sump in each Class 1E GTG gear boxes contains an inventory capable of supporting a minimum of 7 days of operation. This supply is sufficient to allow the operator to replenish lube oil from outside sources. Each Class 1E GTG has an air start system with adequate capacity for three successive start attempts on the Class 1E GTG without recharging the air start receiver(s).
APPLICABLE SAFETY ANALYSES	The initial conditions of Anticipated Operational Occurrence (AOO) and Postulated Accident (PA) analyses in FSAR Chapter 6 (Ref. 4), and in FSAR Chapter 15 (Ref. 5), assume Engineered Safety Feature (ESF) systems are OPERABLE. The Class 1E GTGs are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that fuel, Reactor Coolant System and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for FSAR Section 3.2, Power Distribution Limits; FSAR Section 3.4, Reactor Coolant System (RCS); and FSAR Section 3.6, Containment Systems.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources - Operating

BASES

BACKGROUND

The station dc electrical power system provides the ac emergency power system with control power. It also provides both motive and control power to selected safety related equipment and preferred ac vital bus power (via inverters). As required by 10 CFR 50, Appendix A, ~~G dc~~GDC 17 (Ref. 1), the dc electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. The dc electrical power system also conforms to the recommendations of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3). MAP-16-302

The 125 Vdc electrical power system consists of four independent and redundant safety related Class 1E dc electrical power subsystems (Trains A, B, C, and D). Each subsystem consists of one 125 Vdc battery, the associated battery charger for each battery, and all the associated control equipment and interconnecting cabling.

Additionally there are two spare battery chargers, which provide backup service in the event that the preferred battery charger is out of service. If the spare battery charger is substituted for one of the preferred battery chargers, then the requirements of independence and redundancy between subsystems are maintained.

During normal operation, the 125 Vdc load is powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger, the dc load is automatically powered from the station batteries.

The Train A, B, C, and D dc electrical power subsystems provide the control power for its associated Class 1E ac power load group, 6.9 kV switchgear, and 480 V load centers. The dc electrical power subsystems also provide dc electrical power to the inverters, which in turn power the ac vital buses.

The dc power distribution system is described in more detail in Bases for LCO 3.8.9, "Distribution System - Operating," and LCO 3.8.10, "Distribution Systems - Shutdown."

Each 125 Vdc battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant Class 1E subsystems, such as batteries, battery chargers, or distribution panels.

ACTIONS (continued)

If the charger is operating in the current limit mode after 2 hours that is an indication that the battery is partially discharged and its capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated dc system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 24 hours (Required Action A.2).

Required Action A.2 requires that the battery float current be verified as less than or equal to 5 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it has now been fully recharged. If at the expiration of the initial 24 hour period the battery float current is not less than or equal to 5 amps this indicates there may be additional battery problems and the battery must be declared inoperable.

Required Action A.3.1 limits the restoration time for the inoperable battery charger to 7 days. This action is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., balance of plant non-Class 1E battery charger). Required Action A.3.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Required Action is not applicable in MODE 4. The 7 day Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status. CTS-01268

B.1

Condition B represents batteries in two trains inoperable. With the batteries in these two trains inoperable, the associated dc buses are being supplied by their OPERABLE battery chargers. Any event that results in a loss of the ac buses supporting the battery chargers will also result in loss of dc to those trains. Recovery of the ac bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., Class 1E GTG control and field flash, ac load shed and Class 1E GTG output circuit breakers, etc.) likely rely upon the battery. In addition the energization transients of any dc loads that are beyond the capability of the battery charger and normally require the assistance of the battery will not be able to be brought online. The 2 hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07 V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific Completion Times.

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge helps to ensure the effectiveness of the battery chargers, which support the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state while supplying the continuous steady state loads of the associated dc subsystem. On float charge, battery cells will receive adequate current to optimally charge the battery. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum float voltage established by the battery manufacturer (2.17 Vpc or 130.2 V at the battery terminals). This voltage is controlled by administrative control. This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.8.4.2

This SR verifies the design capacity of the battery chargers. According to Regulatory Guide 1.32 (Ref. 9), the battery charger supply is recommended to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensure that these requirements can be satisfied.

This SR provides two options. One option requires that each battery charger be capable of supplying ~~800~~700 amps at the minimum established float voltage for 8 hours. The ampere requirements are based on the output rating of the chargers. The voltage requirements are based on the charger voltage level after a response to a loss of ac power. The time period is sufficient for the charger temperature to have stabilized and to have been maintained for at least 2 hours. MAP-16-302

The other option requires that each battery charger be capable of recharging the battery after a service test coincident with supplying the largest coincident demands of the various continuous steady state loads (irrespective of the status of the plant during which these demands occur). This level of loading may not normally be available following the battery service test and will need to be supplemented with additional

ACTIONS (continued)

For this reason a Note has been included in Condition A requiring the entry into the Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating." This ensures that the vital bus is re-energized within 2 hours.

Required Action A.1 allows 24 hours to fix the inoperable inverter and return it to service. Required Action A.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Required Action is not applicable in MODE 4. The 24 hour limit is based upon engineering judgment, taking into consideration the time required to repair an inverter and the additional risk to which the unit is exposed because of the inverter inoperability. This has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems such a shutdown might entail. When the ac vital bus is powered from its transformer, it is relying upon interruptible ac electrical power sources (offsite and onsite). The uninterruptible inverter source to the ac vital buses is the preferred source for powering instrumentation trip setpoint devices. CTS-01268

B.1 and B.2

If the inoperable devices or components cannot be restored to OPERABLE status 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 5 within 36 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 plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and ac vital buses energized from the inverter. The verification of proper voltage and frequency output ensures that the required power is readily available for the instrumentation of the RPS and ESFAS connected to the ac vital buses. The proper voltage and frequency of inverter and breaker alignment are controlled by administrative control. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

LCO(continued)

OPERABLE ac electrical power distribution subsystems require the associated buses, load centers, and motor control centers to be energized to their proper voltages. OPERABLE dc electrical power distribution subsystems require the associated buses and distribution panels to be energized to their proper voltage from either the associated battery or charger. OPERABLE vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated inverter or Class 1E transformer.

This LCO is modified by Notes. Note 2 permits the two train buses to be removed from operation when switching from one train to another. The circumstances for de-energizing two train buses are to be limited to situations when the outage time is short. MAP-16-302

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of PA.

Electrical power distribution subsystem requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems - Shutdown."

ACTIONS

A.1 and A.2

With one Train A, B, C or D required ac bus, load center, or motor control center inoperable and a loss of function has not occurred, the remaining ac electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required ac buses, load centers, and motor control centers must be restored to OPERABLE status within 8 hours. Required Action A.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Required Action is not applicable in MODE 4. CTS-01268

Table B 3.8.9-1 (page 1 of 1)
AC and DC Electrical Power Distribution Systems

TYPE	VOLTAGE	TRAIN A*	TRAIN B*	~~TRAIN C*~~ TRAIN C*	TRAIN D*
AC safety buses	6900 V	Class 1E Bus A	Class 1E Bus B	Class 1E Bus C	Class 1E Bus D
AC Load Centers	480 V	Load Centers A A1(1)	Load Center B	Load Center C	Load Centers D D1(2)
AC Motor Control Centers	480 V	Motor Control Centers A A1(1)	Motor Control Center B	Motor Control Center C	Motor Control Centers D D1(2)
DC buses	125 V	Bus A	Bus B	Bus C	Bus D
AC vital buses	120 V	Bus A	Bus B	Bus C	Bus D

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(1) 480 V Load Center A1 and MCC A1 can be supplied from Bus A or B.

(2) 480 V Load Center D1 and MCC D1 can be supplied from Bus C or D.

* Each train of the ac and dc electrical power distribution systems is a subsystem.

B 3.9 REFUELING OPERATIONS

B 3.9.3 Nuclear Instrumentation

BASES

BACKGROUND	The source range neutron flux monitors are used during refueling operations to monitor the core reactivity condition. The installed source range neutron flux monitors are part of the Nuclear Instrumentation System (NIS). These detectors are located external to the reactor vessel and detect neutrons leaking from the core. The installed source range neutron flux monitors are BF3 detectors operating in the proportional region of the gas filled detector characteristic curve. The detectors monitor the neutron flux in counts per second. The instrument range covers six decades of neutron flux (1E+6 cps) with a 5% instrument accuracy. The detectors also provide continuous visual indication in the control room and an audible alarm and count rate to alert operators to a possible dilution accident. The NIS is designed in accordance with the criteria presented in Reference 1.
APPLICABLE SAFETY ANALYSES	Two OPERABLE source range neutron flux monitors are required to provide a signal to alert the operator to unexpected changes in core reactivity such as with a boron dilution accident (Ref. 2) or an improperly loaded fuel assembly. The audible count rate from the source range neutron flux monitors provides prompt and definite indication of any boron dilution. The count rate increase is proportional to the subcritical multiplication factor and allows operators to promptly recognize the initiation of a boron dilution event. Prompt recognition of the initiation of a boron dilution event is consistent with the assumptions of the safety analysis and is necessary to assure sufficient time is available for isolation of the primary water makeup source before SHUTDOWN MARGINE is lost (Ref.2). The source range neutron flux monitors satisfy Criterion 3 of 10 CFR 50.36(~~d~~c)(2)(ii). MAP-16-302
LCO	This LCO requires that two source range neutron flux monitors be OPERABLE to ensure that redundant monitoring capability is available to detect changes in core reactivity. To be OPERABLE, each monitor must provide visual indication in the control room. In addition, at least one of the two monitors must provide an OPERABLE audible alarm and count rate function to alert the operators to the initiation of a boron dilution event.

B 3.9 REFUELING OPERATIONS

B 3.9.6 Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level

BASES

BACKGROUND	The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS), as required by GDC 34, to provide mixing of borated coolant, and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the Containment Spray (CS)/RHR heat exchangers where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS cold leg(s). Operation of the RHR System for normal cooldown decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the CS/RHR heat exchanger(s) and the bypass lines. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System. In MODE 6 Low Water Level, low-pressure letdown line isolation valves are automatically closed upon detection of RCS loop low-level signal to prevent loss of RCS inventory. DCD_19.01-8 The function is effective to prevent core damage during plant shutdown, based on probabilistic risk assessment.
APPLICABLE SAFETY ANALYSES	While there is no explicit analysis assumptions for the decay heat removal function of the RHR System in MODE 6, if the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to a loss of refueling cavity water level. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to the boron plating out on components near the areas of the boiling activity. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant will eventually challenge the integrity of the fuel cladding, which is a fission product barrier. Three trains of the RHR System are required to be OPERABLE, and two trains in operation, in order to prevent this challenge. RHR and Coolant Circulation – Low Water Level satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).
LCO	In MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, three RHR loops must be OPERABLE. Additionally, two loops of RHR must be in operation in order to provide: a. Removal of decay heat, b. Mixing of borated coolant to minimize the possibility of criticality, and

BASES

LCO (continued)

c. Indication of reactor coolant temperature.

This LCO requires the low-pressure letdown line isolation valves to be OPERABLE to mitigate the effects associated with loss of RCS inventory. DCD_19.01-8

This LCO is modified by two Notes. Note 1 permits the RHR pumps to be removed from operation for ≤ 15 minutes when switching from one train to another. The circumstances for stopping all RHR pumps are to be limited to situations when the outage time is short and the core outlet temperature is maintained > 10 degrees F below saturation temperature. The Note prohibits boron dilution or draining operations when RHR forced flow is stopped.

Note 2 allows one RHR loop to be inoperable for a period of 2 hours provided the other loops are OPERABLE and in operation. Prior to declaring the loop inoperable, consideration should be given to the existing plant configuration. This consideration should include that the core time to boil is short, there is no draining operation to further reduce RCS water level and that the capability exists to inject borated water into the reactor vessel. This permits surveillance tests to be performed on the inoperable loop during a time when these tests are safe and possible.

An OPERABLE RHR loop consists of an CS/RHR pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

All RHR pumps may be aligned to the Refueling Water Storage Pit to support filling or draining the refueling cavity or for performance of required testing.

APPLICABILITY

Three RHR loops are required to be OPERABLE, and two RHR loops must be in operation in MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, to provide decay heat removal and mixing of the borated coolant. Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level ≥ 23 ft are located in LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level."

In MODE 6 Low Water Level, low-pressure letdown line isolation valves are automatically closed upon detection of RCS loop low-level signal to prevent loss of RCS inventory. DCD_19.01-8

The function is effective to prevent core damage during plant shutdown, based on probabilistic risk assessment.

BASES

ACTIONS

A.1 and A.2

If less than the required number of RHR loops are OPERABLE, action shall be immediately initiated and continued until the RHR loop is restored to OPERABLE status and to operation or until ≥ 23 ft of water level is established above the reactor vessel flange. When the water level is ≥ 23 ft above the reactor vessel flange, the Applicability changes to that of LCO 3.9.5, and only one RHR loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

B.1 DCD_19.01-8

If one low-pressure letdown isolation valve is inoperable, the automatic isolation function to prevent loss of RCS inventory is lost. Action must be initiated to restore the valve to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of three paths for heat removal.

~~B~~C.1

If no RHR loop is in operation, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that what would be required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.

~~B~~C.2 DCD_19.01-8

If no RHR loop is in operation, actions shall be initiated immediately, and continued, to restore two RHR loop to operation. Since the unit is in Conditions A and B concurrently, the restoration of three OPERABLE RHR loops and at least two operating RHR loop should be accomplished expeditiously.

C~~B~~.3, ~~B~~C.4, ~~B~~C.5.1, and ~~B~~C.5.2 DCD_19.01-8

If no RHR is in operation, the following actions must be taken:

a. The equipment hatch must be closed and secured with four bolts,

b. One door in each air lock must be closed, and

BASES

ACTIONS (continued)

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere must be either closed by a manual or automatic isolation valve, blind flange, or equivalent, or verified to be capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.

With RHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Performing the actions stated above ensures that all containment penetrations are either closed or can be closed so that the dose limits are not exceeded.

The Completion Time of 4 hours allows fixing of most RHR problems and is reasonable, based on the low probability of the coolant boiling in that time.

SURVEILLANCE REQUIREMENTS

SR 3.9.6.1

This Surveillance demonstrates that two RHR loops are in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. In addition, during operation of the RHR loops with the water level in the vicinity of the reactor vessel nozzles, the CS/RHR pump suction requirements must be met. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.9.6.2

Verification that the required pump is OPERABLE ensures that an additional RCS or RHR pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pump. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.9.6.3 DCD_19.01-8

SR 3.9.6.3 requires a complete cycle of each low-pressure letdown isolation valve. This requirements mean confirmation of OPERABILITY of Instrumentation and its control (Setpoints, Channel Checks, Channel Calibrations) and valve. Operating a low-pressure letdown isolation valve through one complete cycle ensures that the low-pressure letdown isolation valve can be automatically actuated to mitigate the effects from loss of RCS inventory. The Surveillance Frequency is based on operating experience,

BASES

SURVEILLANCE REQUIREMENTS (continued)

equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. DCD_19.01-8

REFERENCES

1. FSAR Subsection 5.4.7.