January 18, 2008

TSTF-08-01
PROJ0753

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Response to NRC June 25, 2007 Request for Additional Information Regarding TSTF-493, Revision 2, "Clarify Application of Setpoint Methodology for LSSS Functions"

REFERENCES:

1) Letter from Timothy Kobetz (NRC) to the Technical Specifications Task Force, requesting additional information regarding TSTF-493, Revision 2, "Clarify Application of Setpoint Methodology for LSSS Functions," dated July 25, 2007.

2) Letter from the Technical Specification Task Force to NRC, "Revision to Scheduled Response Date for NRC Request for Additional Information Regarding TSTF-493, Revision 2, "Clarify Application of Setpoint Methodology for LSSS Functions," dated October 31, 2007.

3) Letter from the Technical Specification Task Force to NRC, "Revision to Scheduled Response Date for NRC Request for Additional Information Regarding TSTF-493, Revision 2, "Clarify Application of Setpoint Methodology for LSSS Functions," dated December 19, 2007.

Dear Sir or Madam:

In Reference 1, the NRC provided a Request for Additional Information (RAI) regarding TSTF-493, Revision 2, "Clarify Application of Setpoint Methodology for LSSS Functions." This letter responds to the NRC's referenced request. In References 2 and 3, the TSTF informed the NRC that additional time would be required to respond to the RAI.

The RAI resulted in changes to TSTF-493. Revision 3 of TSTF-493 is attached. The changes are described in the Traveler under "TSTF Revision 3 Revision Description."

In a letter dated March 2, 2006 from Jesse L. Funches (NRC) to Wesley Sparkman (TSTF), the NRC granted an exception from the 10 CFR Part 170 fees for the review of this Traveler.

The TSTF requests that the Traveler be made available under the Consolidated Line Item Improvement Process.

Responding to this RAI and the development of the three revisions to TSTF-493 has required a significant expenditure by the industry. With the submittal of this revision and RAI response, the funding for this effort has been exhausted. We are confident that we have responded adequately to the NRC's questions and anticipate that Revision 3 of TSTF-493 can be approved by the NRC without further RAIs or revisions.

Should you have any questions, please do not hesitate to contact us.

Bert Yates

Bert Yates (PWROG/W)

John Messina

John Messina (BWROG)

David Bice (PWROG/CE)

Reene' Gambrell

Reene' Gambrell (PWROG/B&W)

Enclosure

Attachment

cc: Gerald Waig, Technical Specifications Branch, NRC
Matthew Hamm, Technical Specifications Branch, NRC
Carl Schulten, Technical Specifications Branch, NRC

Response to NRC Request for Additional Information Regarding TSTF-493, Revision 2, "Clarify Application of Setpoint Methodology for LSSS Functions," dated July 25, 2007

The following is the Technical Specification Task Force (TSTF) response to NRC's July 25, 2007, letter requesting the following information to complete the review of TSTF-493.

1. Identify the screening criteria used by the TSTF for deciding whether a BWR Technical Specifications (TS) Instrumentation Function is a Safety Limit related (SL-related) or non-Safety Limit (non-SL) related Limiting Safety System Settings (LSSS). For example, BWR/4 and BWR/6 instrument functions for Drywell Pressure High, Suppression Pool Water Level High and Reactor Vessel Water Level –Low Low Low are not denoted as SL-related LSSS and no justification is included in the TSTF for this determination.

   <u>Response</u>

   BWRs identified four safety limits applicable to anticipated operational occurrences:

   - The limit on reactor power at low pressure or flow conditions,
   - The fuel cladding integrity safety limit minimum critical power ratio,
   - The reactor vessel low water level safety limit, and
   - The reactor vessel high pressure safety limit.

   Based on these safety limits, a systematic process was developed to identify limiting safety system settings which are consistent with the objective of protecting one or more of the four safety limits. A key element of this systematic process is that only those instrument settings that protect the four safety limits (based on safety analysis for each specific BWR) are considered.

   To determine a set of LSSSs, it was necessary to employ a consistent set of criteria that applied to the current BWR safety analysis, and considering only parameters in the improved Standard Technical Specification Tables in Section 3.3 and 3.4. These criteria are:

   A. SL-LSSSs are those parameters that prevent a safety limit from being exceeded. A confirmation would be that if the trip did not occur, then the possibility of exceeding a safety limit exists under steady state operation, normal operational transients, and anticipated operational occurrences as described in the plant Safety Analysis Report. Other LSSSs may be identified that have an equivalent function may also be selected based on a plant specific evaluation.

   B. The Technical Specification safety limits are applicable to steady state operation, normal operational transients, and anticipated operational occurrences as described in the safety analysis report. Accidents (such as loss of coolant accident) and events that are beyond the plant design basis (such as anticipated transients without scram), are excluded because the event limits for these events allow safety limits to be exceeded. Thus, in the

LSSS identification process the instruments settings that mitigate these events are excluded from identification.

C. The single failure criterion applies to mitigating systems that actuate in response to anticipated operational occurrences to prevent a safety limit from being exceeded, to the extent committed in the plant specific safety analysis. It is not necessary to assume a single failure in normal operating systems in addition to the failure assumed as the anticipated operational occurrences event initiator. Note that all anticipated operational occurrences terminated by single failure proof mitigating systems (such as the reactor protection system) meet the single failure criterion. Mitigating systems that are not single failure proof (such as the high pressure coolant injection system for the loss of feedwater flow event) may need a second system (such as the reactor core isolation cooling system for the loss of feedwater flow event) for mitigating the anticipated operational occurrences.

This process identified Technical Specification instrument setpoints in Technical Specification Tables in Sections 3.3 and 3.4, meeting these criteria as being SL-LSSS.

The results of applying this systematic process resulted in the list of potential SL-LSSSs identified in TSTF-493 for a limiting BWR/4 and BWR/6. This is the "limiting" list of functions because all BWRs may not have all the SL-LSSS functions identified in the TSTF due to plant specific analysis revisions or licensing basis changes.

The PWROG determined that it was not possible to generically limit the list of potential SL-LSSS functions identified in TSTF-493 other than to exclude permissives and interlocks. For the PWR plants, all possible SL-LSSS were identified in the TSTF-493 markups, and each plant specific submittal will identify whether the generic SL-LSSS apply and remove any of those identified in TSTF-493 that are not consistent with the plant specific safety analysis.

2. For each instrument function not labeled as a SL-LSSS, revise the Bases for the instrument function to include the justification for the determination. For setpoint verification surveillance tests conducted on these functions, also revise these surveillance test Bases to include performance-based acceptance criteria (similar to the Notes 1 & 2 for SL LSSS) to ensure the agreement concepts for TS non-SL LSSS safety-related instrument setpoints and allowable values are addressed. The agreement concepts referred to are those in the Nuclear Energy Institute (NEI) letter to Mr. James Lyons (NRC) from Alexander Marion (NEI) dated May 18, 2005 and the NRC letter response to Mr. Alexander Marion (NEI) from Mr. Bruce Boger, dated August 23, 2005.

Response

A Reviewer's Note will be added which requires the identification of functions that are not a SL-LSSS. The Reviewer's Note will state:

"Where a function does not directly protect a Safety Limit add the following statement, in the function discussion below.

The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

Each plant currently has a program that verifies Technical Specification channels are functioning as required. The addition of the Notes in this TSTF makes this verification a Technical Specification requirement for a selected set of functions (SL-LSSSs). For all other LSSS functions in the Technical Specifications, the existing programs are consistent with the safety significance of the functions. Therefore, no changes are made to the Bases to document the verifications for functions that are not SL-LSSS.

3. Correct the TSTF definition of SL-LSSS by deleting the word "directly" to be consistent with the requirements of 10 CFR 50.36 which specify SL LSSS as variables "on which a SL has been placed." The TSTF definition must be consistent with regulatory requirements. The TSTF justification states that Notes 1 and 2 are applied to Functions which are Safety Limit Limiting Safety System Settings (SL-LSSS), considering the following definition of SL-LSSS:

   "Trip Setpoints for Functions which provide automatic trips that **directly** (emphasis added) protect against violating the Reactor core and the Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit Limiting Safety System Settings (SL-LSSS)."

   Response

   The term "directly" is important to the SL-LSSS definition. There may be several different settings, permissives, or Limiting Conditions for Operation that contribute to the protection of the Safety Limit but are not part of the direct success path for accident mitigation and protection of a Safety Limit. Some of these functions may provide alternative, anticipatory, or backup protection for the Safety Limit. The SL-LSSS definition is limited to the function credited in the safety analysis as directly preventing exceeding of the Safety Limit.

4. Revise the TSTF Bases Reviewers Note 3 as (changes shown in comparative text format) follows:

   "Notes [1] and [2] ~~are not applied~~ <u>may not apply</u> to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, (such as actuation logic and associated relays) there is no expected change in result between surveillance performances other than measurement and test errors (M&TE) ~~and~~ therefore, <u>justification is needed to confirm that</u> comparison of Surveillance results does not provide an indication of channel or component performance."

   The NRC staff has issued license amendments that include modified versions of Notes 1 and 2 for Surveillances which test digital components. Similarly, the TSTF guidance should not categorically exclude applying the notes to digital components.

   <u>Response</u>

   The TSTF Bases Reviewers Note 3 is revised to state:

   "Notes [a] and [b] may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required."

   For digital channels or parts of channels where the analog to digital (A/D) or digital to analog (D/A) converter is not a part of the specific Surveillance Test, a digital input (without regard to M&TE tolerance) is input and a state change (trip) is generally the expected result. In this case the test only verifies that the correct values exist in the software and that the corrective action occurs when a test value greater than the setpoint is input. Drift is not a possibility in these specific circuits and the Notes provide no increased assurance in detecting degradation of the channel.

5. Include a second version (Option B) to TSTF-493, Revision 2. The format and content of Option B should be modeled after the Section 3.3 Instrumentation TS in ESBWR Design Control Document, Tier 2, Chapter 16, Technical Specifications and Bases dated 12/15/2006, ADAMS Accession Numbers ML070110098 and ML070110101, respectfully.

   For this option, the TS instrument table Allowable Values are replaced with Analytical Limits for Safety Limit (SL) Limiting Safety System Settings (LSSS) and with Design Limits for non-SL LSSS. Also for this option, a Setpoint Control Program (SCP) is added to the programmatic requirements in Section 5.0, Administrative Controls. The SCP contains the

TSTF Table Notes 1 and 2,references to the NRC staff SE containing the approved setpoint methodology, identifies the licensee controlled document that contains the SL-LSSSs, Limiting Trip Setpoint, Nominal Trip Setpoint, Allowable Values, As-found tolerance band, and As-left setting tolerance. Each instrument surveillance requirement which verifies a LSSS (both SL and non-SL-LSSSs) contains a requirement to perform the surveillance test in accordance with the SCP.

Response

The current TSTF option is sufficient to resolve the NRC's concerns related to the control of Allowable Values, Limiting Trip Setpoints, and the performance of channels during and between calibrations. While the Option B recommendation has many merits, the Owners Groups believe it to be essential to resolve the issue based on the work completed over the last 5 years without adding new options to the NRC approval activities.

6. Incorporate the comments on the TSTF Justification provided in Enclosure 2.

   Response

   A revision to TSTF-493 is attached which incorporates the comments with some changes based on industry comments.

7. Incorporate the comments of the TSTF Bases provided in Enclosures 3 through 6

   Response

   A revision to TSTF-493 is attached which incorporates the comments with some changes based on industry comments.

8. Delete Appendix A, "TSTF 493 History" in its entirety. TSTF Appendix A contains references to non-NRC staff (i.e., TSTF) meeting notes and summaries related to the development of industry and NRC staff agreements that resulted in TSTF-493, Rev. 2.

   Response

   The Appendix has been removed from TSTF-493, Revision 3.

Technical Specification Task Force
Improved Standard Technical Specifications Change Traveler

Clarify Application of Setpoint Methodology for LSSS Functions

NUREGs Affected: ☑ 1430 ☑ 1431 ☑ 1432 ☑ 1433 ☑ 1434

Classification: 1) Technical Change

Recommended for CLIIP?: Yes

Correction or Improvement: Not Applicable

NRC Fee Status: Exempt

Benefit: Improves Bases

Industry Contact: John Messina, (330) 384-5878, jmessina@firstenergycorp.com

See attached.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: BWROG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 07-Nov-05

Owners Group Comments
The traveler was revised based on comments provided at a joint WOG/BWROG meeting held on December 14, 2005 in Marco Island, Florida and other comments.

Owners Group Resolution: Approved Date: 06-Jan-06

TSTF Review Information

TSTF Received Date: 07-Nov-05 Date Distributed for Review 07-Nov-05

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

Discussed with all OGs on December 12, 2005. Revised to address comments.

TSTF Resolution: Approved Date: 23-Jan-06

NRC Review Information

NRC Received Date: 27-Jan-06

Final Resolution: Superceded by Revision Final Resolution Date: 02-Oct-06

TSTF Revision 1 Revision Status: Closed

Revision Proposed by: TSTF

Revision Description:
The NRC posted two comments associated with TSFT-493 Rev. 0. The first comment posted on 03/22/2006, stated, "TSTF-493, revision 0 did not generically define the scope of the instrumentation affected. To cover those systems that should be covered to meet 10 CFR 50.36 the TSTF scope for identifying LSSS should apply to TSs instrumentation related to variables which protect the integrity of the reactor fuel and the integrity of the reactor coolant pressure boundary (RCPB) physical barriers. This translates to TSs instrumentation, excluding manual trip functions, that trip the reactor (i.e., reactor trip system instrumentation, reactor protection system instrumentation); TSs instrumentation that ensure the core is adequately cooled in the event of a design basis accident or transient (i.e., engineered safety feature actuation instrumentation, emergency core cooling system instrumentation); TSs instrumentation that provides additional margin to core safety limits, such as the end-of-cycle recirculation pump trip instrumentation; and TSs instrumentation that provides RCPB overpressure protection (pressurizer safety valves, safety/relief valves)." In response to this comment the Owners Groups had the NSSS vendors identify a list of generic LSSS that protected the Reactor Core and Reactor Coolant Pressure Boundary Pressure Safety Limits during Anticipated Operational Occurrences, which are the only events that are considered for determing the Safety Limit (SL) LSSS. The TSTF was revised to include the identified list of LSSS functions for each NUREG. Additional supporting or exempting statements were also included to further define the components that must be considered in the LSSS scope.

The NRC's second comment was posted on 3/28/2006 and addressed the TSTF proposed method of determining if the channel instruments were functioning as required. This comment limited the methodology that could be used to determine the as-left tolerance and still use the TSTFs proposed method of evaluation, which included the comparison of as-found values to the actual plant setpoint rather than to the previous as-left value. In response to this comment the traveler was revised to detail the requirement that the as-left tolerance either be calculated as the Square Root Sum of the Squares (SRSS) combination of Reference Accuracy (RA), Measurement and Test Equipment (M&TE) error, and M&TE readability, or that the as-found tolerance be compared to the current as-found minus the previous as-left setting. Plant specific methodologies may have different methods of calculating as-left and as-found but must provide plant specific justifications for these methods.

TSTF Review Information

TSTF Received Date: 16-Sep-06 Date Distributed for Review 16-Sep-06

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 02-Oct-06

NRC Review Information

NRC Received Date: 02-Oct-06

NRC Comments:

Revised to address NRC comments.

Final Resolution: Superceded by Revision

TSTF Revision 2 Revision Status: Closed

Revision Proposed by: TSTF

Revision Description:
TSTF-493 is revised to address the issues discussed in the NRC's December 14, 2006 letter.

The proposed Notes are added to any Function which could be considered a Safety Limit Limiting Safety System Setting.

The Bases are revised to define Safety Limit Limiting Safety System Setting (SL-LSSS) and to provide Reviewer's Notes to describe plant-specific adoption of the change.

Owners Group Review Information

Date Originated by OG: 05-Mar-07

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 06-Apr-07

TSTF Review Information

TSTF Received Date: 11-Apr-07 Date Distributed for Review 11-Apr-07

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 16-Apr-07

NRC Review Information

NRC Received Date: 16-Apr-07

NRC Comments: Date of NRC Letter: 25-Jul-07

Acceptance and review schedule letter received on 5/24/07.

Final Resolution: Superceded by Revision Final Resolution Date: 25-Jul-07

TSTF Revision 3 Revision Status: Active

Revision Proposed by: NRC

Revision Description:
TSTF-493 Revision 3 incorporates the Owners Group responses to the NRC RAIs as transmitted in the Letter from Timothy Kobetz (NRC) to the Technical Specifications Task Force, requesting for additional information regarding TSTF TRAVELER 493, REVISION 2, "CLARIFY APPLICATION OF SETPOINT METHODOLOGY FOR LSSS FUNCTIONS." DOCKET NO: PROJ0753; TAC MD5249" dated June 25, 2007. The major changes include:

1) The addition of a reviewers Note requiring identification of functions that are not a SL-LSSS as follows:

"Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

TSTF Revision 3 **Revision Status: Active**

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

2) Revised the exclusion for digital functions as follows:
"Notes [a] and [b] may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

3) Revised the definition for SL-LSSS to change the discussion of permissives and interlocks as follows:

Trip Setpoints for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

4) Revised Insert 2 (Notes added to the specification tables) to include the following to explicitly require that the title of the document be included in the Technical Specifications:
"[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]"

5) Revised the terminology from device to channel to indicate that setpoint verification is based on the channels (or part of a channel) and not individual devices.

6) Revised capitalization of terms in accordance with the NRC markups in the RAI attachments.

Owners Group Review Information

Date Originated by OG: 20-Aug-07

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 31-Oct-07

TSTF Review Information

TSTF Received Date: 10-Jan-08 Date Distributed for Review 17-Jan-08

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Revision 3 Revision Status: Active

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 18-Jan-08

NRC Review Information

NRC Received Date: 18-Jan-08

Affected Technical Specifications

Bkgnd 3.3.1 Bases	RPS Instrumentation	NUREG(s)- 1430 Only
S/A 3.3.1 Bases	RPS Instrumentation	NUREG(s)- 1430 Only
LCO 3.3.1	RPS Instrumentation Change Description: Table 3.3.1-1	NUREG(s)- 1430 Only
SR 3.3.1 Bases	RPS Instrumentation	NUREG(s)- 1430 Only
SR 3.3.1.3 Bases	RPS Instrumentation	NUREG(s)- 1430 Only
SR 3.3.1.4 Bases	RPS Instrumentation	NUREG(s)- 1430 Only
SR 3.3.1.5 Bases	RPS Instrumentation	NUREG(s)- 1430 Only
Bkgnd 3.3.5 Bases	ESFAS Instrumentation	NUREG(s)- 1430 Only
S/A 3.3.5 Bases	ESFAS Instrumentation	NUREG(s)- 1430 Only
LCO 3.3.5	ESFAS Instrumentation Change Description: Table 3.3.5-1	NUREG(s)- 1430 Only
LCO 3.3.5 Bases	ESFAS Instrumentation	NUREG(s)- 1430 Only
SR 3.3.5 Bases	ESFAS Instrumentation	NUREG(s)- 1430 Only
SR 3.3.5.2 Bases	ESFAS Instrumentation	NUREG(s)- 1430 Only
SR 3.3.5.3 Bases	ESFAS Instrumentation	NUREG(s)- 1430 Only
Bkgnd 3.3.1 Bases	RTS Instrumentation	NUREG(s)- 1431 Only
S/A 3.3.1 Bases	RTS Instrumentation	NUREG(s)- 1431 Only

LCO 3.3.1	RTS Instrumentation Change Description: Table 3.3.1-1	NUREG(s)- 1431 Only
Action 3.3.1 Bases	RTS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.1 Bases	RTS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.1.7 Bases	RTS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.1.8 Bases	RTS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.1.10 Bases	RTS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.1.11 Bases	RTS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.1.12 Bases	RTS Instrumentation	NUREG(s)- 1431 Only
Bkgnd 3.3.2 Bases	ESFAS Instrumentation	NUREG(s)- 1431 Only
S/A 3.3.2 Bases	ESFAS Instrumentation	NUREG(s)- 1431 Only
LCO 3.3.2	ESFAS Instrumentation Change Description: Table 3.3.2-1	NUREG(s)- 1431 Only
Action 3.3.2 Bases	ESFAS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.2 Bases	ESFAS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.2.5 Bases	ESFAS Instrumentation	NUREG(s)- 1431 Only
SR 3.3.2.9 Bases	ESFAS Instrumentation	NUREG(s)- 1431 Only
Bkgnd 3.3.1 Bases	RPS Instrumentation - Operating (Analog)	NUREG(s)- 1432 Only
Bkgnd 3.3.1 Bases	RPS Instrumentation - Operating (Digital))	NUREG(s)- 1432 Only
S/A 3.3.1 Bases	RPS Instrumentation - Operating (Analog)	NUREG(s)- 1432 Only
LCO 3.3.1	RPS Instrumentation - Operating (Analog) Change Description: Table 3.3.1-1	NUREG(s)- 1432 Only
LCO 3.3.1	RPS Instrumentation - Operating (Digital)) Change Description: Table 3.3.1-1	NUREG(s)- 1432 Only
LCO 3.3.1 Bases	RPS Instrumentation - Operating (Analog)	NUREG(s)- 1432 Only
LCO 3.3.1 Bases	RPS Instrumentation - Operating (Digital))	NUREG(s)- 1432 Only
Action 3.3.1 Bases	RPS Instrumentation - Operating (Analog)	NUREG(s)- 1432 Only
Action 3.3.1 Bases	RPS Instrumentation - Operating (Digital))	NUREG(s)- 1432 Only
SR 3.3.1 Bases	RPS Instrumentation - Operating (Analog)	NUREG(s)- 1432 Only

SR 3.3.1 Bases	RPS Instrumentation - Operating (Digital))	NUREG(s)- 1432 Only
SR 3.3.1.4 Bases	RPS Instrumentation - Operating (Analog)	NUREG(s)- 1432 Only
SR 3.3.1.5 Bases	RPS Instrumentation - Operating (Analog)	NUREG(s)- 1432 Only
SR 3.3.1.7 Bases	RPS Instrumentation - Operating (Digital))	NUREG(s)- 1432 Only
SR 3.3.1.8 Bases	RPS Instrumentation - Operating (Analog)	NUREG(s)- 1432 Only
SR 3.3.1.8 Bases	RPS Instrumentation - Operating (Digital))	NUREG(s)- 1432 Only
SR 3.3.1.10 Bases	RPS Instrumentation - Operating (Digital))	NUREG(s)- 1432 Only
Bkgnd 3.3.4 Bases	ESFAS Instrumentation (Analog)	NUREG(s)- 1432 Only
S/A 3.3.4 Bases	ESFAS Instrumentation (Analog)	NUREG(s)- 1432 Only
LCO 3.3.4	ESFAS Instrumentation (Analog) Change Description: Table 3.3.4-1	NUREG(s)- 1432 Only
Action 3.3.4 Bases	ESFAS Instrumentation (Analog)	NUREG(s)- 1432 Only
SR 3.3.4 Bases	ESFAS Instrumentation (Analog)	NUREG(s)- 1432 Only
SR 3.3.4.2 Bases	ESFAS Instrumentation (Analog)	NUREG(s)- 1432 Only
SR 3.3.4.4 Bases	ESFAS Instrumentation (Analog)	NUREG(s)- 1432 Only
Bkgnd 3.3.5 Bases	ESFAS Instrumentation (Digital)	NUREG(s)- 1432 Only
S/A 3.3.5 Bases	ESFAS Instrumentation (Digital)	NUREG(s)- 1432 Only
LCO 3.3.5	ESFAS Instrumentation (Digital) Change Description: Table 3.3.5-1	NUREG(s)- 1432 Only
SR 3.3.5 Bases	ESFAS Instrumentation (Digital)	NUREG(s)- 1432 Only
SR 3.3.5.2 Bases	ESFAS Instrumentation (Digital)	NUREG(s)- 1432 Only
SR 3.3.5.3 Bases	ESFAS Instrumentation (Digital)	NUREG(s)- 1432 Only
Bkgnd 3.3.1.1 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
Bkgnd 3.3.1.1 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
S/A 3.3.1.1 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
LCO 3.3.1.1	RPS Instrumentation Change Description: Table 3.3.1.1-1	NUREG(s)- 1433 Only
SR 3.3.1.1 Bases	RPS Instrumentation	NUREG(s)- 1433 Only

SR 3.3.1.1.1 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.1.1.2 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.1.1.3 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.1.1.4 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.1.1.5 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.1.1.7 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.1.1.8 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.1.1.9 Bases	RPS Instrumentation	NUREG(s)- 1433 Only
Bkgnd 3.3.2.1 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1433 Only
S/A 3.3.2.1 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1433 Only
LCO 3.3.2.1	Cotnrol Rod Block Instrumentation Change Description: Table 3.3.2.1-1	NUREG(s)- 1433 Only
SR 3.3.2.1 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1433 Only
Ref. 3.3.2.1 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1433 Only
SR 3.3.2.1.7 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1433 Only
Bkgnd 3.3.4.1 Bases	EOC-RPT	NUREG(s)- 1433 Only
S/A 3.3.4.1 Bases	EOC-RPT	NUREG(s)- 1433 Only
SR 3.3.4.1 Bases	EOC-RPT	NUREG(s)- 1433 Only
SR 3.3.4.1.2	EOC-RPT Instrumentation	NUREG(s)- 1433 Only
SR 3.3.4.1.2	EOC-RPT Instrumentation	NUREG(s)- 1433 Only
SR 3.3.4.1.2 Bases	EOC-RPT	NUREG(s)- 1433 Only
SR 3.3.4.1.3	EOC-RPT Instrumentation	NUREG(s)- 1433 Only
SR 3.3.4.1.3	EOC-RPT Instrumentation	NUREG(s)- 1433 Only
SR 3.3.4.1.3 Bases	EOC-RPT	NUREG(s)- 1433 Only
Bkgnd 3.3.5.1 Bases	ECCS Instrumentation	NUREG(s)- 1433 Only
S/A 3.3.5.1 Bases	ECCS Instrumentation	NUREG(s)- 1433 Only
LCO 3.3.5.1	ECCS Instrumentation Change Description: Table 3.3.5.1-1	NUREG(s)- 1433 Only

LCO 3.3.5.1	ECCS Instrumentation Change Description: Table 3.3.5.1-1	NUREG(s)- 1433 Only
SR 3.3.5.1 Bases	ECCS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.5.1.3 Bases	ECCS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.5.1.4 Bases	ECCS Instrumentation	NUREG(s)- 1433 Only
Bkgnd 3.3.5.2 Bases	RCIC System Instrumentation	NUREG(s)- 1433 Only
S/A 3.3.5.2 Bases	RCIC System Instrumentation	NUREG(s)- 1433 Only
LCO 3.3.5.2	RCIC System Instrumentation Change Description: Table 3.3.5.2-1	NUREG(s)- 1433 Only
LCO 3.3.5.2	RCIC System Instrumentation Change Description: Table 3.3.5.2-1	NUREG(s)- 1433 Only
SR 3.3.5.2 Bases	RCIC System Instrumentation	NUREG(s)- 1433 Only
S/A 3.3.5.2.3 Bases	RCIC System Instrumentation	NUREG(s)- 1433 Only
S/A 3.3.5.2.4 Bases	RCIC System Instrumentation	NUREG(s)- 1433 Only
SR 3.3.6.5.2	Relief and LLS Instrumentation	NUREG(s)- 1433 Only
SR 3.3.6.5.3	Relief and LLS Instrumentation	NUREG(s)- 1433 Only
Bkgnd 3.3.1.1 Bases	RPS Instrumentation	NUREG(s)- 1434 Only
S/A 3.3.1.1 Bases	RPS Instrumentation	NUREG(s)- 1434 Only
LCO 3.3.1.1	RPS Instrumentation Change Description: Table 3.3.1.1-1	NUREG(s)- 1434 Only
SR 3.3.1.1 Bases	RPS Instrumentation	NUREG(s)- 1434 Only
SR 3.3.1.1.9 Bases	RPS Instrumentation	NUREG(s)- 1434 Only
Bkgnd 3.3.2.1 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1434 Only
S/A 3.3.2.1 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1434 Only
LCO 3.3.2.1	Cotnrol Rod Block Instrumentation Change Description: Table 3.3.2.1-1	NUREG(s)- 1434 Only
SR 3.3.2.1 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1434 Only
SR 3.3.2.1.7 Bases	Cotnrol Rod Block Instrumentation	NUREG(s)- 1434 Only
Bkgnd 3.3.4.1 Bases	EOC-RPT Instrumentation	NUREG(s)- 1434 Only

S/A 3.3.4.1 Bases	EOC-RPT Instrumentation	NUREG(s)- 1434 Only
SR 3.3.4.1 Bases	EOC-RPT Instrumentation	NUREG(s)- 1434 Only
SR 3.3.4.1.2 Bases	EOC-RPT Instrumentation	NUREG(s)- 1434 Only
SR 3.3.4.1.3 Bases	EOC-RPT Instrumentation	NUREG(s)- 1434 Only
Bkgnd 3.3.5.1 Bases	ECCS Instrumentation	NUREG(s)- 1434 Only
S/A 3.3.5.1 Bases	ECCS Instrumentation	NUREG(s)- 1434 Only
SR 3.3.5.1 Bases	ECCS Instrumentation	NUREG(s)- 1434 Only
SR 3.3.5.1.3 Bases	ECCS Instrumentation	NUREG(s)- 1434 Only
SR 3.3.5.1.4 Bases	ECCS Instrumentation	NUREG(s)- 1434 Only
Bkgnd 3.3.5.2 Bases	RCIC System Instrumentation	NUREG(s)- 1434 Only
S/A 3.3.5.2 Bases	RCIC System Instrumentation	NUREG(s)- 1434 Only
SR 3.3.5.2 Bases	RCIC System Instrumentation	NUREG(s)- 1434 Only
SR 3.3.5.2.3 Bases	RCIC System Instrumentation	NUREG(s)- 1434 Only
SR 3.3.5.2.4 Bases	RCIC System Instrumentation	NUREG(s)- 1434 Only
Bkgnd 3.3.6.5 Bases	Relief and LLS Instrumentation	NUREG(s)- 1434 Only
S/A 3.3.6.5 Bases	Relief and LLS Instrumentation	NUREG(s)- 1434 Only
LCO 3.3.6.5 Bases	Relief and LLS Instrumentation	NUREG(s)- 1434 Only
SR 3.3.6.5 Bases	Relief and LLS Instrumentation	NUREG(s)- 1434 Only
SR 3.3.6.5.2 Bases	Relief and LLS Instrumentation	NUREG(s)- 1434 Only
SR 3.3.6.5.3 Bases	Relief and LLS Instrumentation	NUREG(s)- 1434 Only

1.0 Description

The proposed change revises Surveillance Requirements (SR)s to address NRC concerns that the Technical Specification (TS) requirements for Limiting Safety System Settings (LSSS) that protect the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limits (herein referred to as Safety Limit Limiting Safety System Settings (SL-LSSS)), may not be fully in compliance with the intent of 10 CFR 50.36. Specifically, the NRC is concerned that the existing Surveillance Requirements do not provide adequate assurance that instruments will always actuate safety functions at the point assumed in the applicable safety analysis. While the industry does not share the NRC's concern, this Traveler represents a compromise agreement to address the issue.

2.0 Proposed Change

The location of Notes used to identify potential SL-LSSS in this TSTF varies depending on the format of the vendor TS. Two Notes are added to the Surveillance Requirements associated with potential SL-LSSS Functions in the Surveillance Requirements column in the specification's Function table. If the specification does not contain a Function table with a Surveillance Requirements column, the Notes are added to the table's Allowable Value column. If the specification does not include a Function table, then the Notes are added to the applicable Surveillance Requirement.

Notes are added to SRs that verify trip setpoint settings. Surveillance Requirement Notes will vary due to vendor-specific testing requirements. In NUREG-1430, 1432, 1433, and 1434, the Notes are added to the Channel Calibration Surveillance Requirements, and to Channel Functional Test Surveillance Requirements that verify trip setpoints. In NUREG-1431, the Notes are added to the Channel Calibration, Channel Operational Test (COT), and Trip Actuation Device Operational Test (TADOT) Surveillance Requirements that verify trip setpoints.

Throughout this document and the proposed TS changes, the terms "Limiting Trip Setpoint" and "Nominal Trip Setpoint" and their abbreviations, "LTSP" and "NTSP" are shown in brackets (e.g., "[LTSP]"). In all cases, the term "Limiting Trip Setpoint" may be replaced in the Technical Specifications and in the Bases by a term (e.g. NTSP) consistent with the plant-specific setpoint methodology.

The two Notes added to the Surveillance Requirements are:

Insert 1: If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

Insert 2: The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual

> setpoint implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

In NUREG-1430, 1432, 1433, and 1434, the Technical Specification Function tables contain the Allowable Value. These specifications are referred to as having the "single column" format. In NUREG-1431, the option is given to list only the Allowable Value or to list the Allowable Value and the [Nominal Trip Setpoint (NTSP)]. This second option is referred to as the "multiple columns" format; in this presentation, the [NTSP] is the LSSS. Those plants that utilize the "multiple column" format are not required to incorporate the NTSP value in the last sentence in Insert 2 because any change to the value requires prior NRC review and the values cannot be changed by the licensee under 10 CFR 50.59. For plants that specify the [NTSP] or [LTSP] instead of the Allowable Value, the same restrictions apply and the identification of the [LTSP] or [NTSP] in the last sentence in Insert 2 is not required.

These two Notes are applied to Functions which are SL-LSSS, considering the definition and exclusion criteria given below.

SL-LSSS are defined as:

> "Trip Setpoints for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The two Notes are applied to the indicated Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. The two Notes are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Insert 1 requires a

comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. The two Notes are not applied to Technical Specifications associated with mechanically operated safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. The two Notes may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

An evaluation of the potential SL-LSSS Functions resulted in the two Notes being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the potential SL-LSSS Functions to identify which of the identified functions are SL-LSSS according to the definition of SL-LSSS and their plant specific safety analysis. The two TSTF Notes are not required to be applied to any of the listed Functions which meet any of the exclusion criteria or are not SL-LSSS based on the plant specific design and analysis.

The Bases are revised to reflect the addition of the Notes to the applicable SL-LSSS Functions. The Bases are also revised to define the term "Limiting Trip Setpoint" or "Nominal Trip Setpoint," and to discuss the relationship of the LSSS to other values, such as the Allowable Value and the [NTSP] or [LTSP]. The Bases provide details on the implementation of the requirements described in the Notes and the relationship between the as-found value and Function OPERABILITY. Where necessary to provide context for the other changes, a description of the use of [LTSP] and Allowable Value is added to the Specification Bases, similar to the discussion in the reactor trip system Specification Bases.

Each plant currently has a program that verifies Technical Specification channels are functioning as required, the addition of the Notes in this TSTF, makes this verification a Technical Specification requirement for a selected set of functions that provide the ultimate protection for Safety Limits.

3.0 Background

Plant protective systems are designed to initiate reactor trips (scrams) or other protective actions before selected unit parameters exceed Analytical Limits assumed in the safety analysis in order to prevent violation of the Reactor Core Safety Limits and RCS Pressure Safety Limits from postulated Anticipated Operational Occurrences (AOOs). The Reactor Core Safety Limits and RCS Pressure Safety Limits ensure the integrity of the reactor core and RCS are maintained.

The instrumentation required by the Technical Specifications has been designed to assure that the applicable safety analysis limits will not be exceeded during AOOs. This is achieved by specifying [LTSPs] in terms of parameters directly monitored by the applicable instrumentation systems for LSSSs, as well as specifying Limiting Conditions for Operation (LCOs) on other plant parameters and equipment.

10 CFR 50.36(c)(1) states:

> "(1) Safety limits, limiting safety system settings, and limiting control settings."
>
> "(i)(A) Safety limits for nuclear reactors are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity. If any safety limit is exceeded, the reactor must be shut down."
>
> "(ii)(A) Limiting safety system settings for nuclear reactors are settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded. If, during operation, it is determined that the automatic safety system does not function as required, the licensee shall take appropriate action, which may include shutting down the reactor."

Safety analysis calculations provide a conservative analysis of postulated events to demonstrate that the applicable acceptance criteria are not exceeded. For AOOs, the acceptance criteria include the Reactor Core Safety Limits and RCS Pressure Safety Limits.

The "Allowable Value" is more conservative than the Analytical Limit to account for applicable instrument measurement errors consistent with the plant specific setpoint methodology. If during testing, the actual instrumentation setting is less conservative than the Allowable Value, the channel is declared inoperable and actions must be taken consistent with the Technical Specification requirement.

The "[LTSP]" is more conservative than the Allowable Value and is the nominal value to which the instrument channel is adjusted to actuate. It is impossible to set a physical instrument channel to an exact value, so a calibration tolerance is established around the [LTSP]. Therefore, the [LTSP] is considered a nominal value and the instrument adjustment is considered successful if the as-left instrument setting is within the tolerance (a range of values around the [LTSP]).

The "[Limiting Trip Setpoint (LTSP)]" is the limiting setting for the channel trip setpoint (TSP) considering all credible instrument errors associated with the instrument channel. The [LTSP] is the least conservative value (with an as-left tolerance) to which the channel must be reset at the conclusion of periodic testing to ensure that the Analytical Limit (AL) will not be exceeded during an AOO before the next periodic surveillance or calibration.

The "Nominal Trip Setpoint (NTSP)" is the Limiting Trip Setpoint with margin added. The [NTSP] is always equal to or more conservative than the [LTSP].

In September 2002, during review of a plant-specific license amendment request, the NRC expressed a concern that the Allowable Values calculated using some methods in the industry standard ISA-S67.04-1994 Part II "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation," (Reference 1) could be non-conservative depending upon the evaluation of instrument performance history and the as-left requirements of the calibration procedures, which could have an adverse effect on equipment OPERABILITY depending upon the channel performance evaluation program requirements. In the intervening period, the industry and the NRC have worked together to develop requirements that will ensure that instrument channels will actuate safety systems to perform their preventive or mitigation functions as assumed in the accident analysis.

The industry group on setpoint methods proposed seven concepts that needed to be addressed to ensure the instrument channels function as required. These concepts (paraphrased from an NEI to NRC letter dated May 18, 2005, therefore quote marks and brackets are not used) are:

1. The LTSP must be calculated consistent with the plant-specific methodology. The LTSP is the expected value for the trip. The as-left and as-found values may be less conservative than the LTSP by predefined tolerances (which are factored into the trip setpoint calculation).

2. The as-found trip setpoint must be verified to be within predefined double-sided limits that are based on the actual expected errors between calibrations. Finding the as-found trip setpoint outside these limits warrants additional evaluation and potential corrective action, as necessary, to ensure continued performance of the specified safety function. Normally, the as-found tolerance will be equivalent to the errors verified during the surveillance (e.g. Reference Accuracy (RA), drift, and measurement and test equipment (M&TE) accuracy/errors.)

3. The Nominal Trip Setpoint must be reset or left within the as-left tolerance at the end of every surveillance that requires setpoint verification. The ability to reset the setpoint represents continued confidence that the channel can perform its intended safety function. The as-left tolerance may include the reference accuracy, M&TE accuracy and readability uncertainties.

4. The Nominal Trip Setpoint may be set more conservative than the LTSP. If the Nominal Trip Setpoint is set more conservative than the LTSP, the as-found and as-left tolerances will be maintained around the more conservative Nominal Trip Setpoint

5. The Allowable Value (defined as the least conservative acceptable as-found surveillance value) defines the maximum possible value for process measurement at which the Analytical Limit is protected. The Allowable Value verifies that the Analytical Limit and Safety Limit are still protected at the time of the surveillance. Since OPERABILITY of the instrument channel is determined at the time of the surveillance performance, the fact that the tested trip point occurred conservative to the Allowable Value ensures that at that point in time the channel would have functioned to protect the Analytical Limit and is OPERABLE. With the implementation of these concepts, calculation of the Allowable Value using any of the ISA S67.04 Part II methods is acceptable. The Allowable Value is documented in the Technical Specifications and is in accordance with the normal rules of the Improved Standard Technical Specifications and is consistent with current practices.

6. For those Westinghouse NSSS plants whose plant-specific Technical Specifications contain Allowable Value and Nominal Trip Setpoint columns, the Nominal Trip Setpoint identified in the Technical Specifications is expected to be the NTSP for the channel.

7. When a channel's as-found value is conservative to the Allowable Value but the setpoint is outside the as-found tolerance, the channel may be degraded and may not conform to the assumptions in the design basis calculation. Prior to returning the channel to service, there shall be a determination utilizing available information to ensure that the channel can perform as expected. For example, this determination may include an evaluation of magnitude of change per unit time, response of instrument for reset, previous history, etc., to provide confidence that the channel will perform its specified safety function. This determination, combined with resetting the trip setpoint to within the as-left tolerance, permits the channel to be returned to service.

Each of these items is addressed by the proposed changes. Items 1 through 6 result in changes to the Technical Specifications or Bases. To address Item 7, the revised Bases require that when a channel's as-found value is outside the as-found tolerance, the potentially degraded instrument must be entered into the licensee's corrective action program. The corrective action program evaluation is expected to be performed promptly to validate the determination that was performed prior to returning the channel to service and to confirm that the channel is OPERABLE and performing as expected. The licensee's corrective action program will be used to track or trend these instruments.

4.0 <u>Technical Analysis</u>

The proposed change satisfies the NRC's concerns through the addition of Notes to the Technical Specification SL-LSSS Functions and changes to the Technical Specification Bases.

<u>Addition of Inserts 1 and 2 to the SL-LSSS Functions</u>

There are two Notes added to the Technical Specifications to address the concepts described in the Background section.

Insert 1 states:

> "If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service."

Setpoint calculations determine an [LTSP] based on the Analytical Limit, which ensures that trips will occur prior to the process parameter exceeding the Safety Limit as required by the Safety Analysis calculations. These setpoint calculations may also calculate an allowable limit of change expected (as-found tolerance) between performance of the surveillance tests that monitor the trip setpoint value. The least conservative value of the as-found instrument setting that a channel can have during calibration without a required Technical Specification action is the Allowable Value. Finding a plant setting less conservative than the Allowable Value (AV) indicates that there may not be sufficient margin to the Analytical Limit. Current Channel Calibrations, Channel Functional Tests (with setpoint verification), Trip Unit Calibrations, COTs, and TADOTs (with setpoint verification) are performed to demonstrate compliance with the Allowable Values in the Technical Specifications. When the measured as-found setpoint is non-conservative with respect to the Allowable Value, the channel is inoperable and the actions identified in the Technical Specifications must be taken.

Verification that the trip setting is conservative with respect to the AV when a Surveillance is performed does not necessarily verify proper operation of the channel instruments in the future. Although the channel was OPERABLE during the previous surveillance interval, when channel performance is outside the performance predicted by the plant setpoint calculations, the design basis for the channel may not be met, and proper operation of the channel on a future demand is not assured. Insert 1 will formalize the establishment of an as-found tolerance for each appropriate channel. This as-found tolerance will exist around the [LTSP] or around any more conservative setpoint that the plant chooses to implement. The tolerance will ensure that channel operation is consistent with the assumptions or design inputs used in the setpoint calculations and that there is a high confidence of acceptable channel performance in the future. Because the tolerance is two sided, changes in channel performance that are conservative will also be detected and evaluated for possible effects on expected performance.

Implementation of Insert 1 requires the licensee to calculate an as-found tolerance. One acceptable method of calculating the as-found tolerance is the Square Root Sum of the Squares (SRSS) combination of either a) Reference Accuracy (RA), Measurement and Test Equipment (M&TE) error, M&TE readability (M&TEr) and projected drift, or b) as-left tolerance and the projected drift (assuming that as-left tolerance is ≤ SRSS combination of RA, M&TE error, M&TEr). Different methods of calculating the as-found tolerance (including the inclusion of additional uncertainties (e.g., normal radiation effect, temperature effect between calibrations, capillary tubing error) may be acceptable. Alternate methods must result in an as-found tolerance that is small enough to detect abnormal channel performance. Any additional uncertainties included in the as-found tolerance calculation must be justified.

Verification that the measured setpoint is within the as-found tolerance is determined by calculating the difference between the current as-found value and the [Limiting Trip Setpoint] or by calculating the difference between the current as-found value and the previous as-left value. In order to use the as-found minus [LTSP] methodology, the as-left tolerance must be less than or equal to the SRSS combination of the RA, M&TE, and M&TE readability. The methodology used to determine the as-found and as-left tolerance must be stated in the document controlled under 10 CFR 50.59 referenced in Insert 2, as described below.

Insert 2 states:

> "The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]."

Setpoint calculations assume that the instrument setpoint is left at the [LTSP] within a specific as-left tolerance (e.g., 25 psig $\pm$ 2 psig). A tolerance is necessary because no device perfectly measures the process. Additionally, it is not possible to read and adjust a setting to an absolute value due to the readability and/or accuracy of the test instruments or the ability to adjust potentiometers. The as-left tolerance is normally as small as possible considering the tools and ALARA concerns of the calibration. The as-left tolerance is always considered in the setpoint calculation. Failure to set the actual plant trip setpoint to the [LTSP] (or more conservative than the [LTSP]), and within the as-left tolerance, would invalidate the assumptions in the setpoint calculation because any subsequent instrument drift would not start from the expected as-left setpoint.

The NRC Staff is concerned that some plants may have used as-left tolerances much larger than necessary for proper reading and adjustment of the channels. In this situation, the large tolerances could prevent or mask detection of instrument degradation or failure. However, large as-left tolerances do have the advantage of minimizing the number of times that a channel must be adjusted, and can provide a true indication of long term instrument performance if the results are trended using "as-found minus as-left" techniques.

Implementation of Insert 2 may require some licensees to recalculate the as-left tolerance for some channels to ensure that realistic values are used that do not mask instrument performance.

During the process of checking the setpoint there are four possible results in best case to worst case order:

1. The setpoint is found within the as-left tolerance; the results are recorded in the procedure, and the Technical Specifications require no further action.

2. The setpoint is outside the as-left tolerance but within the as-found tolerance; the setpoint is reset to within the as-left tolerance, and the Technical Specifications require no further action.

3. The setpoint is found conservative with respect to the Allowable Value but outside the as-found tolerance. In this case the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

4. The setpoint is found non-conservative to the Allowable Value; the channel is inoperable until the setpoint is reset to the [LTSP] (within the as-left tolerance), and any evaluations necessary to return the channel to service are completed.

The Bases state that 1) a determination that the instrument is functioning as required must be performed prior to returning the channel to service (within the capabilities of the technician performing the testing) when the channel is found conservative with respect to the Allowable Value but outside the predefined tolerance (as-found tolerance). This determination will consider whether the instrument is degraded or is capable of being reset and performing its specified safety function. If the channel is determined to be functioning as required (i.e., the channel can be adjusted to within the as-left tolerance and is determined to be functioning normally based on the determination performed prior to returning the channel to service), then 2) the licensee must also perform an independent verification that the instrument is functioning as required.

10 CFR 50.36(c)(1)(ii)(A) requires that the LSSS be included in Technical Specifications. The [LTSP] is the LSSS required by 10 CFR 50.36(c)(1)(ii)(A). The Allowable Value may still be the only value included in the Technical Specifications to indicate the least conservative value that the as-found setpoint may have during testing. In this case the [LTSP] values must be contained in a document controlled under 10 CFR 50.59, such as the TRM or any document incorporated into the UFSAR, and the title of this document must be identified in Insert 2 in order to satisfy the 10 CFR 50.36 requirement that the LSSS be in the Technical Specifications. Additionally, to ensure proper use of the Allowable Value, [Limiting Trip Setpoints], and actual plant trip setpoints, the methodology for calculating the as-left and as-found tolerances, as discussed above, must also be included in a document controlled under 10 CFR 50.59 and listed in the second Note.

For TS with a multiple column format which lists the [NTSP] (as shown as an option in NUREG-1431), the last sentence of Insert 2 is modified to remove the requirement that the [NTSP] be identified in a 10 CFR 50.59 controlled document. If the [NTSP] is specified in the Technical Specifications, any change to the [NTSP] requires prior NRC review and approval. As a result, it is not necessary for the [NTSP] to be specified in a document controlled under 10 CFR 50.59. It will still be necessary to identify the methodologies used to determine the as-found and the as-left tolerances in a document controlled under 10 CFR 50.59 and identify this document in Insert 2.

Addition of the Definition of "Limiting Safety System Setting" to the Bases

The Technical Specifications Bases previously defined the Allowable Value as representing the LSSS in the Specifications because this is the value that verified that the Analytical Limit is protected during surveillance testing. This revision designates the [Limiting Trip Setpoint or the Nominal Trip Setpoint] as the Limiting Safety System Setting. This setpoint ensures that the Safety Limit is protected.

Addition of the Definition of "Limiting Trip Setpoint" to the Bases

The term "[Limiting Trip Setpoint]" is added as generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint, but for the purpose of Technical Specifications compliance with 10 CFR 50.36, the plant-specific value for the LSSS must be in the specifications or contained in a document controlled under 10 CFR 50.59.

The application of the plant setpoint methodology defines the [LTSP] as the LSSS in accordance with 10 CFR 50.36. Instead of referencing the title of the document that contains the [LTSPs] in Insert 2, it is also acceptable to list the [LTSPs] directly in the Technical Specifications, and revise Insert 2 to only identify the title of the document that describes the methodology for determining the as-found and as-left tolerances.

Addition of the Definition of "Safety Limit Limiting Safety System Setting (SL-LSSS)" to the Bases

The term "Safety Limit Limiting Safety System Setting (SL-LSSS)" is added as generic terminology to identify Trip Setpoints for Functions which provide automatic trips that protect the Reactor Core Safety Limits and the RCS Pressure Safety Limits during Anticipated Operational Occurrences. Permissive and interlock Functions are not SL-LSSS functions because they do not function as part of the reactor trip or ESF automatic actuation systems and are not explicitly modeled in the accident analyses as discussed previously.

5.0 Regulatory Analysis

5.1 No Significant Hazards Consideration

The TSTF has evaluated whether or not a significant hazards consideration is involved with the proposed generic change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

Response: No.

The proposed change clarifies the requirements for instrumentation to ensure the instrumentation will actuate as assumed in the safety analysis. Instruments are not an assumed initiator of any accident previously evaluated. As a result, the proposed change will not increase the probability of an accident previously evaluated. The proposed change will ensure that the instruments actuate as assumed to mitigate the accidents previously evaluated. As a result, the proposed change will not increase the consequences of an accident previously evaluated.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   Response: No.

   The change does not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. The change does not alter assumptions made in the safety analysis but ensures that the instruments behave as assumed in the accident analysis. The proposed change is consistent with the safety analysis assumptions.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

   Response: No.

   The proposed change clarifies the requirements for instrumentation to ensure the instrumentation will actuate as assumed in the accident analysis. No change is made to the accident analysis assumptions and no margin of safety is reduced as part of this change.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

   Based on the above, the TSTF concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements / Criteria

10 CFR 50.36(c)(1)(ii)(A) states,

> "Limiting safety system settings for nuclear reactors are settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded. If, during operation, it is determined that the automatic safety system does not function as required, the licensee shall take appropriate action, which may include shutting down the reactor."

The proposed change clarifies the Technical Specification requirements to ensure that the automatic protection action will correct the abnormal situation before a safety limit is exceeded.

General Design Criteria (GDC) 13, "Instrumentation and Control," states,

> "Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges."

General Design Criteria (GDC) 20, "Protection System Functions," states,

> "The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety."

The proposed change revises the Technical Specifications to enhance the controls used to maintain the variables and systems within the prescribed operating ranges, in order to ensure that automatic protection actions occur as necessary to initiate the operation of systems and components important to safety as assumed in the accident analysis.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

6.0 Environmental Considerations

A review has determined that the proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or Surveillance Requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

7.0 References

1. Instrument Society of America (ISA) Recommended Practice ISA-RP67.04, Part II, 1994 "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation."

2. Letter from NEI (Alexander Marion) to NRC (James Lyons) dated May 18th 2005 Titled, "Instrumentation, Systems, and Automation Society S67.04 Methods for Determining Trip Setpoints and Allowable Values for Safety-Related Instrumentation."

3. Letter from NRC (Bruce Boger) to Alexander Marion (NEI) dated August 23, 2005 Titled, "Instrumentation, Systems, and Automation Society (ISA) S67.04 Methods for Determining Trip Setpoints and Allowable Values for Safety-Related Instrumentation."

4. Regulatory Issue Summary 2006-017, dated August 24, 2006, Titled, "NRC Staff Position on the Requirements of 10 CFR 50.36, "Technical Specifications," Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels.

INSERTS

INSERT 1

If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

INSERT 2

The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

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

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Nuclear Overpower -				
a. High Setpoint	1,2(a),3(~~d~~b)	D	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)] SR 3.3.1.6	≤ [104.9]% RTP
b. Low Setpoint	2(~~b~~e),3(~~b~~e) 4(~~b~~e),5(~~b~~e)	E	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)] SR 3.3.1.6	≤ 5% RTP
2. RCS High Outlet Temperature	1,2	D	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)]	≤ [618]°F
3. RCS High Pressure	1,2(a),3(b~~d~~)	D	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)] SR 3.3.1.6	≤ [2355] psig
4. RCS Low Pressure	1,2(a)	D	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)] SR 3.3.1.6	≥ [1800] psig
5. RCS Variable Low Pressure	1,2(a)	D	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)]	≥ ([11.59] $\cdot$ T_{out} - [5037.8]) psig
6. Reactor Building High Pressure	1,2,3(~~f~~c)	D	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)]	≤ [4] psig

(a) When not in shutdown bypass operation.

(b) With any CRD trip breaker in the closed position, the CRD System capable of rod withdrawal, and not in shutdown bypass operation.

(c) [INSERT 1]

(d) [INSERT 2]

(~~b~~e) During shutdown bypass operation with any CRD trip breaker in the closed position and the CRD System capable of rod withdrawal.

(~~e~~f) With any CRD trip breaker in the closed position and the CRD System capable of rod withdrawal.

~~(d) With any CRD trip breaker in the closed position, the CRD System capable of rod withdrawal, and not in shutdown bypass operation.~~

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

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7. Reactor Coolant Pump to Power	1,2(a)	D	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)] SR 3.3.1.6	[5]% RTP with ≤ 2 pumps operating
8. Nuclear Overpower RCS Flow and Measured AXIAL POWER IMBALANCE	1,2(a)	D	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)] SR 3.3.1.6	Nuclear Overpower RCS Flow and AXIAL POWER IMBALANCE setpoint envelope in COLR
9. Main Turbine Trip (Control Oil Pressure)	≥ [45]% RTP	F	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)]	≥ [45] psig
10. Loss of Main Feedwater Pumps (Control Oil Pressure)	≥ [15]% RTP	G	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)]	≥ [55] psig
11. Shutdown Bypass RCS High Pressure	2(e~~b~~),3(~~b~~e),4(~~b~~e) 5(~~b~~e)	E	SR 3.3.1.1 SR 3.3.1.4[(c) (d)] SR 3.3.1.5[(c) (d)]	≤ [1720] psig

(a) When not in shutdown bypass operation.

(c) [INSERT 1]

(d) [INSERT 2]

(~~b~~e) During shutdown bypass operation with any CRD trip breakers in the closed position and the CRD System capable of rod withdrawal.

Table 3.3.5-1 (page 1 of 1)
Engineered Safety Feature Actuation System Instrumentation

PARAMETER	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	ALLOWABLE VALUE
1. Reactor Coolant System Pressure - Low Setpoint (HPI Actuation, RB Isolation, RB Cooling, EDG Start)	≥ [1800] psig	≥ [1600] psig[(a) (b)]
2. Reactor Coolant System Pressure - Low Low Setpoint (HPI Actuation, LPI Actuation, RB Isolation, RB Cooling)	≥ [900] psig	≥ [400] psig[(a) (b)]
3. Reactor Building (RB) Pressure - High Setpoint (HPI Actuation, LPI Actuation, RB Isolation, RB Cooling)	1,2,3,4	≤ [5] psig[(a) (b)]
4. Reactor Building Pressure - High High Setpoint (RB Spray Actuation)	1,2,3,4	≤ [30] psig[(a) (b)]

(a) [INSERT 1]

(b) [INSERT 2]

B 3.3 INSTRUMENTATION

B 3.3.1 Reactor Protection System (RPS) Instrumentation

BASES

BACKGROUND

The RPS initiates a reactor trip to protect against violating the core fuel design limits and the Reactor Coolant System (RCS) pressure boundary during anticipated operational occurrences (AOOs). By tripping the reactor, the RPS also assists the Engineered Safety Feature (ESF) Systems in mitigating accidents.

The protection and monitoring systems have been designed to assure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as the LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS)

~~Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "...settings for~~ 10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective ~~devices...so chosen that automatic protective actions will~~action to correct ~~the~~ abnormal ~~situation~~situations before ~~a Safety Limit (~~the SL~~)~~ is exceeded.~~"~~ The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic ~~protective devices~~protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE -----------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.1-1 for the purpose of compliance with 10 CFR 50.36, the plant-

specific location for the Limiting or Nominal Trip Setpoint must be cited in Note d of Table 3.3.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

The ~~trip setpoint~~[Limiting Trip Setpoint (LTSP)] is a predetermined setting for a ~~protective device~~ protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the ~~trip setpoint~~[LTSP] accounts for uncertainties in setting the ~~device~~ channel (e.g., calibration), uncertainties in how the ~~device~~ channel might actually perform (e.g., repeatability), changes in the point of action of the ~~device~~ channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the ~~trip setpoint~~[LTSP] ~~plays an important role in ensuring~~ ensures that SLs are not exceeded. As such, the ~~trip setpoint~~[LTSP] meets the definition of ~~an~~ a SL-LSSS (Ref. 1)~~and could be used to meet the requirement that they be contained in the Technical Specifications~~.

BASES

BACKGROUND (continued)

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." ~~For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for these devices. However, use~~Use of the ~~trip setpoint~~[LTSP] to define OPERABILITY in Technical Specifications ~~and its corresponding designation as the LSSS required by 10 CFR 50.36~~ would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as~~-~~found" value of a ~~protective device~~ protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic ~~protective device~~protection channel with a setting that has been found to be different from the ~~trip setpoint~~ [LTSP] due to some drift of the setting may still be OPERABLE ~~since~~because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the ~~trip setpoint~~[LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as~~-~~-found" setting of the ~~protective device.~~protection channel. Therefore, the ~~device~~channel would still be OPERABLE ~~since~~because it would have performed its safety function and the only corrective action required would be to reset the ~~device~~channel to the ~~trip setpoint~~[LTSP] to account for further drift during the next surveillance interval.

~~Use of the trip setpoint to define "as found" OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted.~~ However, there is also some point beyond which the ~~device~~channel would have not been able to perform its function due to, for example, ~~to~~ greater than expected drift. ~~This~~The Allowable Value specified in Table 3.3.1-1 is the least conservative value ~~needs to be specified in the Technical Specifications in order to define OPERABILITY of the devices and is designated as the Allowable Value which, as stated above, is the same as the LSSS.~~

~~The Allowable Value specified in Table 3.3.1-1 serves as the LSSS~~of the as-found setpoint that a channel can have during testing such that a channel is OPERABLE if the ~~trip setpoint~~ [LTSP] is found ~~not to exceed~~ conservative with respect to the Allowable Value during the CHANNEL FUNCTIONAL TEST (CFT~~). As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties,~~) or CHANNEL CALIBRATION.

BASES

BACKGROUND (continued)

As such, the Allowable Value differs from the [LTSP] by an amount [greater than or] equal to the expected instrument channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the ~~device~~channel 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~~channel has not drifted beyond that expected during the surveillance interval. ~~If the actual setting 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.~~ Note that, although the channel is ~~"~~"OPERABLE~~"~~" under these circumstances, the ~~trip setpoint should trip setpoint~~[LTSP] must be left adjusted to a value within the established trip setpoint 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~~.~~ (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

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

a. The departure from nucleate boiling ratio (DNBR) shall be maintained above the SL value,

b. Fuel centerline melt shall not occur, and

c. The RCS pressure SL of 2750 psia shall not be exceeded.

Maintaining the parameters within the above values ensures that the offsite dose will be within the 10 CFR 20 and 10 CFR 100 criteria during AOOs.

Accidents are events that are analyzed even though they are not expected to occur during the unit's life. The acceptable limit during accidents is that the offsite dose shall be maintained within 10 CFR 100 limits. Meeting the acceptable dose limit for an accident category is considered having acceptable consequences for that event. However, the acceptable dose limit for an accident category and their associated trip setpoints are not considered to be SL-LSSS as defined in 10 CFR 50.36.

RPS Overview

The RPS consists of four separate redundant protection channels that receive inputs of neutron flux, RCS pressure, RCS flow, RCS temperature, RCS pump status, reactor building (RB) pressure, main feedwater (MFW) pump status, and turbine status.

Figure [ ] , FSAR, Chapter [7] (Ref. 2), shows the arrangement of a typical RPS protection channel. A protection channel is composed of measurement channels, a manual trip channel, a reactor trip module (RTM), and CONTROL ROD drive (CRD) trip ~~devices.~~channels. LCO 3.3.1 provides requirements for the individual measurement channels. These channels encompass all equipment and electronics from the point at which the measured parameter is sensed through the bistable relay contacts in the trip string. LCO 3.3.2, "Reactor Protection System (RPS) Manual Reactor Trip," LCO 3.3.3, "Reactor Protection System (RPS) - Reactor Trip Module (RTM)," and LCO 3.3.4, "CONTROL ROD Drive (CRD) Trip ~~Devices~~Channels," discuss the remaining RPS elements.

The RPS instrumentation measures critical unit parameters and compares these to predetermined setpoints. If the setpoint is exceeded, a channel trip signal is generated. The generation of any two trip signals in any of the four RPS channels will result in the trip of the reactor.

The Reactor Trip System (RTS) contains multiple CRD trip ~~devices~~channels, two AC trip breakers, and two DC trip breaker pairs that provide a path for power to the CRD System. Additionally, the power for most of the CRDs passes through electronic trip assembly (ETA) relays. The system has two separate paths (or channels), with each path having either two breakers or a breaker and an ETA relay in series. Each path provides independent power to the CRDs. Either path can provide sufficient power to operate all CRDs. Two separate power paths to the CRDs ensure that a single failure that opens one path will not cause an unwanted reactor trip.

The RPS consists of four independent protection channels, each containing an RTM. The RTM receives signals from its own measurement channels that indicate a protection channel trip is required. The RTM transmits this signal to its own two-out-of-four trip logic and to the two-out-of-four logic of the RTMs in the other three RPS channels. Whenever any two RPS channels transmit channel trip signals, the RTM logic in each channel actuates to remove 120 VAC power from its associated CRD trip breaker.

The reactor is tripped by opening circuit breakers that interrupt the power supply to the CRDs. Six breakers are installed to increase reliability and

BASES

BACKGROUND (continued)

[Limiting Trip Setpoints]/Allowable Value

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

The trip setpoints used in the bistables are based on the analytical limits stated in FSAR, Chapter [14] (Ref. 3). The selection of these analytical limits ~~trip setpoints~~ is such that adequate protection is provided when all sensor and processing uncertainties and time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment errors for those RPS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 4), the Allowable Values specified in Table 3.3.1-1 in the accompanying LCO are conservatively adjusted with respect to the analytical limits. A detailed description of the methodology used to calculate the ~~trip setpoints,~~[LTSPs] including their explicit uncertainties, is provided in "[Unit Specific Setpoint Methodology]" (Ref. 5). The as-left tolerance and as-found tolerance band methodology is provided in Ref. xyz. The actual ~~nominal~~ trip setpoint entered into the bistable is more conservative than that specified by the Allowable Value to account for changes in random measurement errors detectable by a CHANNEL FUNCTIONAL TEST~~.~~ (CFT). The Allowable Value serves as the as-found trip setpoint Technical Specification OPERABILITY limit for the purpose of the CFT. ~~One example of such a change in measurement error is drift during the Surveillance Frequency. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.~~

The [LTSP] is the value at which the bistable is set and is the expected value to be achieved during calibration. The [LTSP] value is the LSSS and ensures the safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on stated channel uncertainties.

[Limiting Trip Setpoints], in conjunction with the use of as-found and as-left tolerances, consistent with the requirements of the ~~in accordance with the~~ Allowable Value ensure that the limits of Chapter 2.0, "Safety Limits," in the Technical Specifications are not violated during AOOs and that the consequences of DBAs will be acceptable, providing the unit is operated from within the LCOs at the onset of the AOO or DBA and the equipment functions as designed. Note that in LCO 3.3.1 the Allowable Values listed in Table 3.3.1-1 are the ~~LSSS~~least conservative value of the as-found setpoint that a channel can have during a periodic CHANNEL CALIBRATION or CHANNEL FUNCTIONAL TEST.

Each channel can be tested online to verify that the signal and setpoint accuracy are within the specified allowance requirements of Reference 5. Once a designated channel is taken out of service for testing, a simulated signal is injected in place of the field instrument signal. The process equipment for the channel in test is then tested, verified, and calibrated. Surveillances for the channels are specified in the SR section.

The Allowable Values listed in Table 3.3.1-1 are based on the methodology described in "[Unit Specific Setpoint Methodology]" (Ref. 5), which incorporates all of the known uncertainties applicable for each channel. The magnitudes of those uncertainties are factored into the determination of each ~~trip setpoint.~~[LTSP]. All field sensors and signal processing equipment for these channels are assumed to operate within the allowances of these uncertainty magnitudes.

BASES

APPLICABLE SAFETY

The RPS Functions to maintain the SLs during all AOOs and mitigates the consequences of DBAs. Trip Setpoints for Functions

~~BASES~~

~~APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)~~

~~Only the Allowable Values are specified for each RPS trip Function in the LCO. Nominal trip setpoints are specified in the unit specific setpoint calculations. The nominal setpoints are selected to ensure that the setpoint measured by CHANNEL FUNCTIONAL TESTS does not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable provided that operation and testing are consistent with the assumptions of the unit specific setpoint calculations. Each Allowable Value specified is more conservative than instrument uncertainties appropriate to the trip Function. These uncertainties are defined in the "[Unit Specific Setpoint Methodology]" (Ref. 5).~~

~~For most RPS Functions, the trip setpoint Allowable Value is to ensure that the departure from nucleate boiling (DNB) or RCS pressure SLs are not challenged. Cycle specific figures for use during operation are contained in the COLR.~~

ANALYSES, LCO,

which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

Each of the analyzed accidents and transients can be detected by one or more RPS Functions. The accident analysis contained in Reference 6 takes credit for most RPS trip Functions. Functions not specifically credited in the accident analysis were qualitatively credited in the safety analysis and the NRC staff approved licensing basis for the unit. However, qualitatively credited or backup Functions are not SL-LSSS These Functions are high RB pressure, high temperature, turbine trip, and loss of main feedwater. These Functions may provide protection for conditions that do not require dynamic transient analysis to demonstrate Function performance. These Functions also serve as backups to Functions that were credited in the safety analysis.

The LCO requires all instrumentation performing an RPS Function, listed in Table 3.3.1-1 in the accompanying LCO, to be OPERABLE. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions. The four channels of each Function in Table 3.3.1-1 of the RPS instrumentation shall be OPERABLE during its specified Applicability to ensure that a reactor trip will be actuated if needed. Additionally, during shutdown bypass with any CRD trip breaker closed, the applicable RPS Functions must also be available. This ensures the capability to trip the withdrawn CONTROL RODS exists at all times that rod motion is possible. The trip Function channels specified in Table 3.3.1-1 are considered OPERABLE when all channel components necessary to provide a reactor trip are capable of performing their specified safety function and in service for the required MODE or Other Specified Condition listed in Table 3.3.1-1.

Required Actions allow maintenance (protection channel) bypass of individual channels, but the bypass activates interlocks that prevent operation with a second channel bypass. Bypass effectively places the unit in a two-out-of-three logic configuration that can still initiate a reactor trip, even with a single failure within the system.

For most RPS Functions, the [LTSP] ensures that the departure from nucleate boiling (DNB) or the RCS Pressure SLs are not challenged. Cycle specific figures for use during operation are contained in the COLR.

Certain RPS trips function to indirectly protect the SLs by detecting specific conditions that do not immediately challenge SLs but will eventually lead to challenge if no action is taken. These trips function to minimize the unit transients caused by the specific conditions. The Allowable Value for these Functions is selected at the minimum deviation from normal values that will indicate the condition, without risking spurious trips due to normal fluctuations in the measured parameter. These [LTSPs] are considered to be LSSS, but not SL-LSSS.

The Allowable Values for bypass removal Functions are stated in the Applicable MODE or Other Specified Condition column of Table 3.3.1-1.

The safety analyses applicable to each RPS Function are discussed next.

----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

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1. Nuclear Overpower

a. Nuclear Overpower - High Setpoint

The Nuclear Overpower - High Setpoint trip provides protection for the design thermal overpower condition based on the measured out of core fast neutron leakage flux.

The Nuclear Overpower - High Setpoint trip initiates a reactor trip when the neutron power reaches a predefined setpoint at the design overpower limit. Because THERMAL POWER lags the neutron power, tripping when the neutron power reaches the design overpower will limit THERMAL POWER to a maximum value of the design overpower. Thus, the Nuclear Overpower - High Setpoint trip protects against violation of the DNBR and fuel centerline melt SLs. However, the RCS Variable Low Pressure, and Nuclear Overpower RCS Flow and Measured AXIAL POWER IMBALANCE, provide more direct protection. The role of the Nuclear Overpower - High Setpoint trip is to limit reactor THERMAL POWER below the highest power at which the other two trips are known to provide protection.

The Nuclear Overpower - High Setpoint trip also provides transient protection for rapid positive reactivity excursions during power operations. These events include the rod withdrawal accident, the rod ejection accident, and the steam line break accident. By providing a trip during these events, the Nuclear Overpower - High Setpoint trip protects the unit from excessive power levels and also serves to reduce reactor power to prevent violation of the RCS pressure SL.

Rod withdrawal accident analyses cover a large spectrum of reactivity insertion rates (rod worths), which exhibit slow and rapid rates of power increases. At high reactivity insertion rates, the Nuclear Overpower - High Setpoint trip provides the primary protection. At low reactivity insertion rates, the high pressure trip provides primary protection.

The specified Allowable Value is selected to ensure that a trip occurs before reactor power exceeds the highest point at which the RCS Variable Low Pressure and the Nuclear Overpower

BASES

ACTIONS (continued)

G.1

If the Required Action and associated Completion Time of Condition A or B are not met and Table 3.3.1-1 directs entry into Condition G, the unit must be brought to a MODE in which the specified RPS trip Function is not required to be OPERABLE. To achieve this status, THERMAL POWER must be reduced < [15]% RTP. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach [15]% RTP from full power conditions in an orderly manner without challenging plant systems.

SURVEILLANCE REQUIREMENTS

The SRs for each RPS Function are identified by the SRs column of Table 3.3.1-1 for that Function. Most Functions are subject to CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, CHANNEL CALIBRATION, and RPS RESPONSE TIME testing.

The SRs are modified by a Note. The [first] Note directs the reader to Table 3.3.1-1 to determine the correct SRs to perform for each RPS Function.

----------------------------------REVIEWER'S NOTE----------------------------------
The CHANNEL FUNCTIONAL TEST Frequencies are based on approved topical reports. For a licensee to use these times, the licensee must justify the Frequencies as required by the NRC Staff SER for the topical report.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.1-1 requiring reset of the channel to a predefined as-left tolerance and the verification of the as-found tolerance are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with allowable values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------
Notes c and d are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes c and d are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the

OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note d requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes c and d are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes c and d may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes c and d being applied to the Functions shown in TS 3.3.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

SR 3.3.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read power range channels are normalized to the calorimetric. Note 1 to the SR states if the absolute difference between the calorimetric and the

SURVEILLANCE REQUIREMENTS (continued)

Nuclear Instrumentation System (NIS) channel output is > [2]% RTP, the NIS is not declared inoperable but must be adjusted. If the NIS channel cannot be properly adjusted, the channel is declared inoperable. Note 2 clarifies that this Surveillance is required only if reactor power is ≥ 15% RTP and that 24 hours is allowed for performing the first Surveillance after reaching 15% RTP. At lower power levels, calorimetric data are inaccurate.

The power range channel's output shall be adjusted consistent with the calorimetric results if the absolute difference between the calorimetric and the power range channel's output is > [2]% RTP. The value of [2]% is adequate because this value is assumed in the safety analyses of FSAR, Chapter [14] (Ref. 3). These checks and, if necessary, the adjustment of the power range channels ensure that channel accuracy is maintained within the analyzed error margins. The 24 hour Frequency is adequate, based on unit operating experience, which demonstrates the change in the difference between the power range indication and the calorimetric results rarely exceeds a small fraction of [2]% in any 24 hour period. Furthermore, the control room operators monitor redundant indications and alarms to detect deviations in channel outputs.

<u>SR 3.3.1.3</u>

A comparison of power range nuclear instrumentation channels against incore detectors shall be performed at a 31 day Frequency when reactor power is > 15% RTP. The SR is modified by two Notes. Note 2 clarifies that 24 hours is allowed for performing the first Surveillance after reaching 15% RTP. Note 1 states if the absolute difference between the power range and incore measurements is ≥ [2]% RTP, the power range channel is not inoperable, but an adjustment of the measured imbalance to agree with the incore measurements is necessary. If the power range channel cannot be properly recalibrated, the channel is declared inoperable. The calculation of the Allowable Value envelope assumes a difference in out of core to incore measurements of 2.5%. Additional inaccuracies beyond those that are measured are also included in the ~~setpoint~~[LTSP] envelope calculation. The 31 day Frequency is adequate, considering that long term drift of the excore linear amplifiers is small and burnup of the detectors is slow. Also, the excore readings are a strong function of the power produced in the peripheral fuel bundles, and do not represent an integrated reading across the core. The slow changes in neutron flux during the fuel cycle can also be detected at this interval.

~~B~~ASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.4

A CHANNEL FUNCTIONAL TEST is performed on each required RPS channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Setpoints must be found ~~within~~conservative with respect to the Allowable Values specified in Table 3.3.1-1. Any setpoint adjustment shall be consistent with the assumptions of the current unit specific setpoint analysis.

The as-~~-~~found and as-~~-~~left values must also be recorded and reviewed for consistency with the assumptions of the surveillance interval extension analysis. The requirements for this review are outlined in BAW-10167 (Ref. 10).

The Frequency of [45] days on a STAGGERED TEST BASIS is consistent with the calculations of Reference 9 that indicate the RPS retains a high level of reliability for this test interval.

SR 3.3.1 4 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable

The second Note also requires that the [LTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.1.5

A Note to the Surveillance indicates that neutron detectors are excluded from CHANNEL CALIBRATION. 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.

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the unit specific setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the unit specific setpoint analysis.

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

The Frequency is justified by the assumption of an [18] month calibration interval in the determination of the magnitude of equipment drift in the ~~setpoint~~ [LTSP] analysis.

SR 3.3.1.5 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will

ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that the [LTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.1.6

This SR verifies individual channel actuation response times are less than or equal to the maximum values assumed in the accident analysis. 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 analytical limit at the sensor to the point of rod insertion. Response time testing acceptance criteria for this unit are included in Reference 2.

A Note to the Surveillance indicates that neutron detectors are excluded from RPS 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.

Response time tests are conducted on an [18] month STAGGERED TEST BASIS. Testing of the final actuation ~~devices~~channels, which make up the bulk of the response time, is included in the testing of each channel. Therefore, staggered testing results in response time verification of these ~~devices~~channels every [18] months. The [18] month Frequency is based on unit operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

B 3.3 INSTRUMENTATION

B 3.3.5 Engineered Safety Feature Actuation System (ESFAS) Instrumentation

BASES

BACKGROUND The ESFAS initiates necessary safety systems, based on the values of selected unit Parameters, to protect against violating core design limits and reactor coolant pressure boundary and to mitigate accidents. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as the LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS)

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE -----------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.5-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.5-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements

Manual or any document incorporated into the facility FSAR]" throughout these Bases.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of a SL-LSSS (Ref. 1).

BASES

BACKGROUND (continued)

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as-found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as-found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel to the [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel would have not been able to perform its function due to, for example, greater than expected drift. The Allowable Value specified in Table 3.3.5-1 is the least conservative value of the as-found setpoint that a channel can have during testing such that a channel is OPERABLE if the [LTSP] is found conservative with respect to the Allowable Value during the CHANNEL FUNCTIONAL TEST (CFT) or CHANNEL CALIBRATION.

BASES

BACKGROUND (continued)

As such, the Allowable Value differs from the [LTSP] by an amount [greater than or] equal to the expected instrument channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the channel will ensure that a SL is not exceeded at any given point of time as long as the channel has not drifted beyond that expected during the surveillance interval. Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the established trip setpoint calibration tolerance, in accordance with uncertainty assumptions (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

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

a. The departure from nucleate boiling ratio (DNBR) shall be maintained above the SL value,

b. Fuel centerline melt shall not occur, and

c. The RCS pressure SL of 2750 psia shall not be exceeded.

Maintaining the parameters within the above values ensures that the offsite dose will be within the 10 CFR 20 and 10 CFR 100 criteria during AOOs.

Accidents are events that are analyzed even though they are not expected to occur during the unit's life. The acceptable limit during accidents is that the offsite dose shall be maintained within 10 CFR 100 limits. Meeting the acceptable dose limit for an accident category is considered having acceptable consequences for that event. However, the acceptable dose limit for an accident category and their associated trip setpoints are not considered to be SL-LSSS as defined in 10 CFR 50.36.

ESFAS actuates the following systems:

- High pressure injection (HPI) Actuation,
- Low pressure injection (LPI) Actuation,
- Reactor building (RB) Cooling,
- RB Spray,
- RB Isolation, and
- Emergency diesel generator (EDG) Start.

ESFAS also provides a signal to the Emergency Feedwater Isolation and Control (EFIC) System. This signal initiates emergency feedwater (EFW) when HPI is initiated.

The ESFAS operates in a distributed manner to initiate the appropriate systems. The ESFAS does this by determining the need for actuation in each of three channels monitoring each actuation Parameter. Once the need for actuation is determined, the condition is transmitted to automatic actuation logics, which perform the two-out-of-three logic to determine the actuation of each end device. Each end device has its own automatic actuation logic, although all automatic actuation logics take their signals from the same point in each channel for each Parameter.

Four Parameters are used for actuation:

- Low Reactor Coolant System (RCS) Pressure,
- Low Low RCS Pressure,

BACKGROUND (continued)

[Limiting Trip Setpoints] and Allowable Values

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

The trip setpoints used in the bistables are based on the analytical limits stated in Figure [ ]~~-~~, FSAR, Chapter [7] (Ref. 1). The selection of these ~~trip setpoints~~analytical limits is such that adequate protection is provided when all sensor and processing uncertainties and time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment induced errors for those ESFAS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 2), the Allowable Values specified in Table 3.3.5-1 in the accompanying LCO are conservatively adjusted with respect to the analytical limits. A detailed description of the methodology used to calculate the ~~trip setpoints~~[LTSPs], including their explicit uncertainties, is provided in the "Unit Specific Setpoint Methodology" (Ref. 3). The as-left tolerance and as-found tolerance band methodology is provided in Ref. xyz. The actual ~~nominal~~ trip setpoint entered into the bistable is more conservative than that specified by the Allowable Value to account for changes in random measurement errors detectable by a CHANNEL FUNCTIONAL TEST. ~~One example of such a change in measurement error is drift during the surveillance interval. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.~~

The [LTSP] is the value at which the bistable is set and is the expected value to be achieved during calibration. The [LTSP] value is the LSSS and ensures the safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on stated channel uncertainties.

[Limiting Trip Setpoints], in conjunction with the use of as-found and as-left tolerances, consistent with the requirements of the ~~in accordance with the~~ Allowable Values, ensure that the consequences of DBAs will be acceptable, providing the unit is operated from within the LCOs at the onset of the DBA and the equipment functions as designed. Note that in LCO 3.3.5 the Allowable Values listed in Table 3.3.5-1 are the least conservative value of the as-found setpoint that a channel can have during a periodic CHANNEL CALIBRATION or CHANNEL FUNCTIONAL TEST.

Each channel can be tested online to verify that the signal and setpoint accuracy is within the specified allowance requirements of Reference 3. Once a designated channel is taken out of service for testing, a simulated signal is injected in place of the field instrument signal. The process equipment for the channel in test is then tested, verified, and calibrated.

BACKGROUND (continued)

The Allowable Values listed in Table 3.3.5-1 are based on the methodology described in FSAR, Chapter [14] (Ref. 4), which incorporates all of the known uncertainties applicable for each channel. The magnitudes of these uncertainties are factored into the determination of each ~~trip setpoint.~~[LTSP]. All field sensors and signal processing equipment for these channels are assumed to operate within the allowances of these uncertainty magnitudes.

[LTSPs] for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS

----------------------------------REVIEWER'S NOTE----------------------------------
The ESFAS LCOs in the BWOG Standard Technical Specifications are based on a system representative of the Crystal River Unit 3 design.

As discussed earlier, this arrangement involves measurement channels shared among all actuation functions, with separate actuation logic channels for each actuated component. In this arrangement, multiple components are affected by each instrumentation channel failure, but a single automatic actuation logic failure affects only one component. The organization of BWOG STS ESFAS LCOs reflects the described logic arrangement by identifying instrumentation requirements on an instrumentation channel rather than on a protective function basis. This greatly simplifies delineation of ESFAS LCOs. Furthermore, the LCO requirements on instrumentation channels, automatic actuation logics, and manual initiation are specified separately to reflect the different impact each has on ESFAS OPERABILITY.

APPLICABLE SAFETY ANALYSES

The following ESFAS Functions have been assumed within the accident analyses.

----------------------------------REVIEWER'S NOTE----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

High Pressure Injection

The ESFAS actuation of HPI has been assumed for core cooling in the LOCA analysis and is credited with boron addition in the SLB analysis.

Low Pressure Injection

The ESFAS actuation of LPI has been assumed for large break LOCAs.

APPLICABLE SAFETY ANALYSES (continued)

Reactor Building Spray, Reactor Building Cooling, and Reactor Building Isolation

The ESFAS actuation of the RB coolers and RB Spray have been credited in RB analysis for LOCAs, both for RB performance and equipment environmental qualification pressure and temperature envelope definition. Accident dose calculations have credited RB Isolation and RB Spray.

Emergency Diesel Generator Start

The ESFAS initiated EDG Start has been assumed in the LOCA analysis to ensure that emergency power is available throughout the limiting LOCA scenarios.

The small and large break LOCA analyses assume a conservative 35 second delay time for the actuation of HPI and LPI in FSAR, Chapter [14] (Ref. 4). This delay time includes allowances for EDG starting, EDG loading, Emergency Core Cooling Systems (ECCS) pump starts, and valve openings. Similarly, the RB Cooling, RB Isolation, and RB Spray have been analyzed with delays appropriate for the entire system analyzed. Typical values used in the analysis are 35 seconds for RB Cooling, 60 seconds for RB Isolation, and 56 seconds for RB Spray.

Accident analyses rely on automatic ESFAS actuation for protection of the core temperature and containment pressure limits and for limiting off site dose levels following an accident. These include LOCA, SLB, and feedwater line break events that result in RCS inventory reduction or severe loss of RCS cooling.

The ESFAS channels satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requires three channels of ESFAS instrumentation for each Parameter in Table 3.3.5-1 to be OPERABLE in each ESFAS train.

Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

LCO (continued)

Only the Allowable Value is specified for each ESFAS Function in the LCO. ~~Nominal trip setpoints~~[LTSP]s are specified in the unit specific setpoint calculations. The ~~nominal trip setpoints~~[LTSPs] are selected to ensure the setpoints measured by CHANNEL FUNCTIONAL TESTS do not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the ~~nominal trip setpoint~~[LTSP], but within its Allowable Value, is acceptable provided that operation and testing are consistent with the assumptions of the unit specific setpoint calculations. Each Allowable Value specified is more conservative than the analytical limit assumed in the safety analysis to account for instrument uncertainties appropriate to the trip Parameter. These uncertainties are defined in the "Unit Specific Setpoint Methodology" (Ref. 3).

The Allowable Values for bypass removal functions are stated in the Applicable MODES or Other Specified Condition column of Table 3.3.5-1.

Three ESFAS instrumentation channels shall be OPERABLE in each ESFAS train to ensure that a single failure in one channel will not result in loss of the ability to automatically actuate the required safety systems.

The bases for the LCO on ESFAS Parameters include the following.

Reactor Coolant System Pressure

Three channels each of RCS Pressure - Low and RCS Pressure - Low Low are required OPERABLE in each train. Each channel includes a sensor, trip bistable, bypass bistable, bypass relays, output relays, and block timers. The analog portion of each pressure channel is common to both trains of both RCS Pressure Parameters. Therefore, failure of one analog channel renders one channel of the low pressure and low low pressure Functions in each train inoperable. The bistable portions of the channels are Function and train specific. Therefore, a bistable failure renders only one Function in one train inoperable. Failure of a bypass bistable or bypass circuitry, such that a trip channel cannot be bypassed, does not render the channel inoperable. Output relays and block timer relays are train specific but may be shared among Parameters. Therefore, output or block timer relay failure renders all affected Functions in one train inoperable.

LCO (continued)

1. Reactor Coolant System Pressure - Low Setpoint

   The RCS Pressure - Low Setpoint is based on HPI actuation for small break LOCAs. The setpoint ensures that the HPI will be actuated at a pressure greater than or equal to the value assumed in accident analyses plus the instrument uncertainties. The maximum value assumed for the setpoint of the RCS Pressure - Low trip of HPI in safety analyses is 1480 psig. The setpoint for the low RCS and Allowable Value of ≥ [1600] psig for the low pressure Parameter is selected to ensure actuation occurs when actual RCS pressure is above 1480 psig. The RCS Pressure instrumentation must function while subject to the severe environment created by a LOCA. Therefore, the ~~trip setpoint~~[LTSP] and Allowable Value accounts for severe environment induced errors.

To ensure the RCS Pressure - Low trip is not bypassed when required to be OPERABLE by the safety analysis, each channel's bypass removal bistable must be set with an Allowable Value of ≤ [1800] psig. The bypass removal does not need to function for accidents initiated from RCS Pressures below the bypass removal setpoint. Therefore, the bypass removal setpoint Allowable Value need not account for severe environment induced errors.

2. Reactor Coolant System Pressure - Low Low Setpoint

The RCS Pressure - Low Low Setpoint LPI actuation occurs in sufficient time to ensure LPI flow prior to the emptying of the core flood tanks during a large break LOCA. The Allowable Value of ≥ [400] psig ensures sufficient overlap of the core flood tank flow and the LPI flow to keep the reactor vessel downcomer full during a large break LOCA. The RCS Pressure instrumentation must function while subject to the severe environment created by a LOCA. Therefore, the ~~trip setpoint~~[LTSP] and Allowable Value accounts for severe environment induced errors.

To ensure the RCS Pressure - Low Low trip is not bypassed when assumed OPERABLE by the safety analysis, each channel's bypass removal bistable must be set with an Allowable Value of ≤ [900] psig. The bypass removal does not need to function for accidents initiated by RCS Pressure below the bypass removal setpoint. Therefore, the bypass removal setpoint Allowable Value need not account for severe environment induced errors.

Reactor Building Pressure

Three channels each of RCS Pressure - Low and RB Pressure - High are required to be OPERABLE in each train. Each channel includes a pressure switch, bypass relays, and output relays. The high pressure channels also include block timers. Each pressure switch is Function and train specific, so there are 12 pressure switches total. Therefore, a pressure switch renders only one Function in one train inoperable. Output relays and block timer relays are train specific but may be shared among Parameters. Therefore, output or block timer relay failure renders all affected Functions in one train inoperable.

The RB Pressure switches may be subjected to high radiation conditions during the accidents that they are intended to mitigate. The sensor portion of the switches is also exposed to the steam environment present in the RB following a LOCA or high energy line break. Therefore, the ~~trip setpoint~~[LTSP] and Allowable Value accounts for measurement errors induced by these environments.

1. Reactor Building Pressure - High Setpoint

   The RB Pressure - High Setpoint Allowable Value ≤ [5] psig was selected to be low enough to detect a rise in RB Pressure that would occur due to a small break LOCA, thus ensuring that the RB high pressure actuation of the safety systems will occur for a wide spectrum of break sizes. The trip setpoint also causes the RB coolers to shift to emergency mode to prevent damage to the cooler fans due to the increase in the density of the air steam mixture present in the containment following a LOCA.

2. Reactor Building Pressure - High High Setpoint

   The RB Pressure - High High Setpoint Allowable Value ≤ [30] psig was chosen to be high enough to avoid actuation during ~~an~~ a SLB, but also low enough to ensure a timely actuation during a large break LOCA.

ACTIONS (continued)

A.1

Condition A applies when one channel becomes inoperable in one or more Parameters. If one ESFAS channel is inoperable, placing it in a tripped condition leaves the system in a one-out-of-two condition for actuation. Thus, if another channel were to fail, the ESFAS instrumentation could still perform its actuation functions. This action is completed when all of the affected output relays and block timers are tripped. This can normally be accomplished by tripping the affected bistables or tripping the individual output relays and block timers. [At this unit, the specific output relays associated with each ESFAS instrumentation channel are listed in the following document:]

The 1 hour Completion Time is sufficient time to perform the Required Action.

B.1, B.2.1, B.2.2, and B.2.3

Condition B applies when Required Action A.1 is not met within the required Completion Time or when one or more parameters have more than one inoperable channel. If Condition B applies, 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, for the RCS Pressure - Low Setpoint, to < [1800] psig, for the RCS Pressure - Low Low Setpoint, to < [900] psig, and for the RB Pressure High Setpoint and High High Setpoint, 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 unit systems.

SURVEILLANCE REQUIREMENTS

All ESFAS Parameters listed in Table 3.3.5-1 are subject to CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, CHANNEL CALIBRATION, and response time testing. The operational bypasses associated with each ESFAS instrumentation channel are also subject to these SRs to ensure OPERABILITY of the ESFAS instrumentation channel.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.5-1 requiring reset of the channel to a predefined as-left tolerance and the verification of the as-found tolerance are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with allowable values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------
Notes a and b are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1 Notes a and b are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note b requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes a and b are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes a and b and d may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.5. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by

the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.1

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

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

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

SR 3.3.5.2

A Note defines a channel as being OPERABLE for up to 8 hours while bypassed for Surveillance testing provided the remaining two ESFAS channels are OPERABLE or tripped. The Note allows channel bypass for testing without defining it as inoperable, although during this time period it cannot initiate ESFAS. This allowance is based on the inability to perform the Surveillance in the time permitted by the Required Actions. Eight hours is the average time required to perform the Surveillance. It is not acceptable to routinely remove channels from service for more than 8 hours to perform required Surveillance testing.

SURVEILLANCE REQUIREMENTS (continued)

A CHANNEL FUNCTIONAL TEST is performed on each required ESFAS channel to ensure the entire channel will perform the intended functions. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current unit specific setpoint analysis.

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

SR 3.3.5 2 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable

The second Note also requires that the [LTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.3

CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the unit specific setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the unit specific setpoint analysis.

This Frequency is justified by the assumption of an [18] month calibration interval to determine the magnitude of equipment drift in the setpoint analysis.

SR 3.3.5.3 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable

The second Note also requires that the [LTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.4

SR 3.3.5.4 ensures that the ESFAS actuation channel response times are less than or equal to the maximum times assumed in the accident analysis. The response time values are the maximum values assumed in the safety analyses. Individual component response times are not modeled in the analyses. Response time testing acceptance criteria for this unit are included in Reference 1. The analyses model the overall or total elapsed time from the point at which the parameter exceeds the

BASES

SURVEILLANCE REQUIREMENTS (continued)

actuation setpoint value at the sensor to the point at which the end device is actuated. Thus, this SR encompasses the automatic actuation logic components covered by LCO 3.3.7 and the operation of the mechanical ESF components.

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

REFERENCES

1. FSAR, Chapter [7].
2. 10 CFR 50.49.
3. [Unit Specific Setpoint Methodology.]
4. FSAR, Chapter [14].

Table 3.3.1-1 (page 1 of 7)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~i~~j) TRIP SETPOINT]
1. Manual Reactor Trip	1,2	2	B	SR 3.3.1.14	NA	NA
	3(a), 4(a), 5(a)	2	C	SR 3.3.1.14	NA	NA
2. Power Range Neutron Flux						
a. High	1,2	4	D	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.7[(b)(c)] SR 3.3.1.11[(b)(c)] SR 3.3.1.16	≤ [111.2]% RTP	[109]% RTP
b. Low	1(~~b~~d),2	4	E	SR 3.3.1.1 SR 3.3.1.8[(b)(c)] SR 3.3.1.11[(b)(c)] SR 3.3.1.16	≤ [27.2]% RTP	[25]% RTP
3. Power Range Neutron Flux Rate						
a. High Positive Rate	1,2	4	E	SR 3.3.1.7[(b)(c)] SR 3.3.1.11[(b)(c)]	≤ [6.8]% RTP with time constant ≥ [2] sec	[5]% RTP with time constant ≥ [2] sec
b. High Negative Rate	1,2	4	E	SR 3.3.1.7[(b)(c)] SR 3.3.1.11[(b)(c)] SR 3.3.1.16	≤ [6.8]% RTP with time constant ≥ [2] sec	[5]% RTP with time constant ≥ [2] sec
4. Intermediate Range Neutron Flux	1(~~b~~d), 2(~~c~~e)	2	F,G	SR 3.3.1.1 SR 3.3.1.8[(b)(c)] SR 3.3.1.11[(b)(c)]	≤ [31]% RTP	[25]% RTP

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

(b) [INSERT 1]

(c) [INSERT ~~3~~2]

(~~b~~d) Below the P-10 (Power Range Neutron Flux) interlocks.

(~~c~~e) Above the P-6 (Intermediate Range Neutron Flux) interlocks.

------------------------------REVIEWER'S NOTE------------------------------

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.1-1 (page 2 of 7)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~j~~l) TRIP SETPOINT]
5. Source Range Neutron Flux	2(~~d~~f)	2	H,I	SR 3.3.1.1 SR 3.3.1.8[(b)(c)] SR 3.3.1.11[(b)(c)] SR 3.3.1.16	≤ [1.4 E5] cps	[1.0 E5] cps
	3(a), 4(a), 5(a)	2	I,J	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.11[(b)(c)] SR 3.3.1.16	≤ [1.4 E5] cps	[1.0 E5] cps
6. Overtemperature ΔT	1,2	[4]	E	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7[(b)(c)] SR 3.3.1.12[(b)(c)] SR 3.3.1.16	Refer to Note 1 (Page 3.3.1-19)	Refer to Note 1 (Page 3.3.1-19)
7. Overpower ΔT	1,2	[4]	E	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.12[(b)(c)] SR 3.3.1.16	Refer to Note 2 (Page 3.3.1-20)	Refer to Note 2 (Page 3.3.1-20)
8. Pressurizer Pressure						
a. Low	1(~~f~~h)	[4]	K	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.10[(b)(c)] SR 3.3.1.16	≥ [1886] psig	[1900] psig
b. High	1,2	[4]	E	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.10[(b)(c)] SR 3.3.1.16	≤ [2396] psig	[2385] psig
9. Pressurizer Water Level - High	1(~~e~~g)	3	K	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.10[(b)(c)]	≤ [93.8]%	[92]%

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~j~~l) TRIP SETPOINT]
10. Reactor Coolant Flow - Low	1(~~f~~h)	3 per loop	K	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.10[(b)(c)] SR 3.3.1.16	≥ [89.2]%	[90]%

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

(b) [INSERT 1]

(c) [INSERT 2]

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

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

(~~f~~h) Above the P-8 (Power Range Neutron Flux) interlock.

--REVIEWER'S NOTE--

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.1-1 (page 3 of 7)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(il) TRIP SETPOINT]
11. Reactor Coolant Pump (RCP) BreakerPosition						
a. Single Loop	1(fh)	1 per RCP	L	SR 3.3.1.14	NA	NA
b. Two Loops	1(gi)	1 per RCP	M	SR 3.3.1.14	NA	NA
12. Undervoltage RCPs	1(eg)	[3] per bus	K	SR 3.3.1.9 SR 3.3.1.10[(b)(c)] SR 3.3.1.16	≥ [4760] V	[4830] V
13. Underfrequency RCPs	1(eg)	[3] per bus	K	SR 3.3.1.9 SR 3.3.1.10[(b)(c)] SR 3.3.1.16	≥ [57.1] Hz	[57.5] Hz
14. Steam Generator (SG) Water Level - Low Low	1,2	[4 per SG]	E	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.10[(b)(c)] SR 3.3.1.16	≥ [30.4]%	[32.3]%
15. SG Water Level - Low	1,2	2 per SG	E	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.10[(b)(c)] SR 3.3.1.16	≥ [30.4]%	[32.3]%
Coincident with Steam Flow/Feedwater Flow Mismatch	1,2	2 per SG	E	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.10[(b)(c)] SR 3.3.1.16	≤ [42.5]% full steam flow at RTP	[40]% full steam flow at RTP
16. Turbine Trip						
a. Low Fluid Oil Pressure	1(hj)	3	N	SR 3.3.1.10[(b)(c)] SR 3.3.1.15[(b)(c)]	≥ [750] psig	[800] psig
b. Turbine Stop Valve Closure	1(hj)	4	N	SR 3.3.1.10[(b)(c)] SR 3.3.1.15[(b)(c)]	≥ [1]% open	[1]% open

(b) [INSERT 1]

(c) [INSERT 2]

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

(~~f~~h) Above the P-8 (Power Range Neutron Flux) interlock.

(~~g~~i) Above the P-7 (Low Power Reactor Trips Block) interlock and below the P-8 (Power Range Neutron Flux) Interlock

(~~h~~j) Above the P-9 (Power Range Neutron Flux) interlock.

--REVIEWER'S NOTE--

(~~i~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.1-1 (page 4 of 7)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~j~~l) TRIP SETPOINT]
17. Safety Injection (SI) Input from Engineered Safety Feature Actuation System (ESFAS)	1,2	2 trains	O	SR 3.3.1.14	NA	NA
18. Reactor Trip System Interlocks						
a. Intermediate Range Neutron Flux, P-6	2(~~d~~f)	2	Q	SR 3.3.1.11 SR 3.3.1.13	≥ [6E-11] amp	[1E-10] amp
b. Low Power Reactor Trips Block, P-7	1	1 per train	R	SR 3.3.1.5	NA	NA
c. Power Range Neutron Flux, P-8	1	4	R	SR 3.3.1.11 SR 3.3.1.13	≤ [50.2]% RTP	[48]% RTP
d. Power Range Neutron Flux, P-9	1	4	R	SR 3.3.1.11 SR 3.3.1.13	≤ [52.2]% RTP	[50]% RTP
e. Power Range Neutron Flux, P-10	1,2	4	Q	SR 3.3.1.11 SR 3.3.1.13	≥ [7.8]% RTP and ≤ [12.2]% RTP	[10]% RTP
f. Turbine Impulse Pressure, P-13	1	2	R	[SR 3.3.1.1] SR 3.3.1.10 SR 3.3.1.13	≤ [12.2]% turbine power	10]% turbine power
19. Reactor Trip Breakers(~~i~~k) (RTBs)	1,2	2 trains	P	SR 3.3.1.4	NA	NA
	3(~~b~~d), 4(~~b~~d), 5(~~b~~d)	2 trains	C	SR 3.3.1.4	NA	NA

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

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

(~~i~~k) Including any reactor trip bypass breakers that are racked in and closed for bypassing an RTB.

---REVIEWER'S NOTE---

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.1-1 (page 5 of 7)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~i~~l) TRIP SETPOINT]
20. Reactor Trip Breaker Undervoltage and Shunt Trip Mechanisms	1,2	1 each per RTB	S	SR 3.3.1.4	NA	NA
	3(~~b~~d), 4(~~b~~d), 5(~~b~~d)	1 each per RTB	C	SR 3.3.1.4	NA	NA
21. Automatic Trip Logic	1,2	2 trains	O	SR 3.3.1.5	NA	NA
	3(~~b~~d), 4(~~b~~d), 5(~~b~~d)	2 trains	C	SR 3.3.1.5	NA	NA

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

--REVIEWER'S NOTE--

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

(~~i~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.2-1 (page 1 of 8)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~j~~l) TRIP SETPOINT]
1. Safety Injection						
a. Manual Initiation	1,2,3,4	2	B	SR 3.3.2.8	NA	NA
b. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
c. Containment Pressure - High 1	1,2,3	3	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [3.86] psig	[3.6] psig
d. Pressurizer Pressure - Low	1,2,3(a)	[3]	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [1839] psig	[1850] psig
e. Steam Line Pressure						
(1) Low	1,2,3[(a)]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [635](~~b~~d) psig	[675](~~b~~d) psig
(2) High Differential Pressure Between Steam Lines	1,2,3	3 per steam line	D	[SR 3.3.2.1] SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [106] psig	[97] psig

(~~a~~a~~c~~) Above the P-11 (Pressurizer Pressure) interlock.

(b) [INSERT 1]

(c) [INSERT 2]

(~~b~~d) Time constants used in the lead/lag controller are t_1 ≥ [50] seconds and t_2 ≤ [5] seconds.

---REVIEWER'S NOTE---

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.2-1 (page 2 of 8)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL[(~~j~~l)] TRIP SETPOINT]
1. Safety Injection						
f. High Steam Flow in Two Steam Lines	1,2,3 [(~~c~~e)]	2 per steam line	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	(~~d~~f)	(~~e~~g)
Coincident with T_{avg} - Low Low	1,2,3 [(~~c~~e)]	1 per loop	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [550.6]°F	[553]°F
g. High Steam Flow in Two Steam Lines	1,2,3 [(~~c~~e)]	2 per steam line	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	(~~d~~f)	(~~e~~g)
Coincident with Steam Line Pressure - Low	1,2,3 [(~~c~~e)]	1 per steam line	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [635][(~~b~~d)] psig	[675] psig
2. Containment Spray						
a. Manual Initiation	1,2,3,4	2 per train, 2 trains	B	SR 3.3.2.8	NA	NA
b. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
c. Containment Pressure High - 3 (High High)	1,2,3	4	E	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [12.31] psig	[12.05] psig

(b) [INSERT 1]

(c) [INSERT 2]

(d) Time constants used in the lead/lag controller are $t_1 \geq [50]$ seconds and $t_2 \leq [5]$ seconds.

(~~c~~e) Above the P-12 (T_{avg} - Low Low) interlock.

(~~d~~f) Less than or equal to a function defined as ΔP corresponding to [44]% full steam flow below [20]% load, and ΔP increasing linearly from [44]% full steam flow at [20]% load to [114]% full steam flow at [100]% load, and ΔP corresponding to [114]% full steam flow above 100% load.

(~~e~~g) Less than or equal to a function defined as ΔP corresponding to [40]% full steam flow between [0]% and [20]% load and then a ΔP increasing linearly from [40]% steam flow at [20]% load to [110]% full steam flow at [100]% load.

-----REVIEWER'S NOTE-----

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.2-1 (page 3 of 8)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL[ij] TRIP SETPOINT]
2. Containment Spray						
d. Containment Pressure High - 3 (Two Loop Plants)	1,2,3	[3] sets of [2]	E	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [12.31] psig	[12.05] psig
3. Containment Isolation						
a. Phase A Isolation						
(1) Manual Initiation	1,2,3,4	2	B	SR 3.3.2.8	NA	NA
(2) Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
(3) Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
b. Phase B Isolation						
(1) Manual Initiation	1,2,3,4	2 per train, 2 trains	B	SR 3.3.2.8	NA	NA
(2) Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
(3) Containment Pressure High - 3 (High High)	1,2,3	[4]	E	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [12.31] psig	[12.05] psig

(b) [INSERT 1]

(c) [INSERT 2]

--REVIEWER'S NOTE--

(ij) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.2-1 (page 4 of 8)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~i~~l) TRIP SETPOINT]
4. Steam Line Isolation						
a. Manual Initiation	1,2 (~~h~~j),3 (~~h~~j)	2	F	SR 3.3.2.8	NA	NA
b. Automatic Actuation Logic and Actuation Relays	1,2 (~~h~~j),3 (~~h~~j)	2 trains	G	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
c. Containment Pressure - High 2	1, 2 (~~h~~j), 3 (~~h~~j)	[4]	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [6.61] psig	[6.35] psig
d. Steam Line Pressure						
(1) Low	1, 2 (~~h~~j), 3 (~~ac~~k) (~~h~~j)	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [635](~~b~~d) psig	[675](~~b~~d) psig
(2) Negative Rate - High	3 (~~f~~h) (~~h~~j)	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [121.6](~~g~~i) psi	[110](~~g~~i) psi

(b) [INSERT 1]

(c) [INSERT 2]

~~(ac) Above the P-11 (Pressurizer Pressure) interlock.~~

(~~b~~d) Time constants used in the lead/lag controller are $t_1 \geq$ [50] seconds and $t_2 \leq$ [5] seconds.

(~~f~~h) Below the P-11 (Pressurizer Pressure) interlock.

(~~g~~i) Time constant utilized in the rate/lag controller is ≥ [50] seconds.

(~~h~~j) Except when all MSIVs are closed and [de-activated].

(k) Above the P-11 (Pressurizer Pressure) interlock.

--REVIEWER'S NOTE--

(~~i~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.2-1 (page 5 of 8)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~i~~) TRIP SETPOINT]
4. Steam Line Isolation						
e. High Steam Flow in Two Steam Lines	1, 2 (~~h~~j), 3 (~~h~~j)	2 per steam line	D	SR 3.3.2.1 SR 3.3.2.5 [(b)(c)] SR 3.3.2.9 [(b)(c)] SR 3.3.2.10	(~~d~~f)	(~~e~~g)
Coincident with T_{avg} - Low Low	1, 2 (~~h~~j), 3 (~~c~~e) (~~h~~j)	1 per loop	D	SR 3.3.2.1 SR 3.3.2.5 [(b)(c)] SR 3.3.2.9 [(b)(c)] SR 3.3.2.10	≥ [550.6]°F	[553]°F
f. High Steam Flow in Two Steam Lines	1, 2 (~~h~~j), 3 (~~h~~j)	2 per steam line	D	SR 3.3.2.1 SR 3.3.2.5 [(b)(c)] SR 3.3.2.9 [(b)(c)] SR 3.3.2.10	(~~d~~f)	(~~e~~g)
Coincident with Steam Line Pressure - Low	1,2,(~~h~~j) 3 (~~h~~j)	1 per steam line	D	SR 3.3.2.1 SR 3.3.2.5 [(b)(c)] SR 3.3.2.9 [(b)(c)] SR 3.3.2.10	≥ [635](~~b~~d) psig	[675](~~b~~d) psig
g. High Steam Flow	1,2 (~~h~~j), 3 (~~h~~j)	2 per steam line	D	SR 3.3.2.1 SR 3.3.2.5 [(b)(c)] SR 3.3.2.9 [(b)(c)] SR 3.3.2.10	≤ [25]% of full steam flow at no load steam pressure	[ ] full steam flow at no load steam pressure
Coincident with Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
and						
Coincident with T_{avg} - Low Low	1,2 (~~h~~j), 3 (~~c~~e) (~~h~~j)	[2] per loop	D	SR 3.3.2.1 SR 3.3.2.5 [(b)(c)] SR 3.3.2.9 [(b)(c)] SR 3.3.2.10	≥ [550.6]°F	[553]°F

(b) [INSERT 1]

(c) [INSERT 2]

(~~b~~d) Time constants used in the lead/lag controller are $t_1 \geq$ [50] seconds and $t_2 \leq$ [5] seconds.

(~~c~~e) Above the P-12 (T_{avg} - Low Low) interlock.

(~~d~~f) Less than or equal to a function defined as ΔP corresponding to [44]% full steam flow below [20]% load, ΔP increasing linearly from [44]% full steam flow at [20]% load to [114]% full steam flow at [100]% load, and ΔP corresponding to [114]% full steam flow above 100% load.

(~~e~~g) Less than or equal to a function defined as ΔP corresponding to [40]% full steam flow between [0]% and [20]% load and then a ΔP increasing linearly from [40]% steam flow at [20]% load to [110]% full steam flow at [100]% load.

(~~h~~j) Except when all MSIVs are closed and [de-activated].

--REVIEWER'S NOTE--

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.2-1 (page 6 of 8)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~j~~l) TRIP SETPOINT]
4. Steam Line Isolation						
h. High High Steam Flow	1,2 (~~h~~j),3 (~~h~~j)	2 per steam line	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [130]% of full steam flow at full load steam pressure	[ ] of full steam flow at full load steam pressure
Coincident with Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
5. Turbine Trip and Feedwater Isolation						
a. Automatic Actuation Logic and Actuation Relays	1, 2 (~~i~~k), [3](~~i~~k)	2 trains	H[G]	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
b. SG Water Level - High High (P-14)	1,2 (~~i~~k),[3](~~i~~k)	[3] per SG	I[D]	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≤ [84.2]%	[82.4]%
c. Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
6. Auxiliary Feedwater						
a. Automatic Actuation Logic and Actuation Relays (Solid State Protection System)	1,2,3	2 trains	G	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
b. Automatic Actuation Logic and Actuation Relays (Balance of Plant ESFAS)	1,2,3	2 trains	G	SR 3.3.2.3	NA	NA

(b) [INSERT 1]

(c) [INSERT 2]

(~~h~~j) Except when all MSIVs are closed and [de-activated].

(~~i~~k) Except when all MFIVs, MFRVs, [and associated bypass valves] are closed and [de-activated] [or isolated by a closed manual valve].

--REVIEWER'S NOTE--

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.2-1 (page 7 of 8)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL[(i)] TRIP SETPOINT]
6. Auxiliary Feedwater						
c. SG Water Level - Low Low	1,2,3	[3] per SG	D	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [30.4]%	[32.2]%
d. Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
e. Loss of Offsite Power	1,2,3	[3] per bus	F	SR 3.3.2.7 SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [2912] V with ≤ 0.8 sec time delay	[2975] V with ≤ 0.8 sec time delay
f. Undervoltage Reactor Coolant Pump	1,2	[3] per bus	I	SR 3.3.2.7 SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [69]% bus voltage	[70]% bus voltage
g. Trip of all Main Feedwater Pumps	1,2	[2] per pump	J	SR 3.3.2.8 SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [ ] psig	[ ] psig
h. Auxiliary Feedwater Pump Suction Transfer on Suction Pressure - Low	1,2,3	[2]	F	SR 3.3.2.1 SR 3.3.2.7[(b)(c)] SR 3.3.2.9[(b)(c)]	≥ [20.53] [psia]	[ ] [psia]
7. Automatic Switchover to Containment Sump						
a. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
b. Refueling Water Storage Tank (RWST) Level - Low Low	1,2,3,4	4	K	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [15]% and ≤ [ ]%	[ ]% and [ ]%
Coincident with Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					

(b) [INSERT 1]

(c) [INSERT 2]

--REVIEWER'S NOTE--

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

Table 3.3.2-1 (page 8 of 8)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	[NOMINAL(~~j~~l) TRIP SETPOINT]
7. Automatic Switchover to Containment Sump						
c. RWST Level - Low Low	1,2,3,4	4	K	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [15]%	[18]%
Coincident with Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
and						
Coincident with Containment Sump Level - High	1,2,3,4	4	K	SR 3.3.2.1 SR 3.3.2.5[(b)(c)] SR 3.3.2.9[(b)(c)] SR 3.3.2.10	≥ [30] in. above el. [703] ft	[ ] in. above el. [ ]ft
8. ESFAS Interlocks						
a. Reactor Trip, P-4	1,2,3	1 per train, 2 trains	F	SR 3.3.2.11	NA	NA
b. Pressurizer Pressure, P-11	1,2,3	3	L	SR 3.3.2.1 SR 3.3.2.5 SR 3.3.2.9	≤ [1996] psig	[ ] psig
c. T_{avg} - Low Low, P-12	1,2,3	[1] per loop	L	SR 3.3.2.1 SR 3.3.2.5 SR 3.3.2.9	≥ [550.6]°F	[553]° F

(b) [INSERT 1]

(c) [INSERT 2]

--REVIEWER'S NOTE--

(~~j~~l) Unit specific implementations may contain only Allowable Value depending on Setpoint Study methodology used by the unit.

B 3.3 INSTRUMENTATION

B 3.3.1 Reactor Trip System (RTS) Instrumentation

BASES

BACKGROUND

The RTS initiates a unit shutdown, based on the values of selected unit parameters, to protect against violating the core fuel design limits and Reactor Coolant System (RCS) pressure boundary during ~~anticipated~~ Anticipated ~~o~~Operational ~~o~~Occurrences (AOOs) and to assist the Engineered Safety Features (ESF) Systems in mitigating accidents.

The protection and monitoring systems have been designed to assure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RTS, as well as specifying LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS)

10 CFR 50.36(c)(1)(ii)(A) requires ~~Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "...settings for automatic protective devices...so chosen~~ that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to~~will~~ correct ~~the~~ abnormal situations before the ~~a Safety Limit (~~SL~~)~~ is exceeded. ~~."~~ The Analytical Limit is the limit of the process variable at which a protective ~~safety~~ action is initiated, as established by the safety analysis, to ensure that a Safety Limit (SL) is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels~~protective devices~~ must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

-------------------------------- REVIEWER'S NOTE ------------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [NTSP] is not included in Table 3.3.1-1 for the purpose of compliance with 10 CFR 50.36, the plant-

specific location for the Nominal Trip Setpoint must be cited in Note c of Table 3.3.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. [NTSP] is the standard terminology for most Westinghouse plants and is used as the preferred term in the Bases descriptions.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases. Those plants that do not include the [NTSP] in Table 3.3.1-1 must insert the name of the document(s) controlled under 10 CFR 50.59 that contain the [NTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" in Note c of the specifications.

The [Nominal Trip Setpoint (NTSP)] is a predetermined setting, plus margin, for a ~~protective device~~ protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [NTSP] ~~trip setpoint~~accounts for uncertainties in setting the ~~device~~ channel (e.g., calibration), uncertainties in how the ~~device~~channel might actually perform (e.g., repeatability), changes in the point of action of the ~~device~~channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [NTSP] ~~trip setpoint plays an important role in ensuring~~ ensures that SLs are not exceeded. As such, the [NTSP] ~~trip setpoint~~meets the definition of a SL-LSSS (Ref. 1)~~and could be used to meet the requirement that they be contained in the Technical Specifications~~.

BASES

BACKGROUND (continued)

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety functions(s)." Use~~For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for these devices. However, use~~ of the [NTSP] ~~trip setpoint~~ to define OPERABILITY in Technical Specifications ~~and its corresponding designation as the LSSS required by 10 CFR 50.36~~ would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as-found" value of a protection channel~~protective device~~ setting during a surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel~~protective device~~ with a setting that has been found to be different from the [NTSP] ~~trip setpoint~~ due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [NTSP]~~trip setpoint~~ and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as-found" setting of the protection channel.~~protective device.~~ Therefore, the channel~~device~~ would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel~~device~~ to the [NTSP]~~trip setpoint~~ to account for further drift during the next surveillance interval.

~~Use of the trip setpoint to define "as found" OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted.~~ However, there is also some point beyond which the channel~~device~~ would have not been able to perform its function due to, 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 which, as stated above, is the same as the LSSS.~~

The Allowable Value specified in Table 3.3.1-1 is~~serves as~~ the least conservative value of the as-found setpoint that the channel can have when tested,~~LSSS~~ such that a channel is OPERABLE if the as-~~trip setpoint is~~ found setpoint is conservative with respect to~~not to exceed~~ the Allowable Value during the CHANNEL OPERATIONAL TEST (COT). As such, the Allowable Value differs from the [NTSP]~~trip setpoint~~ by an amount [greater than or]~~primarily~~ equal to the expected instrument channel~~loop~~ uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the channel~~device~~ will ~~still meet the LSSS definition and~~ ensure that a SL

BASES

BACKGROUND (continued)

is not exceeded at any given point of time as long as the channel~~device~~ has not drifted beyond that expected during the surveillance interval. Note that, although the channel is ~~"~~OPERABLE~~"~~ under these circumstances, the trip setpoint must~~should~~ be left adjusted to a value within the as-left~~established trip setpoint 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 (as-found criteria).

~~.~~ If the actual setting of the channel~~device~~ is found to be conservative with respect to~~have exceeded~~ the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint cannot be reset to the [LTSP], it is inoperable.

~~device would be considered inoperable from a~~
If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable.~~technical specification perspective.~~ This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels~~protective devices~~ do not function as required.

[Note: Alternatively, a Technical Specification format incorporating an Allowable Value only column may be proposed by a licensee. In this case, for SL-LSSS setpoints, the [NTSP] value and the methodologies used to calculate the as-found and as-left tolerances must be specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. ~~In this case the trip setpoint value of Table 3.3.1-1 is located in the Technical Specification Bases or in a licensee-controlled document outside the Technical Specification.~~ Changes to the actual plant trip setpoint or [NTSP] value would be controlled by 10 CFR 50.59 or administratively as appropriate, and adjusted per the setpoint methodology and applicable surveillance requirements. ~~At their option,~~

~~the licensee may include the trip setpoint in Table 3.3.1-1 as shown, or as suggested by the licensees' setpoint methodology or license.]~~

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 2750 psia 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. However, the acceptable dose limit for an accident category and their associated [NTSPs] are not considered to be LSSS as defined in 10 CFR 50.36.

BASES

BACKGROUND (continued)

The RTS instrumentation is segmented into four distinct but interconnected modules as illustrated in Figure [ ], FSAR, Chapter [7] (Ref. 2), and as identified below:

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

2. Signal Process Control and Protection System, including Analog Protection System, Nuclear Instrumentation System (NIS), field contacts, and protection channel sets: provides signal conditioning, bistable setpoint comparison, process algorithm actuation, compatible electrical signal output to protection system channels~~devices~~, and control board/control room/miscellaneous indications,

3. Solid State Protection System (SSPS), including input, logic, and output bays: initiates proper unit shutdown and/or ESF actuation in accordance with the defined logic, which is based on the bistable outputs from the signal process control and protection system, and

4. Reactor trip switchgear, including reactor trip breakers (RTBs) and bypass breakers: provides 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. The bypass breakers allow testing of the RTBs at power.

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 [NTSP]~~trip setpoint~~ and Allowable Value.~~s.~~ 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 behavior observed during performance of the CHANNEL CHECK.

BASES

BACKGROUND (continued)

Signal Process Control and Protection System

Generally, three or four channels of process control equipment are used for the signal processing of unit parameters measured by the field instruments. The process control equipment provides signal conditioning, comparable output signals for instruments located on the main control board, and comparison of measured input signals with [NTSPs]~~setpoints~~ established by safety analyses. These [NTSPs]~~setpoints~~ are defined in FSAR, Chapter [7] (Ref. 2), Chapter [6] (Ref. 3), and Chapter [15] (Ref. 4). If the measured value of a unit parameter exceeds the predetermined setpoint, an output from a bistable is forwarded to the SSPS for decision evaluation. Channel separation is maintained up to and through the input bays. However, not all unit parameters require four channels of sensor measurement and signal processing. Some unit parameters provide input only to the SSPS, while others provide input to the SSPS, the main control board, the unit computer, and 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.

Generally, if a parameter is used for input to the SSPS and a control function, four channels with a two-out-of-four logic are sufficient to provide the required reliability and redundancy. The circuit must be able to withstand both an input failure to the control system, which may then require the protection function actuation, and a single failure in the other channels providing the protection function actuation. Again, a single failure will neither cause nor prevent the protection function actuation. These requirements are described in IEEE-279-1971 (Ref. 5). The actual number of channels required for each unit parameter is specified in Reference 2.

Two logic channels are required to ensure no single random failure of a logic channel will disable the RTS. The logic channels are designed such that testing required while the reactor is at power may be accomplished without causing trip. Provisions to allow removing logic channels from service during maintenance are unnecessary because of the logic system's designed reliability.

BACKGROUND (continued)

[NTSPs]~~Allowable Values~~ and RTS Setpoints

The trip setpoints used in the bistables are based on the analytical limits stated in Reference 2. The selection of these analytical limits ~~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. 6), the Allowable Values specified in Table 3.3.1-1 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 [NTSPs]~~trip setpoints~~, including their explicit uncertainties, is provided in the "RTS/ESFAS Setpoint Methodology Study" (Ref. 7) which incorporates all of the known uncertainties applicable to each channel. The as-left tolerance and as-found tolerance band methodology is provided in Ref. xyz. The magnitudes of these uncertainties are factored into the determination of each [NTSP] ~~trip setpoint~~ and corresponding Allowable Value. The trip setpoint entered into the bistable is more conservative than that specified by the Allowable Value ~~(LSSS)~~ to account for measurement errors detectable by the COT. The Allowable Value serves as the as-found trip setpoint Technical Specification OPERABILITY limit for the purpose of the COT. ~~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.~~.

The [NTSP]~~trip setpoint~~ is the value at which the bistable is set and is the expected value to be achieved during calibration. The [NTSP]~~trip setpoint~~ value is the LSSS and ensures the ~~LSSS and the~~ safety analysis limits are met for the 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" [NTSP]~~setpoint~~ value is within the as-left tolerance band for CHANNEL CALIBRATION uncertainty allowance (i.e., ± rack calibration and~~+~~ comparator setting uncertainties). The [NTSP]~~trip setpoint~~ value is therefore considered a "nominal" value (i.e., expressed as a value without inequalities) for the purposes of COT and CHANNEL CALIBRATION.

[Nominal Trip Setpoints], in conjunction with the use of as-found and as-left tolerances,~~setpoints~~ consistent with the requirements of the Allowable Value ensure that SLs are not violated during AOOs (and that the consequences of DBAs will be acceptable, providing the unit is operated from within the LCOs at the onset of the AOO or DBA and the equipment functions as designed). Note that the Allowable Values listed in Table 3.3.1-1 are the least conservative value of the as-found setpoint that a channel can have during a periodic CHANNEL CALIBRATION, COT, or a TADOT that requires trip setpoint verification.

BASES

BACKGROUND (continued)

Each channel of the process control equipment can be tested on line to verify that the signal or setpoint accuracy is within the specified allowance requirements of Reference 3. Once a designated channel is taken out of service for testing, a simulated signal is injected in place of the field instrument signal. The process equipment for the channel in test is then tested, verified, and calibrated. SRs for the channels are specified in the SRs section.

Solid State Protection System

The SSPS equipment is used for the decision logic processing of outputs from the signal processing equipment bistables. To meet the redundancy requirements, two trains of SSPS, each performing the same functions, are provided. If one train is taken out of service for maintenance or test purposes, the second train will provide reactor trip and/or ESF actuation for the unit. If both trains are taken out of service or placed in test, a reactor trip will result. Each train is packaged in its own cabinet for physical and electrical separation to satisfy separation and independence requirements. The system has been designed to trip in the event of a loss of power, directing the unit to a safe shutdown condition.

The SSPS performs the decision logic for actuating a reactor trip or ESF actuation, generates the electrical output signal that will initiate the required trip or actuation, and provides the status, permissive, and annunciator output signals to the main control room of the unit.

The bistable outputs from the signal processing equipment are sensed by the SSPS equipment and combined into logic matrices that represent combinations indicative of various unit upset and accident transients. If a required logic matrix combination is completed, the system will initiate a reactor trip or send actuation signals via master and slave relays to 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.

Reactor Trip Switchgear

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. Each RTB is equipped with a bypass breaker to allow testing of the RTB while the unit is at power.

BASES

BACKGROUND (continued)

During normal operation the output from the SSPS is a voltage signal that energizes the undervoltage coils in the RTBs and bypass breakers, if in use. When the required logic matrix combination is completed, the SSPS 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 and bypass breakers 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 SSPS. 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 3. 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 a built in testing device that can automatically test the decision logic matrix Functions and the actuation channels~~devices~~ while the unit is at power. When any one train is taken out of service for testing, the other train is capable of providing unit monitoring and protection until the testing has been completed. The testing device is semiautomatic to minimize testing time.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

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

Trip Setpoints for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

~~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 with a trip setpoint value outside its calibration tolerance band provided the trip setpoint "as-found" value does not exceed its~~

~~BASES~~

~~APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)~~

~~associated Allowable Value and provided the trip setpoint "as-left" value is adjusted to a value within the "as-left" calibration tolerance band of the Nominal Trip Setpoint. A trip setpoint may be set more conservative than the Nominal 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.~~

Each of the analyzed accidents and transients can be detected by one or more RTS Functions. The accident analysis described in Reference 4 takes credit for most RTS trip Functions. RTS trip Functions not specifically credited in the accident analysis may be qualitatively credited in the safety analysis and the NRC staff approved licensing basis for the unit. However, qualitatively credited or backup functions are not SL-LSSS. 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 ~~The LCO generally requires OPERABILITY of four or three channels in each~~ instrumentation performing an RTS Function, listed in Table 3.3.1-1 in the accompanying LCO, to be OPERABLE. The Allowable Value specified in Table 3.3.1-1 is the least conservative value of the as-found setpoint that the channel can have when tested, such that a channel is OPERABLE if the as-found setpoint is conservative with respect to the Allowable Value during the CHANNEL OPERATIONAL TEST (COT). As such, the Allowable Value differs from the [NTSP] by an amount [greater than or] equal to the expected instrument channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the channel ([NTSP]) will ensure that a SL is not exceeded at any given point of time as long as the channel has not drifted beyond that expected during the surveillance interval.

Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, 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 (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but a degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance) and determining that the channel is performing as expected. At the completion of the SR, operations will confirm the SR results and determine the channel condition. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

~~OPERABILITY~~

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

A trip setpoint may be set more conservative than the ~~Nominal Trip Setpoint~~ [NTSP] 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.

The LCO generally requires OPERABILITY of four or three channels in each instrument~~ation~~ Function, two channels of Manual Reactor Trip in each logic Function, and two trains in each Automatic Trip Logic Function. Four OPERABLE instrumentation channels in a two-out-of-four configuration are required when one RTS channel is also used as a control system input. This configuration accounts for the possibility of the shared channel failing in such a manner that it creates a transient that requires RTS action. In this case, the RTS will still provide protection, even with random failure of one of the other three protection channels. Three OPERABLE instrumentation channels in a two-out-of-three configuration are generally required when there is no potential for control system and protection system interaction that could simultaneously create a need for RTS trip and disable one RTS channel. The two-out-of-three and two-out-of-four configurations allow one channel to be tripped during maintenance or testing without causing a reactor trip. Specific exceptions to the above general philosophy exist and are discussed below.

Reactor Trip System Functions

-----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

The safety analyses and OPERABILITY requirements applicable to each RTS Function are discussed below:

1. Manual Reactor Trip

The Manual Reactor Trip ensures that the control room operator can initiate a reactor trip at any time by using either of two reactor trip switches in the control room. A Manual Reactor Trip accomplishes the same results as any one of the automatic trip Functions. It is used by the reactor operator to shut down the reactor whenever any parameter is rapidly trending toward its Trip Setpoint.

The LCO requires two Manual Reactor Trip channels to be OPERABLE. Each channel is controlled by a manual reactor trip switch. Each channel activates the reactor trip breaker in both trains. Two independent channels are required to be OPERABLE so that no single random failure will disable the Manual Reactor Trip Function.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The LCO requires four channels for two and four loop units (three channels for three loop units) of the Pressurizer Pressure - High to be OPERABLE.

The Pressurizer Pressure - High [SL-]LSSS is selected to be below the pressurizer safety valve actuation pressure and above the power operated relief valve (PORV) setting. This setting minimizes challenges to safety valves while avoiding unnecessary reactor trip for those pressure increases that can be controlled by the PORVs.

In MODE 1 or 2, the Pressurizer Pressure - High trip must be OPERABLE to help prevent RCS overpressurization and minimize challenges to the relief and safety valves. In MODE 3, 4, 5, or 6, the Pressurizer Pressure - High trip Function does not have to be OPERABLE because transients that could cause an overpressure condition will be slow to occur. Therefore, the operator will have sufficient time to evaluate unit conditions and take corrective actions. Additionally, low temperature overpressure protection systems provide overpressure protection when below MODE 4.

9. Pressurizer Water Level - High

The Pressurizer Water Level - High trip Function provides a backup signal for the Pressurizer Pressure - High trip and also provides protection against water relief through the pressurizer safety valves. These valves are designed to pass steam in order to achieve their design energy removal rate. A reactor trip is actuated prior to the pressurizer becoming water solid. The LCO requires three channels of Pressurizer Water Level - High to be OPERABLE. The pressurizer level channels are used as input to the Pressurizer Level Control System. A fourth channel is not required to address control/protection interaction concerns. The level channels do not actuate the safety valves, and the high pressure reactor trip is set below the safety valve setting. Therefore, with the slow rate of charging available, pressure overshoot due to level channel failure cannot cause the safety valve to lift before reactor high pressure trip.

In MODE 1, when there is a potential for overfilling the pressurizer, the Pressurizer Water Level - High trip must be OPERABLE. This trip Function is automatically enabled on increasing power by the P-7

ACTIONS

-----------------------------------REVIEWER'S NOTE-----------------------------------
In Table 3.3.1-1, Functions 11.a and 11.b were not included in the generic evaluations approved in either WCAP-10271, as supplemented, WCAP-15376, or WCAP-14333. In order to apply the WCAP-10271, as supplemented, and WCAP-15376 or WCAP-14333 TS relaxations to plant specific Functions not evaluated generically, licensees must submit plant specific evaluations for NRC review and approval.

A Note has been added to the ACTIONS to clarify the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed in Table 3.3.1-1.

In the event a channel's trip setpoint~~Trip Setpoint~~ is found non-conservative with respect to the Allowable Value, or the transmitter, instrument loop, signal processing electronics, or bistable is found inoperable, then all affected Functions provided by that channel must be declared inoperable and the LCO Condition(s) entered for the protection Function(s) affected.

When the number of inoperable channels in a trip Function exceed those specified in one or other related Conditions associated with a trip Function, then the unit is outside the safety analysis. Therefore, LCO 3.0.3 must be immediately entered if applicable in the current MODE of operation.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use these times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

A.1

Condition A applies to all RTS protection Functions. Condition A addresses the situation where one or more required channels or trains for one or more Functions are inoperable at the same time. The Required Action is to refer to Table 3.3.1-1 and to take the Required Actions for the protection functions affected. The Completion Times are those from the referenced Conditions and Required Actions.

BASES

ACTIONS (continued)

S.1 and S.2

Condition S applies to the RTB Undervoltage and Shunt Trip Mechanisms, or diverse trip features, in MODES 1 and 2. With one of the diverse trip features inoperable, it must be restored to an OPERABLE status within 48 hours or the unit must be placed in a MODE where the requirement does not apply. This is accomplished by placing the unit in MODE 3 within the next 6 hours (54 hours total time). The Completion Time of 6 hours is a reasonable time, based on operating experience, to reach MODE 3 from full power in an orderly manner and without challenging unit systems. With the unit in MODE 3, ACTION C would apply to any inoperable RTB trip mechanism. The affected RTB shall not be bypassed while one of the diverse features is inoperable except for the time required to perform maintenance to one of the diverse features. The allowable time for performing maintenance of the diverse features is 2 hours for the reasons stated under Condition P.

The Completion Time of 48 hours for Required Action S.1 is reasonable considering that in this Condition there is one remaining diverse feature for the affected RTB, and one OPERABLE RTB capable of performing the safety function and given the low probability of an event occurring during this interval.

SURVEILLANCE REQUIREMENTS

----------------------------------REVIEWER'S NOTE----------------------------------
In Table 3.3.1-1, Functions 11.a and 11.b were not included in the generic evaluations approved in either WCAP-10271, as supplemented, or WCAP-14333. In order to apply the WCAP-10271, as supplemented, and WCAP-14333 TS relaxations to plant specific Functions not evaluated generically, licensees must submit plant specific evaluations for NRC review and approval.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.1-1 requiring reset of the channel to a predefined as-left tolerance and the verification of the as-found tolerance are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with allowable values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------
Notes b and c are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes b and c are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note c requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes b and c are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes b and c may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes b and c being applied to the Functions shown in TS 3.3.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 both trains of the RTS. When testing Channel I, Train A and Train B must be examined. Similarly, Train A and Train B must be examined when testing Channel II, Channel III, and Channel IV (if applicable). The CHANNEL

CALIBRATION and COTs are performed in a manner that is consistent with the assumptions used in analytically calculating the required channel accuracies.

----------------------------------REVIEWER'S NOTE----------------------------------
Certain Frequencies are based on approval topical reports. In order for a licensee to use these times, the licensee must justify the Frequencies as required by the staff SER for the topical report.

SR 3.3.1.1

Performance of the CHANNEL CHECK once every 12 hours 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 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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.7

SR 3.3.1.7 is the performance of a COT every 184 days.

A COT 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 a 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 the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

Setpoints must be conservative with respect to~~within~~ the Allowable Values specified in Table 3.3.1-1.

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 setpoint shall be left set consistent with the assumptions of the current unit specific setpoint methodology.

The "as-~~-~~found" [and "as-~~-~~left"] values must also be recorded and reviewed for consistency with the assumptions of Reference 9.

SR 3.3.1.7 is modified by a Note that provides a 4 hours delay in the requirement to perform this Surveillance for source range instrumentation when entering MODE 3 from MODE 2. This Note allows a normal shutdown to proceed without ~~-~~a delay for testing in MODE 2 and for a short time in MODE 3 until the RTBs are open and SR 3.3.1.7 is no longer required to be performed. If the unit is to be in MODE 3 with the RTBs closed for > 4 hours this Surveillance must be performed prior to 4 hours after entry into MODE 3.

The Frequency of 184 days is justified in Reference 9.

SR 3.3.1.7 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will

ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [NTSP]. Where a setpoint more conservative than the [NTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the channel shall be declared inoperable.

-----------------------------------REVIEWER'S NOTE-----------------------------------
The bracketed section '[NTSP and the]' of the sentence in Note (c) in Table 3.3.1-1 is not required in plant-specific Technical Specifications which include a [Nominal Trip Setpoint] column in Table 3.3.1-1.

The second Note also requires that the [NTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.8

SR 3.3.1.8 is the performance of a COT as described in SR 3.3.1.7, except it is modified by a Note that this test shall include verification that the P-6 and P-10 interlocks are in their required state for the existing unit condition. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a 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 the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The Frequency is modified by a Note that allows this surveillance to be satisfied if it has been performed within 184 days of the Frequencies prior to reactor startup and four hours after reducing power below P-10 and P-6. The Frequency of "prior to startup" ensures this surveillance is performed prior to critical operations and applies to the source, intermediate and power range low instrument channels. The Frequency of [12] hours after reducing power below P-10 (applicable to intermediate and power range low channels) and 4 hours after reducing power below P-6 (applicable to source range channels) allows a normal shutdown to be completed and the unit removed from the MODE of Applicability for this surveillance without a delay to perform the testing required by this surveillance. The Frequency of every 92 days thereafter applies if the plant remains in the MODE of Applicability after the initial performances of prior to reactor startup and [12] and four hours after reducing power below P-10 or P-6, respectively. The MODE of Applicability for this surveillance is < P-10 for the power range low and intermediate range channels and < P-6 for the source range channels. Once the unit is in MODE 3, this surveillance is no longer required. If power is to be maintained < P-10 for more than [12] hours or < P-6 for more than 4 hours, then the testing required by this surveillance must be performed prior to the expiration of the time limit. [Twelve] hours and four hours are reasonable times to complete the required testing or place the unit in a MODE where this surveillance is no longer required. This test ensures that the NIS source, intermediate, and power range low channels are OPERABLE prior to taking the reactor critical and after reducing power into the applicable MODE (< P-10 or < P-6) for periods > [12] and 4 hours, respectively. The Frequency of 184 days is justified in Reference 13.

SR 3.3.1.8 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [NTSP]. Where a setpoint more conservative than the [NTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the channel shall be declared inoperable.

----------------------------------REVIEWER'S NOTE----------------------------------
The bracketed section '[NTSP and the]' of the sentence in Note (c) in Table 3.3.1-1 is not required in plant-specific Technical Specifications which include a [Nominal Trip Setpoint] column in Table 3.3.1-1.

The second Note also requires that the [NTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.9

SR 3.3.1.9 is the performance of a TADOT and is performed every [92] days, as justified in Reference 9. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The SR is modified by a Note that excludes verification of setpoints from the TADOT. Since this SR applies to RCP undervoltage and underfrequency relays, setpoint verification requires elaborate bench calibration and is accomplished during the CHANNEL CALIBRATION.

SR 3.3.1.10

A CHANNEL CALIBRATION is performed every [18] months, or approximately at every refueling. 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 CALIBRATIONS must be performed consistent with the assumptions of the unit specific setpoint methodology. The difference between the current "as~~-~~found" values and the [NTSP or previous test "as~~-~~left" values] must be consistent with the drift allowance used in the setpoint methodology.

The Frequency of 18 months is based on the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint methodology.

SR 3.3.1.10 is modified by a Note stating that this test shall include verification that the time constants are adjusted to the prescribed values where applicable.

SR 3.3.1.10 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [NTSP]. Where a setpoint more conservative than the [NTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the channel shall be declared inoperable.

----------------------------------REVIEWER'S NOTE----------------------------------
The bracketed section '[NTSP and the]' of the sentence in Note (c) in Table 3.3.1-1 is not required in plant-specific Technical Specifications which include a [Nominal Trip Setpoint] column in Table 3.3.1-1.

The second Note also requires that the [NTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.11

SR 3.3.1.11 is the performance of a CHANNEL CALIBRATION, as described in SR 3.3.1.10, every [18] months. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. The CHANNEL CALIBRATION for the power range neutron detectors consists of a normalization of the detectors based on a power calorimetric and flux map performed above 15% RTP. The CHANNEL CALIBRATION for the source range and intermediate range neutron detectors consists of obtaining the detector plateau or preamp discriminator curves, evaluating those curves, and comparing the curves to the manufacturer's data. This Surveillance is not required for the NIS power range detectors for entry into MODE 2 or 1, and is not required for the NIS intermediate range detectors for entry into MODE 2, because the unit must be in at least MODE 2 to perform the test for the intermediate range detectors and MODE 1 for the power range detectors. The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed on the [18] month Frequency.

SR 3.3.1.11 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [NTSP]. Where a setpoint more conservative than the [NTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the channel shall be declared inoperable.

-----------------------------------REVIEWER'S NOTE-----------------------------------

The bracketed section '[NTSP and the]' of the sentence in Note (c) in Table 3.3.1-1 is not required in plant-specific Technical Specifications which include a [Nominal Trip Setpoint] column in Table 3.3.1-1.

The second Note also requires that the [NTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.1.12

SR 3.3.1.12 is the performance of a CHANNEL CALIBRATION, as described in SR 3.3.1.10, every [18] months. This SR is modified by a Note stating that this test shall include verification of the RCS resistance temperature detector (RTD) bypass loop flow rate. Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION of the resistance temperature detectors (RTD) sensors is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element.

This test will verify the rate lag compensation for flow from the core to the RTDs.

The Frequency is justified by the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.1.12 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [NTSP]. Where a setpoint more conservative than the [NTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the channel shall be declared inoperable.

-----------------------------------REVIEWER'S NOTE-----------------------------------
The bracketed section '[NTSP and the]' of the sentence in Note (c) in Table 3.3.1-1 is not required in plant-specific Technical Specifications which include a [Nominal Trip Setpoint] column in Table 3.3.1-1.

The second Note also requires that the [NTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

B 3.3 INSTRUMENTATION

B 3.3.2 Engineered Safety Feature Actuation System (ESFAS) Instrumentation

BASES

BACKGROUND

The ESFAS initiates necessary safety systems, based on the values of selected unit parameters, to protect against violating core design limits and the Reactor Coolant System (RCS) pressure boundary, and to mitigate accidents. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RTS, as well as specifying LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS)

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a protective action is initiated, as established by the safety analysis, to ensure that a Safety Limit (SL) is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

-------------------------------- REVIEWER'S NOTE -----------------------------------

The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [NTSP] is not included in Table 3.3.2-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Nominal Trip Setpoint must be cited in Note c of Table 3.3.2-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. [NTSP] is the standard terminology for most Westinghouse plants and is used as the preferred term in the Bases descriptions.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases. Those plants that do not include the [NTSP] in Table 3.3.2-1 must insert the name of the document(s) controlled under 10 CFR 50.59 that contain the [NTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" in Note c of the specifications.

The [Nominal Trip Setpoint (NTSP)] is a predetermined setting, plus margin, for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [NTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [NTSP] ensures that SLs are not exceeded. As such, the [NTSP] meets the definition of a SL-LSSS (Ref. 15).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety functions(s)." Use of the [NTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as-found" value of a protection channel setting during a surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [NTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [NTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as-found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel to the [NTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel would have not been able to perform its function due to, for example, greater than expected drift. The Allowable Value specified in Table 3.3.2-1 is the least conservative value of the as-found setpoint that the channel can have when tested, such that a channel is OPERABLE if the as-found setpoint is conservative with respect to the Allowable Value during the CHANNEL OPERATIONAL TEST (COT). As such, the Allowable Value differs from the [NTSP] by an amount [greater than or] equal to the expected instrument channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the channel will ensure that a SL

is not exceeded at any given point of time as long as the channel has not drifted beyond that expected during the surveillance interval. Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, 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 (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

[Note: Alternatively, a Technical Specification format incorporating an Allowable Value only column may be proposed by a licensee. In this case, for SL-LSSS setpoints, the [NTSP] value and the methodologies used to calculate the as-found and as-left tolerances must be specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. Changes to the actual plant trip setpoint or [NTSP] value would be controlled by 10 CFR 50.59 or administratively as appropriate, and adjusted per the setpoint methodology and applicable surveillance requirements.

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 2750 psia 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. However, the acceptable dose limit for an accident category and their associated [NTSPs] are not considered to be LSSS as defined in 10 CFR 50.36.

The ESFAS instrumentation is segmented into three distinct but interconnected modules as identified below:

- Field transmitters or process sensors and instrumentation: provide a measurable electronic signal based on the physical characteristics of the parameter being measured,

- Signal processing equipment including analog protection system, field contacts, and protection channel sets: provide signal conditioning, bistable setpoint comparison, process algorithm actuation, compatible electrical signal output to protection system ~~devices~~channels, and control board/control room/miscellaneous indications, and

- Solid State Protection System (SSPS) including input, logic, and output bays: initiates the proper unit shutdown or engineered safety feature (ESF) actuation in accordance with the defined logic and based on the bistable outputs from the signal process control and protection system.

~~The Allowable Value in conjunction with the trip setpoint and LCO establishes the threshold for ESFAS action to prevent exceeding acceptable limits such that the consequences of Design Basis Accidents (DBAs) will be acceptable. The Allowable Value is considered a limiting value such that a channel is OPERABLE if the setpoint is found not to exceed the Allowable Value during the CHANNEL OPERATIONAL TEST (COT). Note that, although a channel is "OPERABLE" under these circumstances, the ESFAS setpoint must be left adjusted to within the established calibration tolerance band of the ESFAS setpoint in accordance with the 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.~~

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. In many cases, field transmitters or sensors that input to the ESFAS are shared with the Reactor Trip System (RTS). In some cases, the same channels also provide control system inputs. To account for calibration tolerances and instrument drift, which are assumed to occur between calibrations, statistical allowances are provided in the ~~Trip Setpoint~~[NTSP] and Allowable Value~~s.~~. 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 behavior observed during performance of the CHANNEL CHECK.

Signal Processing Equipment

Generally, three or four channels of process control equipment are used for the signal processing of unit parameters measured by the field instruments. The process control equipment provides signal conditioning, comparable output signals for instruments located on the main control board, and comparison of measured input signals with ~~setpoints~~[NTSPs] established by safety analyses. These ~~setpoints~~[NTSPs] are defined in FSAR, Chapter [6] (Ref. 1), Chapter [7] (Ref. 2), and Chapter [15] (Ref. 3). If the measured value of a unit parameter exceeds the predetermined setpoint, an output from a bistable is forwarded to the SSPS for decision evaluation. Channel separation is maintained up to and through the input bays. However, not all unit parameters require four channels of sensor measurement and signal processing. Some unit parameters provide input only to the SSPS, while others provide input to the SSPS, the main control board, the unit computer, and 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 SSPS and a control function, four channels with a two-out-of-four logic are sufficient to provide the required reliability and redundancy. The circuit must be able to withstand both an input failure to the control system, which may then require the protection function actuation, and a single failure in the other channels providing the protection function actuation. Again, a single failure will neither cause nor prevent the protection function actuation.

These requirements are described in IEEE-279-1971 (Ref. 4). The actual number of channels required for each unit parameter is specified in Reference 2.

~~Allowable Values~~[NTSPs] and ESFAS Setpoints

The trip setpoints used in the bistables are based on the analytical limits stated in Reference 2. The selection of these analytical limits ~~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 specified in Table 3.3.2-1 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 ESFAS ~~setpoints~~[NTSPs] including their explicit uncertainties, is provided in the plant specific setpoint methodology study (Ref. 6) which incorporates all of the known uncertainties applicable to each channel. The as-left tolerance and as-found tolerance band methodology is provided in Ref. xyz. The magnitudes of these uncertainties are factored into the determination of each ESFAS ~~setpoint~~[NTSP] and corresponding Allowable Value. The nominal ESFAS setpoint entered into the bistable is more conservative than that specified by the ~~Allowable Value~~[NTSP] to account for measurement errors detectable by the COT. The Allowable Value serves as the as-found trip setpoint Technical Specification OPERABILITY limit for the purpose of the COT. ~~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.~~

The ~~ESFAS setpoints are the values~~ [NTSP] is the value at which the bistables are set and is the expected value to be achieved during calibration. The ~~ESFAS setpoint value~~[NTSP] value, is the LSSS and ensures the safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on stated

~~BASES~~

~~BACKGROUND (continued)~~

channel uncertainties. Any bistable is considered to be properly adjusted when the "as-left" ~~setpoint~~[NTSP] value is within the ~~band~~ as-left tolerance for CHANNEL

~~BASES~~

~~BACKGROUND (continued)~~

CALIBRATION uncertainty allowance (i.e., ± rack calibration ~~tolerance~~ and comparator setting uncertainties). The ~~ESFAS setpoint~~ [NTSP] value is therefore considered a "nominal value" (i.e., expressed as a value without inequalities) for the purposes of the COT and CHANNEL CALIBRATION.

[Nominal Trip Setpoints], in conjunction with the use of as-found and as-left tolerances ~~Setpoints adjusted~~ consistent with the requirements of the Allowable Value ensure that the consequences of Design Basis Accidents (DBAs) will be acceptable, providing the unit is operated from within the LCOs at the onset of the DBA and the equipment functions as designed. Note that the Allowable Values listed in Table 3.3.2-1 are the least conservative value of the as-found setpoint that a channel can have during a periodic CHANNEL CALIBRATION, COT, or a TADOT that requires trip setpoint verification.

Each channel can be tested on line to verify that the signal processing equipment and setpoint accuracy is within the specified allowance requirements of Reference 2. Once a designated channel is taken out of service for testing, a simulated signal is injected in place of the field instrument signal. The process equipment for the channel in test is then tested, verified, and calibrated. SRs for the channels are specified in the SR section.

Solid State Protection System

The SSPS equipment is used for the decision logic processing of outputs from the signal processing equipment bistables. To meet the redundancy requirements, two trains of SSPS, each performing the same functions, are provided. If one train is taken out of service for maintenance or test purposes, the second train will provide ESF actuation for the unit. If both trains are taken out of service or placed in test, a reactor trip will result. Each train is packaged in its own cabinet for physical and electrical separation to satisfy separation and independence requirements.

The SSPS 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.

The bistable outputs from the signal processing equipment are sensed by the SSPS equipment and combined into logic matrices that represent combinations indicative of various transients. If a required logic matrix combination is completed, the system will send actuation signals via master and slave relays to 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.

BASES

BACKGROUND (continued)

Each SSPS train has a built in testing device that can automatically test the decision logic matrix functions and the actuation ~~devices~~channels while the unit is at power. When any one train is taken out of service for testing, the other train is capable of providing unit monitoring and protection until the testing has been completed. The testing ~~device~~channel is semiautomatic to minimize testing time.

The actuation of ESF components is accomplished through master and slave relays. The SSPS energizes the master relays appropriate for the condition of the unit. Each master relay then energizes one or more slave relays, which then cause actuation of the end ~~devices.~~channels. The master and slave relays are routinely tested to ensure operation. The test of the master relays energizes the relay, which then operates the contacts and applies a low voltage to the associated slave relays. The low voltage is not sufficient to actuate the slave relays but only demonstrates signal path continuity. The SLAVE RELAY TEST actuates the ~~devices~~channels if their operation will not interfere with continued unit operation. For the latter case, actual component operation is prevented by the SLAVE RELAY TEST circuit, and slave relay contact operation is verified by a continuity check of the circuit containing the slave relay.

---------------------------REVIEWER'S NOTE---
No one unit ESFAS incorporates all of the Functions listed in Table 3.3.2-1. In some cases (e.g., Containment Pressure - High 3, Function 2.c), the Table reflects several different implementations of the same Function. Typically, only one of these implementations are used at any specific unit.

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, Pressurizer Pressure - Low 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. However, qualitatively credited or backup functions are not SL-LSSS. 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)~~.~~

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ESFAS Trip Setpoints for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

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 with a trip setpoint value outside its calibration tolerance band provided the trip setpoint "as-found" value does not exceed its associated Allowable Value and provided the trip setpoint "as-left" value is adjusted to a value within the calibration tolerance band of the Nominal Trip Setpoint. A trip setpoint may be set more conservative than the Nominal 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.~~The Allowable Value specified in Table 3.3.2-1 is the least conservative value of the as-found setpoint that the channel can have when tested, such that a channel is OPERABLE if the as-found setpoint is conservative with respect to the Allowable Value during the CHANNEL OPERATIONAL TEST (COT). As such, the Allowable Value differs from the [NTSP] by an amount [greater than or] equal to the expected instrument channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the channel ([NTSP]) will ensure that a SL is not exceeded at any given point of time as long as the channel has not drifted beyond that expected during the surveillance interval.

Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, 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 (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but a degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [NTSP] (within the allowed tolerance) and determining that the channel is performing as expected. At the completion of the SR, operations will confirm the SR results and determine the channel condition. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [NTSP], it is inoperable.

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

The LCO generally requires OPERABILITY of four or three channels in each instrumentation function and two channels in each logic and manual initiation function. The two-out-of-three and the two-out-of-four configurations allow one channel to be tripped during maintenance or testing without causing an ESFAS initiation. Two logic or manual initiation channels are required to ensure no single random failure disables the ESFAS.

The required channels of ESFAS instrumentation provide unit protection in the event of any of the analyzed accidents. ESFAS protection functions are as follows:

----------------------------------REVIEWER'S NOTE----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

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1. Safety Injection

Safety Injection (SI) provides two primary functions:

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

pressure and temperature are very low and many ESF components are administratively locked out or otherwise prevented from actuating to prevent inadvertent overpressurization of unit systems.

c. Safety Injection - Containment Pressure - High 1

This signal provides protection against the following accidents:

- SLB inside containment,
- LOCA, and
- Feed line break inside containment.

Containment Pressure - High 1 provides no input to any control functions. Thus, three OPERABLE channels are sufficient to satisfy protective requirements with a two-out-of-three logic. The transmitters (d/p cells) and electronics are located outside of containment with the sensing line (high pressure side of the transmitter) located inside containment.

Thus, the high pressure Function will not experience any adverse environmental conditions and the ~~Trip Setpoint~~[NTSP] reflects only steady state instrument uncertainties.

Containment Pressure - High 1 must be OPERABLE in MODES 1, 2, and 3 when there is sufficient energy in the primary and secondary systems to pressurize the containment following a pipe break. In MODES 4, 5, and 6, there is insufficient energy in the primary or secondary systems to pressurize the containment.

d. Safety Injection - Pressurizer Pressure – Low

This signal provides protection against the following accidents:

- Inadvertent opening of a steam generator (SG) relief or safety valve,
- SLB,

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

- A spectrum of rod cluster control assembly ejection accidents (rod ejection),
- Inadvertent opening of a pressurizer relief or safety valve,
- LOCAs, and
- SG Tube Rupture.

At some units pressurizer pressure provides both control and protection functions: input to the Pressurizer Pressure Control System, reactor trip, and SI. Therefore, the actuation logic must be able to withstand both an input failure to control system, which may then require the protection function actuation, and a single failure in the other channels providing the protection function actuation. Thus, four OPERABLE channels are required to satisfy the requirements with a two-out-of-four logic. For units that have dedicated protection and control channels, only three protection channels are necessary to satisfy the protective requirements.

The transmitters are located inside containment, with the taps in the vapor space region of the pressurizer, and thus possibly experiencing adverse environmental conditions (LOCA, SLB inside containment, rod ejection). Therefore, the ~~Trip Setpoint~~[NTSP] reflects the inclusion of both steady state and adverse environmental instrument uncertainties.

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 SI actuation below this pressure setpoint is then performed by the Containment Pressure - High 1 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.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

e. Safety Injection - Steam Line Pressure

(1) Steam Line Pressure – Low

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

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

Steam Line Pressure - Low provides no input to any control functions. Thus, 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.

With the transmitters typically located inside the steam tunnels, it is possible for them to experience adverse environmental conditions during a secondary side break. Therefore, the ~~Trip Setpoint~~[NTSP] reflects both steady state and adverse environmental instrument uncertainties.

This Function is anticipatory in nature and has a typical lead/lag ratio of 50/5.

Steam Line Pressure - Low must be OPERABLE in MODES 1, 2, and 3 (above P-11) when a secondary side break or stuck open valve could result in the rapid depressurization of the steam lines. This signal may be manually blocked by the operator below the P-11 setpoint. Below P-11, feed line break is not a concern. Inside containment SLB will be terminated by automatic SI actuation via Containment Pressure - High 1, and outside containment SLB will be terminated by the Steam Line Pressure - Negative Rate - High signal for steam line isolation. This Function is not required to be OPERABLE in MODE 4, 5, or 6 because there is insufficient energy in the secondary side of the unit to cause an accident.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

(2) Steam Line Pressure - High Differential Pressure Between Steam Lines

Steam Line Pressure - High Differential Pressure Between Steam Lines provides protection against the following accidents:

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

Steam Line Pressure - High Differential Pressure Between Steam Lines provides no input to any control functions. Thus, three OPERABLE channels on each steam line are sufficient to satisfy the requirements, with a two-out-of-three logic on each steam line.

With the transmitters typically located inside the steam tunnels, it is possible for them to experience adverse environmental conditions during ~~an~~ a SLB event. Therefore, the ~~Trip Setpoint~~[NTSP] reflects both steady state and adverse environmental instrument uncertainties. Steam line high differential pressure must be OPERABLE in MODES 1, 2, and 3 when a secondary side break or stuck open valve could result in the rapid depressurization of the steam line(s). This Function is not required to be OPERABLE in MODE 4, 5, or 6 because there is not sufficient energy in the secondary side of the unit to cause an accident.

f, g. Safety Injection - High Steam Flow in Two Steam Lines Coincident With T_{avg} - Low Low or Coincident With Steam Line Pressure – Low

These Functions (1.f and 1.g) provide protection against the following accidents:

- SLB, and
- the inadvertent opening of an SG relief or an SG safety valve.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

With the transmitters typically located inside the containment (T_{avg}) or inside the steam tunnels (High Steam Flow), it is possible for them to experience adverse steady state environmental conditions during a~~n~~ SLB event. Therefore, the ~~Trip Setpoint~~[NTSP] reflects both steady state and adverse environmental instrument uncertainties. The Steam Line Pressure - Low signal was discussed previously under Function 1.e.(1).

This Function must be OPERABLE in MODES 1, 2, and 3 (above P-12) when a secondary side break or stuck open valve could result in the rapid depressurization of the steam line(s). This signal may be manually blocked by the operator when below the P-12 setpoint. Above P-12, this Function is automatically unblocked. This Function is not required OPERABLE below P-12 because the reactor is not critical, so feed line break is not a concern. SLB may be addressed by Containment Pressure High 1 (inside containment) or by High Steam Flow in Two Steam Lines coincident with Steam Line Pressure - Low, for Steam Line Isolation, followed by High Differential Pressure Between Two Steam Lines, for SI. This Function is not required to be OPERABLE in MODE 4, 5, or 6 because there is insufficient energy in the secondary side of the unit to cause an accident.

2. Containment Spray

Containment Spray provides three primary functions:

1. Lowers containment pressure and temperature after an HELB in containment,

2. Reduces the amount of radioactive iodine in the containment atmosphere, and

3. Adjusts the pH of the water in the containment recirculation sump after a large break LOCA.

These functions are necessary to:

- Ensure the pressure boundary integrity of the containment structure,

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Manual and automatic initiation of containment spray must be OPERABLE in MODES 1, 2, and 3 when there is a potential for an accident to occur, and sufficient energy in the primary or secondary systems to pose a threat to containment integrity due to overpressure conditions. Manual initiation is also required in MODE 4, even though automatic actuation is not required. In this MODE, adequate time is available to manually actuate required components in the event of a DBA. However, because of the large number of components actuated on a containment spray, actuation is simplified by the use of the manual actuation push buttons. Automatic actuation logic and actuation relays must be OPERABLE in MODE 4 to support system level manual initiation. In MODES 5 and 6, there is insufficient energy in the primary and secondary systems to result in containment overpressure. In MODES 5 and 6, there is also adequate time for the operators to evaluate unit conditions and respond, to mitigate the consequences of abnormal conditions by manually starting individual components.

c. Containment Spray - Containment Pressure

This signal provides protection against a LOCA or a~~n~~ SLB inside containment. The transmitters (d/p cells) are located outside of containment with the sensing line (high pressure side of the transmitter) located inside containment. The transmitters and electronics are located outside of containment. Thus, they will not experience any adverse environmental conditions and the ~~Trip Setpoint~~[NTSP] reflects only steady state instrument uncertainties.

This is one of the only Functions that requires the bistable output to energize to perform its required action. It is not desirable to have a loss of power actuate containment spray, since the consequences of an inadvertent actuation of containment spray could be serious. Note that this Function also has the inoperable channel placed in bypass rather than trip to decrease the probability of an inadvertent actuation.

Two different logic configurations are typically used. Three and four loop units use four channels in a two-out-of-four logic configuration. This configuration may be called the Containment Pressure - High 3 Setpoint for three and four loop units, and

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

CCW is not isolated at this time to permit continued operation of the RCPs with cooling water flow to the thermal barrier heat exchangers and air or oil coolers. All process lines not equipped with remote operated isolation valves are manually closed, or otherwise isolated, prior to reaching MODE 4.

Manual Phase A Containment Isolation is accomplished by either of two switches in the control room. Either switch actuates both trains. Note that manual actuation of Phase A Containment Isolation also actuates Containment Purge and Exhaust Isolation.

The Phase B signal isolates CCW. This occurs at a relatively high containment pressure that is indicative of a large break LOCA or ~~an~~ a SLB. For these events, forced circulation using the RCPs is no longer desirable. Isolating the CCW at the higher pressure does not pose a challenge to the containment boundary because the CCW System is a closed loop inside containment. Although some system components do not meet all of the ASME Code requirements applied to the containment itself, the system is continuously pressurized to a pressure greater than the Phase B setpoint. Thus, routine operation demonstrates the integrity of the system pressure boundary for pressures exceeding the Phase B setpoint. Furthermore, because system pressure exceeds the Phase B setpoint, any system leakage prior to initiation of Phase B isolation would be into containment. Therefore, the combination of CCW System design and Phase B isolation ensures the CCW System is not a potential path for radioactive release from containment.

Phase B containment isolation is actuated by Containment Pressure - High 3 or Containment Pressure - High High, or manually, via the automatic actuation logic, as previously discussed. For containment pressure to reach a value high enough to actuate Containment Pressure - High 3 or Containment Pressure - High High, a large break LOCA or SLB must have occurred and containment spray must have been actuated. RCP operation will no longer be required and CCW to the RCPs is, therefore, no longer necessary. The RCPs can be operated with seal injection flow alone and without CCW flow to the thermal barrier heat exchanger.

Manual Phase B Containment Isolation is accomplished by the same switches that actuate Containment Spray. When the two switches in either set are turned simultaneously, Phase B Containment Isolation and Containment Spray will be actuated in both trains.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

4. Steam Line Isolation

Isolation of the main steam lines provides protection in the event of ~~an~~ a SLB inside or outside containment. Rapid isolation of the steam lines will limit the steam break accident to the blowdown from one SG, at most. For ~~an~~ a SLB upstream of the main steam isolation valves (MSIVs), inside or outside of containment, closure of the MSIVs limits the accident to the blowdown from only the affected SG. For ~~an~~ a SLB downstream of the MSIVs, closure of the MSIVs terminates the accident as soon as the steam lines depressurize. For units that do not have steam line check valves, Steam Line Isolation also mitigates the effects of a feed line break and ensures a source of steam for the turbine driven AFW pump during a feed line break.

a. Steam Line Isolation - Manual Initiation

Manual initiation of Steam Line Isolation can be accomplished from the control room. There are two switches in the control room and either switch can initiate action to immediately close all MSIVs. The LCO requires two channels to be OPERABLE.

b. Steam Line Isolation - Automatic Actuation Logic and Actuation Relays

Automatic actuation logic and actuation relays consist of the same features and operate in the same manner as described for ESFAS Function 1.b.

Manual and automatic initiation of steam line isolation must be OPERABLE in MODES 1, 2, and 3 when there is sufficient energy in the RCS and SGs to have ~~an~~ a SLB or other accident. This could result in the release of significant quantities of energy and cause a cooldown of the primary system. The Steam Line Isolation Function is required in MODES 2 and 3 unless all MSIVs are closed and [de-activated]. In MODES 4, 5, and 6, there is insufficient energy in the RCS and SGs to experience a~~n~~ SLB or other accident releasing significant quantities of energy.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

c. Steam Line Isolation - Containment Pressure - High 2

This Function actuates closure of the MSIVs in the event of a LOCA or ~~an~~ a SLB inside containment to maintain at least one unfaulted SG as a heat sink for the reactor, and to limit the mass and energy release to containment. The transmitters (d/p cells) are located outside containment with the sensing line (high pressure side of the transmitter) located inside containment. Containment Pressure - High 2 provides no input to any control functions. Thus, three OPERABLE channels are sufficient to satisfy protective requirements with two-out-of-three logic. However, for enhanced reliability, this Function was designed with four channels and a two-out-of-four logic. The transmitters and electronics are located outside of containment. Thus, they will not experience any adverse environmental conditions, and the ~~Trip Setpoint~~[NTSP] reflects only steady state instrument uncertainties.

Containment Pressure - High 2 must be OPERABLE in MODES 1, 2, and 3, when there is sufficient energy in the primary and secondary side to pressurize the containment following a pipe break. This would cause a significant increase in the containment pressure, thus allowing detection and closure of the MSIVs. The Steam Line Isolation Function remains OPERABLE in MODES 2 and 3 unless all MSIVs are closed and [de-activated]. In MODES 4, 5, and 6, there is not enough energy in the primary and secondary sides to pressurize the containment to the Containment Pressure - High 2 setpoint.

d. Steam Line Isolation - Steam Line Pressure

(1) Steam Line Pressure – Low

Steam Line Pressure - Low provides closure of the MSIVs in the event of ~~an~~ a SLB to maintain at least one unfaulted SG as a heat sink for the reactor, and to limit the mass and energy release to containment. This Function provides closure of the MSIVs in the event of a feed line break to ensure a supply of steam for the turbine driven AFW pump. Steam Line Pressure - Low was discussed previously under SI Function 1.e.1.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Steam Line Pressure - Low Function must be OPERABLE in MODES 1, 2, and 3 (above P-11), with any main steam valve open, when a secondary side break or stuck open valve could result in the rapid depressurization of the steam lines. This signal may be manually blocked by the operator below the P-11 setpoint. Below P-11, an inside containment SLB will be terminated by automatic actuation via Containment Pressure - High 2. Stuck valve transients and outside containment SLBs will be terminated by the Steam Line Pressure - Negative Rate - High signal for Steam Line Isolation below P-11 when SI has been manually blocked. The Steam Line Isolation Function is required in MODES 2 and 3 unless all MSIVs are closed and [de-activated]. This Function is not required to be OPERABLE in MODES 4, 5, and 6 because there is insufficient energy in the secondary side of the unit to have an accident.

(2) Steam Line Pressure - Negative Rate – High

Steam Line Pressure - Negative Rate - High provides closure of the MSIVs for ~~an~~ a SLB when less than the P-11 setpoint, to maintain at least one unfaulted SG as a heat sink for the reactor, and to limit the mass and energy release to containment. When the operator manually blocks the Steam Line Pressure - Low main steam isolation signal when less than the P-11 setpoint, the Steam Line Pressure - Negative Rate - High signal is automatically enabled. Steam Line Pressure - Negative Rate - High provides no input to any control functions. Thus, three OPERABLE channels are sufficient to satisfy requirements with a two-out-of-three logic on each steam line.

Steam Line Pressure - Negative Rate - High must be OPERABLE in MODE 3 when less than the P-11 setpoint, when a secondary side break or stuck open valve could result in the rapid depressurization of the steam line(s). In MODES 1 and 2, and in MODE 3, when above the P-11 setpoint, this signal is automatically disabled and the Steam Line Pressure - Low signal is automatically enabled. The

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Steam Line Isolation Function is required to be OPERABLE in MODES 2 and 3 unless all MSIVs are closed and [de-activated]. In MODES 4, 5, and 6, there is insufficient energy in the primary and secondary sides to have ~~an~~ a SLB or other accident that would result in a release of significant enough quantities of energy to cause a cooldown of the RCS.

While the transmitters may experience elevated ambient temperatures due to a~~n~~ SLB, the trip function is based on rate of change, not the absolute accuracy of the indicated steam pressure. Therefore, the ~~Trip Setpoint~~[NTSP] reflects only steady state instrument uncertainties.

e, f. Steam Line Isolation - High Steam Flow in Two Steam Lines Coincident with T_{avg} - Low Low or Coincident With Steam Line Pressure - Low (Three and Four Loop Units)

These Functions (4.e and 4.f) provide closure of the MSIVs during ~~an~~ a SLB or inadvertent opening of an SG relief or a safety valve, to maintain at least one unfaulted SG as a heat sink for the reactor and to limit the mass and energy release to containment.

These Functions were discussed previously as Functions 1.f. and 1.g.

These Functions must be OPERABLE in MODES 1 and 2, and in MODE 3, when a secondary side break or stuck open valve could result in the rapid depressurization of the steam lines unless all MSIVs are closed and [de-activated]. These Functions are not required to be OPERABLE in MODES 4, 5, and 6 because there is insufficient energy in the secondary side of the unit to have an accident.

g. Steam Line Isolation - High Steam Flow Coincident With Safety Injection and Coincident With T_{avg} - Low Low (Two Loop Units)

This Function provides closure of the MSIVs during ~~an~~ a SLB or inadvertent opening of an SG relief or safety valve to maintain at least one unfaulted SG as a heat sink for the reactor, and to limit the mass and energy release to containment.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Two steam line flow channels per steam line are required OPERABLE for this Function. These are combined in a one-out-of-two logic to indicate high steam flow in one steam line. The steam flow transmitters provide control inputs, but the control function cannot cause the events that the function must protect against. Therefore, two channels are sufficient to satisfy redundancy requirements. The one-out-of-two configuration allows online testing because trip of one high steam flow channel is not sufficient to cause initiation.

The High Steam Flow Allowable Value is a ΔP corresponding to 25% of full steam flow at no load steam pressure. The Trip Setpoint is similarly calculated.

With the transmitters (d/p cells) typically located inside the steam tunnels, it is possible for them to experience adverse environmental conditions during a~~n~~ SLB event. Therefore, the ~~Trip Setpoints~~[NTSPs] reflect both steady state and adverse environmental instrument uncertainties.

The main steam line isolates only if the high steam flow signal occurs coincident with an SI and low low RCS average temperature. The Main Steam Line Isolation Function requirements for the SI Functions are the same as the requirements for their SI function. Therefore, the requirements are not repeated in Table 3.3.2-1. Instead, Function 1, SI, is referenced for all initiating functions and requirements.

Two channels of T_{avg} per loop are required to be OPERABLE. The T_{avg} channels are combined in a logic such that two channels tripped cause a trip for the parameter. The accidents that this Function protects against cause reduction of T_{avg} in the entire primary system. Therefore, the provision of two OPERABLE channels per loop in a two-out-of-four configuration ensures no single random failure disables the T_{avg} - Low Low Function. The T_{avg} channels provide control inputs, but the control function cannot initiate events that the Function acts to mitigate. Therefore, additional channels are not required to address control protection interaction issues.

With the T_{avg} resistance temperature detectors (RTDs) located inside the containment, it is possible for them to experience adverse environmental conditions during a~~n~~ SLB event. Therefore, the ~~Trip Setpoint~~[NTSP] reflects both steady state and adverse environmental instrumental uncertainties.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

This Function must be OPERABLE in MODES 1 and 2, and in MODE 3, when above the P-12 setpoint, when a secondary side break or stuck open valve could result in rapid depressurization of the steam lines. Below P-12 this Function is not required to be OPERABLE because the High High Steam Flow coincident with SI Function provides the required protection. The Steam Line Isolation Function is required to be OPERABLE in MODES 2 and 3 unless all MSIVs are closed and [de-activated]. This Function is not required to be OPERABLE in MODES 4, 5, and 6 because there is insufficient energy in the secondary side of the unit to have an accident.

h. Steam Line Isolation - High High Steam Flow Coincident With Safety Injection (Two Loop Units)

This Function provides closure of the MSIVs during a steam line break (or inadvertent opening of a relief or safety valve) to maintain at least one unfaulted SG as a heat sink for the reactor, and to limit the mass and energy release to containment.

Two steam line flow channels per steam line are required to be OPERABLE for this Function. These are combined in a one-out-of-two logic to indicate high steam flow in one steam line. The steam flow transmitters provide control inputs, but the control function cannot cause the events that the Function must protect against. Therefore, two channels are sufficient to satisfy redundancy requirements.

The Allowable Value for high steam flow is a ∆P, corresponding to 130% of full steam flow at full steam pressure. The Trip Setpoint is similarly calculated.

With the transmitters typically located inside the steam tunnels, it is possible for them to experience adverse environmental conditions during a~~n~~ SLB event. Therefore, the ~~Trip Setpoint~~[NTSP] reflects both steady state and adverse environmental instrument uncertainties.

The main steam lines isolate only if the high steam flow signal occurs coincident with an SI signal. The Main Steam Line Isolation Function requirements for the SI Functions are the same as the requirements for their SI function. Therefore, the requirements are not repeated in Table 3.3.2-1. Instead, Function 1, SI, is referenced for all initiating functions and requirements.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

b. Turbine Trip and Feedwater Isolation - Steam Generator Water Level - High High (P-14)

This signal provides protection against excessive feedwater flow. The ESFAS SG water level instruments provide input to the SG Water Level Control System. Therefore, the actuation logic must be able to withstand both an input failure to the control system (which may then require the protection function actuation) and a single failure in the other channels providing the protection function actuation. Thus, four OPERABLE channels are required to satisfy the requirements with a two-out-of-four logic. For units that have dedicated protection and control channels, only three protection channels are necessary to satisfy the protective requirements. For other units that have only three channels, a median signal selector is provided or justification is provided in NUREG-1218 (Ref. 7).

The transmitters (d/p cells) are located inside containment. However, the events that this Function protects against cannot cause a severe environment in containment. Therefore, the ~~Trip Setpoint~~[NTSP] reflects only steady state instrument uncertainties.

c. Turbine Trip and Feedwater Isolation - Safety Injection

Turbine Trip and Feedwater Isolation is also initiated by all Functions that initiate SI. The Feedwater Isolation Function requirements for these Functions are the same as the requirements for their SI function. Therefore, the requirements are not repeated in Table 3.3.2-1. Instead Function 1, SI, is referenced for all initiating functions and requirements.

Turbine Trip and Feedwater Isolation Functions must be OPERABLE in MODES 1 and 2 [and 3] except when all MFIVs, MFRVs, [and associated bypass valves] are closed and [de-activated] [or isolated by a closed manual valve] when the MFW System is in operation and the turbine generator may be in operation. In MODES [3,] 4, 5, and 6, the MFW System and the turbine generator are not in service and this Function is not required to be OPERABLE.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

With the transmitters (d/p cells) located inside containment and thus possibly experiencing adverse environmental conditions (feed line break), the ~~Trip Setpoint~~[NTSP] reflects the inclusion of both steady state and adverse environmental instrument uncertainties.

d. Auxiliary Feedwater - Safety Injection

An SI signal starts the motor driven and turbine driven AFW pumps. The AFW initiation functions are the same as the requirements for their SI function. Therefore, the requirements are not repeated in Table 3.3.2-1. Instead, Function 1, SI, is referenced for all initiating functions and requirements.

e. Auxiliary Feedwater - Loss of Offsite Power

A loss of offsite power to the service buses will be accompanied by a loss of reactor coolant pumping power and the subsequent need for some method of decay heat removal. The loss of offsite power is detected by a voltage drop on each service bus. Loss of power to either service bus will start the turbine driven AFW pumps to ensure that at least one SG contains enough water to serve as the heat sink for reactor decay heat and sensible heat removal following the reactor trip.

Functions 6.a through 6.e must be OPERABLE in MODES 1, 2, and 3 to ensure that the SGs remain the heat sink for the reactor. SG Water Level - Low Low in any operating SG will cause the motor driven AFW pumps to start. The system is aligned so that upon a start of the pump, water immediately begins to flow to the SGs. SG Water Level - Low Low in any two operating SGs will cause the turbine driven pumps to start. These Functions do not have to be OPERABLE in MODES 5 and 6 because there is not enough heat being generated in the reactor to require the SGs as a heat sink. In MODE 4, AFW actuation does not need to be OPERABLE because either AFW or residual heat removal (RHR) will already be in operation to remove decay heat or sufficient time is available to manually place either system in operation.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

f. Auxiliary Feedwater - Undervoltage Reactor Coolant Pump

A loss of power on the buses that provide power to the RCPs provides indication of a pending loss of RCP forced flow in the RCS. The Undervoltage RCP Function senses the voltage downstream of each RCP breaker. A loss of power, or an open RCP breaker, on two or more RCPs, will start the turbine driven AFW pump to ensure that at least one SG contains enough water to serve as the heat sink for reactor decay heat and sensible heat removal following the reactor trip.

g. Auxiliary Feedwater - Trip of All Main Feedwater Pumps

A Trip of all MFW pumps is an indication of a loss of MFW and the subsequent need for some method of decay heat and sensible heat removal to bring the reactor back to no load temperature and pressure. A turbine driven MFW pump is equipped with two pressure switches on the control air/oil line for the speed control system. A low pressure signal from either of these pressure switches indicates a trip of that pump. Motor driven MFW pumps are equipped with a breaker position sensing ~~device.~~channel. An open supply breaker indicates that the pump is not running. Two OPERABLE channels per pump satisfy redundancy requirements with one-out-of-two taken twice logic. A trip of all MFW pumps starts the motor driven and turbine driven AFW pumps to ensure that at least one SG is available with water to act as the heat sink for the reactor.

Functions 6.f and 6.g must be OPERABLE in MODES 1 and 2. This ensures that at least one SG is provided with water to serve as the heat sink to remove reactor decay heat and sensible heat in the event of an accident. In MODES 3, 4, and 5, the RCPs and MFW pumps may be normally shut down, and thus neither pump trip is indicative of a condition requiring automatic AFW initiation.

h. Auxiliary Feedwater - Pump Suction Transfer on Suction Pressure – Low

A low pressure signal in the AFW pump suction line protects the AFW pumps against a loss of the normal supply of water for the pumps, the CST. Two pressure switches are located on the AFW pump suction line from the CST. A low pressure signal

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

sensed by any one of the switches will cause the emergency supply of water for both pumps to be aligned, or cause the AFW pumps to stop until the emergency source of water is aligned. ESW (safety grade) is then lined up to supply the AFW pumps to ensure an adequate supply of water for the AFW System to maintain at least one of the SGs as the heat sink for reactor decay heat and sensible heat removal.

Since the detectors are located in an area not affected by HELBs or high radiation, they will not experience any adverse environmental conditions and the ~~Trip Setpoint~~[NTSP] reflects only steady state instrument uncertainties.

This Function must be OPERABLE in MODES 1, 2, and 3 to ensure a safety grade supply of water for the AFW System to maintain the SGs as the heat sink for the reactor. This Function does not have to be OPERABLE in MODES 5 and 6 because there is not enough heat being generated in the reactor to require the SGs as a heat sink. In MODE 4, AFW automatic suction transfer does not need to be OPERABLE because RHR will already be in operation, or sufficient time is available to place RHR in operation, to remove decay heat.

7. Automatic Switchover to Containment Sump

At the end of the injection phase of a LOCA, the RWST will be nearly empty. Continued cooling must be provided by the ECCS to remove decay heat. The source of water for the ECCS pumps is automatically switched to the containment recirculation sump. The low head residual heat removal (RHR) pumps and containment spray pumps draw the water from the containment recirculation sump, the RHR pumps pump the water through the RHR heat exchanger, inject the water back into the RCS, and supply the cooled water to the other ECCS pumps. Switchover from the RWST to the containment sump must occur before the RWST empties to prevent damage to the RHR pumps and a loss of core cooling capability. For similar reasons, switchover must not occur before there is sufficient water in the containment sump to support ESF pump suction. Furthermore, early switchover must not occur to ensure that sufficient borated water is injected from the RWST. This ensures the reactor remains shut down in the recirculation mode.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

a. Automatic Switchover to Containment Sump - Automatic Actuation Logic and Actuation Relays

Automatic actuation logic and actuation relays consist of the same features and operate in the same manner as described for ESFAS Function 1.b.

b, c. Automatic Switchover to Containment Sump - Refueling Water Storage Tank (RWST) Level - Low Low Coincident With Safety Injection and Coincident With Containment Sump Level – High

During the injection phase of a LOCA, the RWST is the source of water for all ECCS pumps. A low low level in the RWST coincident with an SI signal provides protection against a loss of water for the ECCS pumps and indicates the end of the injection phase of the LOCA. The RWST is equipped with four level transmitters. These transmitters provide no control functions. Therefore, a two-out-of-four logic is adequate to initiate the protection function actuation. Although only three channels would be sufficient, a fourth channel has been added for increased reliability.

The RWST - Low Low Allowable Value/Trip Setpoint has both upper and lower limits. The lower limit is selected to ensure switchover occurs before the RWST empties, to prevent ECCS pump damage. The upper limit is selected to ensure enough borated water is injected to ensure the reactor remains shut down. The high limit also ensures adequate water inventory in the containment sump to provide ECCS pump suction.

The transmitters are located in an area not affected by HELBs or post accident high radiation. Thus, they will not experience any adverse environmental conditions and the ~~Trip Setpoint~~[NTSP] reflects only steady state instrument uncertainties.

Automatic switchover occurs only if the RWST low low level signal is coincident with SI. This prevents accidental switchover during normal operation. Accidental switchover could damage ECCS pumps if they are attempting to take suction from an empty sump. The automatic switchover Function requirements for the SI Functions are the same as the requirements for their SI

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

--------------------------------------REVIEWER'S NOTE-------------------------------
In some units, additional protection from spurious switchover is provided by requiring a Containment Sump Level - High signal as well as RWST Level - Low Low and SI. This ensures sufficient water is available in containment to support the recirculation phase of the accident. A Containment Sump Level - High signal must be present, in addition to the SI signal and the RWST Level - Low Low signal, to transfer the suctions of the RHR pumps to the containment sump. The containment sump is equipped with four level transmitters. These transmitters provide no control functions. Therefore, a two-out-of-four logic is adequate to initiate the protection function actuation. Although only three channels would be sufficient, a fourth channel has been added for increased reliability. The containment sump level Trip Setpoint/Allowable Value is selected to ensure enough borated water is injected to ensure the reactor remains shut down. The high limit also ensures adequate water inventory in the containment sump to provide ECCS pump suction. The transmitters are located inside containment and thus possibly experience adverse environmental conditions. Therefore, the ~~trip setpoint~~[NTSP] reflects the inclusion of both steady state and environmental instrument uncertainties.

Units only have one of the Functions, 7.b or 7.c.

These Functions must be OPERABLE in MODES 1, 2, 3, and 4 when there is a potential for a LOCA to occur, to ensure a continued supply of water for the ECCS pumps. These Functions are not required to be OPERABLE in MODES 5 and 6 because there is adequate time for the operator to evaluate unit conditions and respond by manually starting systems, pumps, and other equipment to mitigate the consequences of an abnormal condition or accident. System pressure and temperature are very low and many ESF components are administratively locked out or otherwise prevented from actuating to prevent inadvertent overpressurization of unit systems.

8. Engineered Safety Feature Actuation System Interlocks

To allow some flexibility in unit operations, several interlocks are included as part of the ESFAS. These interlocks permit the operator to block some signals, automatically enable other signals, prevent some actions from occurring, and cause other actions to occur. The interlock Functions back up manual actions to ensure bypassable functions are in operation under the conditions assumed in the safety analyses.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The RTB position switches that provide input to the P-4 interlock only function to energize or de-energize or open or close contacts. Therefore, this Function has no adjustable trip setpoint with which to associate a ~~Trip Setpoint~~[NTSP] and Allowable Value.

This Function must be OPERABLE in MODES 1, 2, and 3 when the reactor may be critical or approaching criticality. This Function does not have to be OPERABLE in MODE 4, 5, or 6 because the main turbine, the MFW System, and the Steam Dump System are not in operation.

b. Engineered Safety Feature Actuation System Interlocks - Pressurizer Pressure, P-11

The P-11 interlock permits a normal unit cooldown and depressurization without actuation of SI or main steam line isolation. With two-out-of-three pressurizer pressure channels (discussed previously) less than the P-11 setpoint, the operator can manually block the Pressurizer Pressure - Low and Steam Line Pressure - Low SI signals and the Steam Line Pressure - Low steam line isolation signal (previously discussed). When the Steam Line Pressure - Low steam line isolation signal is manually blocked, a main steam isolation signal on Steam Line Pressure - Negative Rate - High is enabled. This provides protection for a~~n~~ SLB by closure of the MSIVs. With two-out-of-three pressurizer pressure channels above the P-11 setpoint, the Pressurizer Pressure - Low and Steam Line Pressure - Low SI signals and the Steam Line Pressure - Low steam line isolation signal are automatically enabled. The operator can also enable these trips by use of the respective manual reset buttons. When the Steam Line Pressure - Low steam line isolation signal is enabled, the main steam isolation on Steam Line Pressure - Negative Rate - High is disabled. The ~~Trip Setpoint~~[NTSP] reflects only steady state instrument uncertainties.

This Function must be OPERABLE in MODES 1, 2, and 3 to allow an orderly cooldown and depressurization of the unit without the actuation of SI or main steam isolation. This Function does not have to be OPERABLE in MODE 4, 5, or 6 because system pressure must already be below the P-11 setpoint for the requirements of the heatup and cooldown curves to be met.

BASES

ACTIONS (continued)

In the event a channel's ~~Trip Setpoint~~trip setpoint is found nonconservative with respect to the Allowable Value, or the transmitter, instrument Loop, signal processing electronics, or bistable is found inoperable, then all affected Functions provided by that channel must be declared inoperable and the LCO Condition(s) entered for the protection Function(s) affected. When the Required Channels in Table 3.3.2-1 are specified (e.g., on a per steam line, per loop, per SG, etc., basis), then the Condition may be entered separately for each steam line, loop, SG, etc., as appropriate.

When the number of inoperable channels in a trip function exceed those specified in one or other related Conditions associated with a trip function, then the unit is outside the safety analysis. Therefore, LCO 3.0.3 should be immediately entered if applicable in the current MODE of operation.

---------------------------REVIEWER'S NOTE---
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use these times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

A.1

Condition A applies to all ESFAS protection functions.

Condition A addresses the situation where one or more channels or trains for one or more Functions are inoperable at the same time. The Required Action is to refer to Table 3.3.2-1 and to take the Required Actions for the protection functions affected. The Completion Times are those from the referenced Conditions and Required Actions.

B.1, B.2.1, and B.2.2

Condition B applies to manual initiation of:

- SI,
- Containment Spray,
- Phase A Isolation, and
- Phase B Isolation.

BASES

SURVEILLANCE REQUIREMENTS

-----------------------------REVIEWER'S NOTE--
In Table 3.3.2-1, Functions 7.b and 7.c were not included in the generic evaluations approved in either WCAP-10271, as supplemented, or WCAP-14333. In order to apply the WCAP-10271, as supplemented, and WCAP-14333 TS relaxations to plant specific Functions not evaluated generically, licensees must submit plant specific evaluations for NRC review and approval.

------------------------ REVIEWER'S NOTE --
The Notes in Table 3.3.2-1 requiring reset of the channel to a predefined as-left tolerance and the verification of the as-found tolerance are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with allowable values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE ------------------------------------
Notes b and c are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes b and c are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note c requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes b and c are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes b and c may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in

result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes b and c being applied to the Functions shown in TS 3.3.2. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

The SRs for each ESFAS Function are identified by the SRs column of Table 3.3.2-1.

A Note has been added to the SR Table to clarify that Table 3.3.2-1 determines which SRs apply to which ESFAS Functions.

Note that each channel of process protection supplies both trains of the ESFAS. When testing channel I, train A and train B must be examined. Similarly, train A and train B must be examined when testing channel II, channel III, and channel IV (if applicable). The CHANNEL CALIBRATION and COTs are performed in a manner that is consistent with the assumptions used in analytically calculating the required channel accuracies.

----------------------------REVIEWER'S NOTE---
Certain Frequencies are based on approved topical reports. In order for a licensee to use these times, the licensee must justify the Frequencies as required by the staff SER for the topical report.

SR 3.3.2.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.4

SR 3.3.2.4 is the performance of a MASTER RELAY TEST. The MASTER RELAY TEST is the energizing of the master relay, verifying contact operation and a low voltage continuity check of the slave relay coil. Upon master relay contact operation, a low voltage is injected to the slave relay coil. This voltage is insufficient to pick up the slave relay, but large enough to demonstrate signal path continuity. This test is performed every 92 days on a STAGGERED TEST BASIS. The time allowed for the testing (4 hours) is justified in Reference 11. The Frequency of 92 days is justified in Reference 9.

SR 3.3.2.5

SR 3.3.2.5 is the performance of a COT.

A COT is performed on each required channel to ensure the entire channel will perform the intended Function. Setpoints must be found ~~within~~conservative with respect to the Allowable Values specified in ~~Table ~~Table 3.3.2-1~~-1.~~. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a 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 the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

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 setpoint shall be left set consistent with the assumptions of the current unit specific setpoint methodology.

The "as~~-~~-found" and "as~~-~~-left" values must also be recorded and reviewed for consistency with the assumptions of Reference 6.

The Frequency of 184 days is justified in Reference 11.

SR 3.3.2.5 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.2-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [NTSP]. Where a setpoint more conservative than the [NTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the channel shall be declared inoperable..

----------------------------------REVIEWER'S NOTE----------------------------------
The bracketed section '[NTSP and the]' of the sentence in Note (c) in Table 3.3.2-1 is not required in plant-specific Technical Specifications which include a [Nominal Trip Setpoint] column in Table 3.3.2-1.

The second Note also requires that the [NTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.2.6

SR 3.3.2.6 is the performance of a SLAVE RELAY TEST. The SLAVE RELAY TEST is the energizing of the slave relays. Contact operation is verified in one of two ways. Actuation equipment that may be operated in the design mitigation MODE is either allowed to function, or is placed in a condition where the relay contact operation can be verified without operation of the equipment. Actuation equipment that may not be operated in the design mitigation MODE is prevented from operation by the SLAVE RELAY TEST circuit. For this latter case, contact operation is verified by a continuity check of the circuit containing the slave relay.

This test is performed every [92] days. The Frequency is adequate, based on industry operating experience, considering instrument reliability and operating history data.

SR 3.3.2.7

SR 3.3.2.7 is the performance of a TADOT every [92] days. This test is a check of the Loss of Offsite Power, Undervoltage RCP, and AFW Pump Suction Transfer on Suction Pressure - Low Functions. Each Function is tested up to, and including, the master transfer relay coils. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The test also includes trip ~~devices~~channels that provide actuation signals directly to the SSPS. 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 Frequency is adequate. It is based on industry operating experience, considering instrument reliability and operating history data.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.8

SR 3.3.2.8 is the performance of a TADOT. This test is a check of the Manual Actuation Functions and AFW pump start on trip of all MFW pumps. It is performed every [18] months. Each Manual Actuation Function is tested up to, and including, the master relay coils. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. In some instances, the test includes actuation of the end device (i.e., pump starts, valve cycles, etc.). The Frequency is adequate, based on industry operating experience and is consistent with the typical refueling cycle. 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 3.3.2.9

SR 3.3.2.9 is the performance of a CHANNEL CALIBRATION.

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

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 Frequency of [18] months is based on the assumption of an [18] month calibration interval in the determination of the magnitude of equipment drift in the setpoint methodology.

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 3.3.2.9 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.2-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [NTSP]. Where a setpoint more conservative than the [NTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the channel shall be declared inoperable.

----------------------------------REVIEWER'S NOTE----------------------------------

The bracketed section '[NTSP and the]' of the sentence in Note (c) in Table 3.3.2-1 is not required in plant-specific Technical Specifications which include a [Nominal Trip Setpoint] column in Table 3.3.2-1.

The second Note also requires that the [NTSP and the] methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

BASES

REFERENCES

1. FSAR, Chapter [6].

2. FSAR, Chapter [7].

3. FSAR, Chapter [15].

4. IEEE-279-1971.

5. 10 CFR 50.49.

6. Plant-specific setpoint methodology study.

7. NUREG-1218, April 1988.

8. WCAP-14333-P-A, Rev. 1, October 1998.

9. WCAP-10271-P-A, Supplement 2, Rev. 1, June 1990.

10. [Plant specific evaluation reference.]

11. WCAP-15376, Rev. 0. October 2000.

12. Technical Requirements Manual, Section 15, "Response Times."

13. WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," January 1996.

14. WCAP-14036-P, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," December 1995.

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

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

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Variable High Power Trip	1, 2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4[(a) (b)] SR 3.3.1.5[(a) (b)] SR 3.3.1.8[(a) (b)] SR 3.3.1.9	≤ [10]% RTP above current THERMAL POWER but not < [30]% RTP nor > [107]% RTP
2. Power Rate of Change - High(~~a~~c)	1, 2	SR 3.3.1.1 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8[(a) (b)]	≤ [2.6] dpm
3. Reactor Coolant Flow - Low(~~b~~d)	1, 2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.7 SR 3.3.1.8[(a) (b)] SR 3.3.1.9	≥ [95]%
4. Pressurizer Pressure - High	1, 2	SR 3.3.1.1 SR 3.3.1.4[(a) (b)] SR 3.3.1.8[(a) (b)] SR 3.3.1.9	≤ [2400] psia
5. Containment Pressure - High	1, 2	[SR 3.3.1.1] SR 3.3.1.4[(a) (b)] SR 3.3.1.8[(a) (b)] SR 3.3.1.9	≤ [4.0] psig
6. Steam Generator Pressure - Low(~~c~~e)	1, 2	SR 3.3.1.1 SR 3.3.1.4[(a) (b)] SR 3.3.1.7 SR 3.3.1.8[(a) (b)] SR 3.3.1.9	≥ [685] psia

(a) [INSERT 1]

(b) [INSERT 2]

(~~a~~c) Trip may be bypassed when THERMAL POWER is < [1E-4]% RTP or > [13]% RTP. Bypass shall be automatically removed when THERMAL POWER is ≥ [1E-4]% RTP and ≤ [13]% RTP.

(~~b~~d) Trips may be bypassed when THERMAL POWER is < [1E-4]%. Bypass shall be automatically removed when THERMAL POWER is ≥ [1E-4]% RTP. During testing pursuant to LCO 3.4.17, RCS Loops - Test Exceptions, trips may be bypassed below 5% RTP. Bypass shall be automatically removed when THERMAL POWER is ≥ 5% RTP.

(~~c~~e) Trip may be bypassed when steam generator pressure is < [785] psig. Bypass shall be automatically removed when steam generator pressure is ≥ [785] psig.

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

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7a. Steam Generator A Level - Low	1, 2	SR 3.3.1.1 SR 3.3.1.4[(a) (b)] SR 3.3.1.8[(a) (b)] SR 3.3.1.9	≥ [24.7]%
7b. Steam Generator B Level - Low	1, 2	SR 3.3.1.1 SR 3.3.1.4[(a) (b)] SR 3.3.1.8[(a) (b)] SR 3.3.1.9	≥ [24.7]%
[8. Axial Power Distribution - High	1(d) (e)	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4[(a) (b)] SR 3.3.1.5[(a) (b)] SR 3.3.1.7 SR 3.3.1.8[(a) (b)] SR 3.3.1.9	Figure 3.3.1-3]
9a. Thermal Margin/Low Pressure (TM/LP)(~~b~~d)	1, 2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4[(a) (b)] SR 3.3.1.5[(a) (b)] SR 3.3.1.7 [SR 3.3.1.8[(a) (b)]] SR 3.3.1.9	Figures 3.3.1-1 and 3.3.1-2
[9b. Steam Generator Pressure Difference(~~b~~d)	1, 2	SR 3.3.1.1 SR 3.3.1.4[(a) (b)] SR 3.3.1.8[(a) (b)] SR 3.3.1.9	≤ [135] psid]
10. Loss of Load (turbine stop valve control oil pressure)	1(f~~d~~) (~~e~~g)	SR 3.3.1.6 SR 3.3.1.7[(a) (b)] SR 3.3.1.8[(a) (b)]	≥ [800] psig

(a) [INSERT 1]

(b) [INSERT 2]

(~~b~~d) Trips may be bypassed when THERMAL POWER is < [1E-4]%. Bypass shall be automatically removed when THERMAL POWER is ≥ [1E-4]% RTP. During testing pursuant to LCO 3.4.17, trips may be bypassed below 5% RTP. Bypass shall be automatically removed when THERMAL POWER is ≥ 5% RTP.

(~~d~~f) Trip is not applicable and may be bypassed when THERMAL POWER is < [15]% RTP. Bypass shall be automatically removed when THERMAL POWER is ≥ [15]% RTP.

(~~e~~g) Trip is only applicable in MODE 1 ≥ [15]% RTP.

Table 3.3.4-1 (page 1 of 2)
Engineered Safety Features Actuation System Instrumentation

FUNCTION	MODES	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Safety Injection Actuation Signal (SIAS)			
a. Containment Pressure - High	1,2,3	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≤ [19.0] psia
b. Pressurizer Pressure - Low~~()~~(c)	1,2,3	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.3 SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≥ [1687] psia
2. Containment Spray Actuation Signal~~()~~(d)			
a. Containment Pressure - High	1,2,3	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≤ [19.0] psia
3. Containment Isolation Actuation Signal			
a. Containment Pressure - High	1,2,3	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≤ [19.0] psia
[b. Containment Radiation - High	1,2,3	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≤ [2x Background]]

(a) [INSERT 1]

(b) [INSERT 2]

~~(a)~~(c) Pressurizer Pressure - Low may be manually bypassed when pressurizer pressure is < [1800] psia. The bypass shall be automatically removed whenever pressurizer pressure is ≥ [1800] psia.

[~~(b)~~(d) SIAS is also required as a permissive to initiate containment spray.]

Table 3.3.4-1 (page 2 of 2)
Engineered Safety Features Actuation System Instrumentation

FUNCTION	MODES	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. Main Steam Isolation Signal			
a. Steam Generator Pressure - Low[e]	1,2[d],3[d]	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.3 SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≥ [495] psig
5. Recirculation Actuation Signal			
a. Refueling Water Tank Level - Low	1,2,3	[SR 3.3.4.1] SR 3.3.4.2[(a) (b)] SR 3.3.4.4[(a) (b)] SR 3.3.4.5	[≥ 24 inches and ≤ 30] inches above tank bottom
6. Auxiliary Feedwater Actuation Signal (AFAS)			
a. Steam Generator A Level - Low	1,2,3	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≥ [45.7] %
b. Steam Generator B Level - Low	1,2,3	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≥ [45.7] %
c. Steam Generator Pressure Difference - High (A > B) or (B > A)	1,2,3	SR 3.3.4.1 SR 3.3.4.2[(a) (b)] SR 3.3.4.4[(a) (b)] SR 3.3.4.5	≤ [48.3] psid

(a) [INSERT 1]

(b) [INSERT 2]

(~~c~~e) Steam Generator Pressure - Low may be manually bypassed when steam generator pressure is < [785] psia. The bypass shall be automatically removed whenever steam generator pressure is ≥ [785] psia.

(d) Only the Main Steam Isolation Signal (MSIS) Function and the Steam Generator Pressure - Low and Containment Pressure - High signals are not required to be OPERABLE when all associated valves isolated by the MSIS Function are closed and [de-activated].

B 3.3 INSTRUMENTATION

B 3.3.1 Reactor Protective System (RPS) Instrumentation - Operating (Analog)

BASES

BACKGROUND

The Reactor Protective System (RPS) initiates a reactor trip to protect against violating the core specified acceptable fuel design limits and breaching the reactor coolant pressure boundary (RCPB) during anticipated operational occurrences (AOOs). By tripping the reactor, the RPS also assists the Engineered Safety Features (ESF) systems in mitigating accidents.

The protection and monitoring systems have been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

~~Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "…settings for automatic protective devices…so chosen that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded.~~ 10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic ~~protective devices~~ protection channels must be chosen to be more conservative than the Analytical Limit to account for ~~instrument loop~~ channel uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE -----------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used.

The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.1-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

The ~~trip setpoint~~ [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a ~~protective device~~ protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the ~~trip setpoint~~ [LTSP] accounts for uncertainties in setting the ~~device~~ channel (e.g., calibration), uncertainties in how the ~~device~~channel might actually perform (e.g., repeatability), changes in the point of action of the ~~device~~channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the ~~trip setpoint~~[LTSP] ~~plays an important role in ensuring~~ ensures that SLs are not exceeded. As such, the ~~trip setpoint~~ [LTSP] meets the definition of a SL-LSSS (Ref. 1)~~and could be used to meet the requirement that they be contained in the Technical Specifications~~.

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." ~~For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for these devices. However, u~~Use of the ~~trip setpoint~~[LTSP] to define OPERABILITY in Technical Specifications ~~and its corresponding designation as the LSSS required by 10 CFR 50.36~~ would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as~~-~~-found" value of a ~~protective device~~ protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic

~~protective device~~protection channel with a setting that has been found to be different from the ~~trip setpoint~~[LTSP] due to some drift of the setting may still be OPERABLE ~~since ~~because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the ~~trip setpoint~~[LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as~~-~~-found" setting of the ~~protective device.~~protection channel. Therefore, the ~~device~~channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the ~~device~~channel to the[LTSP]~~ trip setpoint~~ to account for further drift during the next surveillance interval.

~~Use ~~However, there is also some point beyond which the channel would have not been able to perform its function due to, for example, greater than expected drift. The Allowable Value specified in Table 3.3.1-1 is the least conservative value of the ~~trip setpoint to define "~~as~~-~~-found~~"~~ ~~OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted. 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 which, as stated above, is the same as the LSSS.~~

~~The Allowable Valuable specified in Table 3.3.1-1 serves as the LSSS~~ setpoint that a channel can have during testing such that a channel is OPERABLE if the trip setpoint is found ~~not to exceed ~~conservative with respect to the Allowable Value during the CHANNEL FUNCTIONAL TEST (CFT). As such, the Allowable Value differs from the ~~trip setpoint~~[LTSP] by an amount ~~primarily~~[greater than or] equal to the expected instrument ~~loop~~channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the ~~device~~channel 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~~channel has

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BACKGROUND (continued)

not drifted beyond that expected during the surveillance interval. ~~If the actual setting 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.~~ Note that, although the channel is ~~"~~OPERABLE~~"~~ under these circumstances, the ~~trip~~ setpoint ~~should~~must be left adjusted to a value within the established ~~trip setpoint calibration~~as-left 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~~.~~ (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

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

- The departure from nucleate boiling ratio (DNBR) shall be maintained above the Safety Limit (SL) value to prevent departure from nucleate boiling,
- Fuel centerline melting shall not occur, and
- The Reactor Coolant System (RCS) pressure SL of 2750 psia shall not be exceeded.

Maintaining the parameters within the above values ensures that the offsite dose will be within the 10 CFR 50 (Ref. 2) and 10 CFR 100 (Ref. 3) criteria during AOOs.

Accidents are events that are analyzed even though they are not expected to occur during the plant life. The acceptable limit during accidents is that the offsite dose shall be maintained within an acceptable fraction of 10 CFR 100 (Ref. 3) limits. Different accident categories allow 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. However, the acceptable dose limit for an accident category and their associated [LTSPs] are not considered to be LSSS as defined in 10 CFR 50.36.

The RPS is segmented into four interconnected modules. These modules are:

- Measurement channels,

- Bistable trip units,
- RPS Logic, and
- Reactor trip circuit breakers (RTCBs).

This LCO addresses measurement channels and bistable trip units. It also addresses the automatic bypass removal feature for those trips with operating bypasses. The RPS Logic and RTCBs are addressed in LCO 3.3.3, "Reactor Protective System (RPS) Logic and Trip Initiation."

The role of each of these modules in the RPS, including those associated with the logic and RTCBs, is discussed below.

Measurement Channels

Measurement channels, consisting of field transmitters or process sensors and associated instrumentation, provide a measurable electronic signal based upon the physical characteristics of the parameter being measured.

The excore nuclear instrumentation and the analog core protection calculators (CPCs) are considered components in the measurement channels. The wide range nuclear instruments (NIs) provide a Power Rate of Change - High Trip. Three RPS trips use a power level designated as Q power as an input. Q power is the higher of NI power and primary calorimetric power (ΔT power) based on RCS hot leg and cold leg temperatures. Trips using Q power as an input include the Variable High Power Trip (VHPT) - High, Thermal Margin/Low Pressure (TM/LP), and the Axial Power Distribution (APD) - High trips.

The analog CPCs provide the complex signal processing necessary to calculate the TM/LP trip setpoint, APD trip setpoint, VHPT trip setpoint, and Q power calculation.

The excore NIs (wide range and power range) and the analog CPCs (TM/LP and APD calculators) are mounted in the RPS cabinet, with one channel of each in each of the four RPS bays.

BACKGROUND (continued)

Four identical measurement channels, designated channels A through D, with electrical and physical separation are provided for each parameter used in the direct generation of trip signals. ~~These are designated channels A through D.~~ Measurement channels provide input to one or more RPS bistables within the same RPS channel. In addition, some measurement channels may also be used as inputs to Engineered Safety Features Actuation System (ESFAS) bistables, and most provide indication in the control room. Measurement channels used as an input to the RPS are never used for control functions.

When a channel monitoring a parameter exceeds a predetermined setpoint, indicating an unsafe condition, the bistable monitoring the parameter in that channel will trip. Tripping two or more channels of bistables monitoring the same parameter de-energizes Matrix Logic, which in turn de-energizes the Initiation Logic. This causes all eight RTCBs to open, interrupting power to the control element assemblies (CEAs), allowing them to fall into the core.

Three of the four measurement and bistable channels are necessary to meet the redundancy and testability of GDC 21 in 10 CFR 50, Appendix A (Ref. 2). The fourth channel provides additional flexibility by allowing one channel to be removed from service (trip channel bypass) for maintenance or testing while still maintaining a minimum two-out-of-three logic. Thus, even with a channel inoperable, no single additional failure in the RPS can either cause an inadvertent trip or prevent a required trip from occurring.

Since no single failure will either cause or prevent a protective system actuation, and no protective channel feeds a control channel, this arrangement meets the requirements of IEEE Standard 279-1971 (Ref. 4).

Many of the RPS trips are generated by comparing a single measurement to a fixed bistable ~~setpoint.~~[LTSP]. Certain Functions, however, make use of more than one measurement to provide a trip. The following trips use multiple measurement channel inputs:

- Steam Generator Level - Low

  This trip uses the lower of the two steam generator levels as an input to a common bistable.

BACKGROUND (continued)

- Steam Generator Pressure - Low

  This trip uses the lower of the two steam generator pressures as an input to a common bistable.

- Variable High Power Trip (VHPT) - High

  The VHPT uses Q power as its only input. Q power is the higher of NI power and ΔT power. It has a trip setpoint that tracks power levels downward so that it is always within a fixed increment above current power, subject to a minimum value.

  On power increases, the trip setpoint remains fixed unless manually reset, at which point it increases to the new setpoint, a fixed increment above Q power at the time of reset, subject to a maximum value. Thus, during power escalation, the trip setpoint must be repeatedly reset to avoid a reactor trip.

- Thermal Margin/Low Pressure (TM/LP) and Steam Generator Pressure Difference

  Q power is only one of several inputs to the TM/LP trip. Other inputs include internal ASI and cold leg temperature based on the higher of two cold leg resistance temperature detectors. The TM/LP trip setpoint is a complex function of these inputs and represents a minimum acceptable RCS pressure to be compared to actual RCS pressure in the TM/LP trip unit.

  Steam generator pressure is also an indirect input to the TM/LP trip via the Steam Generator Pressure Difference. This Function provides a reactor trip when the secondary pressure in either steam generator exceeds that of the other generator by greater than a fixed amount. The trip is implemented by biasing the TM/LP trip setpoint upward so as to ensure TM/LP trip if an asymmetric steam generator transient is detected.

- Axial Power Distribution (APD) - High

  Q Power and ASI are inputs to the APD trip. The APD trip setpoint is a function of Q power, being more restrictive at higher power levels. It provides a reactor trip if actual ASI exceeds the APD trip setpoint.

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BACKGROUND (continued)

Bistable Trip Units

Bistable trip units, mounted in the RPS cabinet, receive an analog input from the measurement channels, compare the analog input to trip setpoints, and provide contact output to the Matrix Logic. They also provide local trip indication and remote annunciation.

There are four channels of bistable trip units, designated A through D, for each RPS Function, one for each measurement channel. Bistable output relays de-energize when a trip occurs.

The contacts from these bistable relays are arranged into six coincidence matrices, comprising the Matrix Logic. If bistables monitoring the same parameter in at least two channels trip, the Matrix Logic will generate a reactor trip (two-out-of-four logic).

~~.~~ Some of the RPS measurement channels provide contact outputs to the RPS, so the comparison of an analog input to a trip setpoint is not necessary. In these cases, the bistable trip unit is replaced with an auxiliary trip unit. The auxiliary trip units provide contact multiplication so the single input contact opening can provide multiple contact outputs to the coincidence logic as well as trip indication and annunciation.

Trips employing auxiliary trip units include the Loss of Load trip and the APD - High trip. The Loss of Load trip is a contact input from the Electro Hydraulic Control System control oil pressure on each of the four high pressure stop valves.

The APD trip, described above, is a complex function in which the actual trip comparison is performed within the CPC. Therefore the APD - High trip unit employs a contact input from the CPC.

All RPS trips, with the exception of the Loss of Load trip, generate a pretrip alarm as the trip setpoint is approached.

The trip setpoints used in the bistable trip units are based on the analytical limits stated in Reference 5. The selection of these ~~trip setpoints~~ analytical limits 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 RPS channels that must function in harsh environments, as defined by 10 CFR 50.49 (Ref. 6) - Allowable Values specified in Table 3.3.1-1, in the accompanying LCO, are

BASES

BACKGROUND (continued)

conservatively adjusted with respect to the analytical limits. A detailed description of the methodology used to calculate the trip setpoints, including their explicit uncertainties, is provided in the "Plant Protection System Selection of Trip Setpoint Values" (Ref. 7). The ~~nominal~~ trip setpoint entered into the bistable is normally still more conservative than that specified by the Allowable Value, to account for changes in random measurement errors detectable by a CHANNEL FUNCTIONAL TEST. One example of such a change in measurement error is drift during the interval between surveillances. ~~A channel is inoperable if its actual setpoint is not within its required Allowable Value.~~

~~Setpoints~~[LTSPs] in accordance with the Allowable Value will ensure that SLs of Chapter 2.0 are not violated during AOOs and the consequences of DBAs will be acceptable, providing the plant is operated from within the LCOs at the onset of the AOO or DBA and the equipment functions as designed.

Note that in the accompanying LCO 3.3.1, the Allowable Values of Table 3.3.1-1 are the ~~LSSS.~~least conservative value of the as-found setpoint that a channel can have during a periodic CHANNEL CALIBRATION or CHANNEL FUNCTIONAL TEST, such that a channel is operable if the as-found setpoint is conservative with respect to the Allowable Value.

RPS Logic

The RPS Logic, addressed in LCO 3.3.3, consists of both Matrix and Initiation Logic and employs a scheme that provides a reactor trip when bistables in any two out of the four channels sense the same input parameter trip. This is called a two-out-of-four trip logic. This logic and the RTCB configuration are shown in Figure B 3.3.1-1.

Bistable relay contact outputs from the four channels are configured into six logic matrices. Each logic matrix checks for a coincident trip in the same parameter in two bistable channels. The matrices are designated the AB, AC, AD, BC, BD, and CD matrices to reflect the bistable channels being monitored. Each logic matrix contains four normally energized matrix relays. When a coincidence is detected, consisting of a trip in the same Function in the two channels being monitored by the logic matrix, all four matrix relays de-energize.

BASES

BACKGROUND (continued)

Each set of RTCBs is operated by either a Manual Trip push button or an RPS actuated K-relay. There are four Manual Trip push buttons, arranged in two sets of two, as shown in Figure B 3.3.1-1. Depressing both push buttons in either set will result in a reactor trip.

When a Manual Trip is initiated using the control room push buttons, the RPS trip paths and K-relays are bypassed, and the RTCB undervoltage and shunt trip attachments are actuated independent of the RPS.

Manual Trip circuitry includes the push button and interconnecting wiring to both RTCBs necessary to actuate both the undervoltage and shunt trip attachments but excludes the K-relay contacts and their interconnecting wiring to the RTCBs, which are considered part of the Initiation Logic.

Functional testing of the entire RPS, from bistable input through the opening of individual sets of RTCBs, can be performed either at power or shutdown and is normally performed on a quarterly basis.
FSAR, Section [7.2] (Ref. 8), explains RPS testing in more detail.

APPLICABLE SAFETY ANALYSES

Each of the analyzed accidents and transients can be detected by one or more RPS Functions. The accident analysis contained in Reference 5 takes credit for most RPS trip Functions. Functions not specifically credited in the accident analysis are part of the NRC approved licensing basis for the plant. These Functions may provide protection for conditions that do not require dynamic transient analysis to demonstrate Function performance. Other Functions, such as the Loss of Load trip, are purely equipment protective, and their use minimizes the potential for equipment damage.

Trip Setpoints for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Loss of Load and APD - High bypass removal. The Loss of Load and APD - High trips are automatically bypassed when at < 15% RTP as sensed by the power range NI Level 1 bistable. The bypass is automatically removed by this bistable above the setpoint. This same bistable is used to bypass the Power Rate of Change - High trip.

Steam Generator Pressure - Low bypass removal. The Steam Generator Pressure - Low trip is manually enabled below the pretrip setpoint. The permissive is removed, and the bypass automatically removed, when the Steam Generator Pressure - Low pretrip clears.

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

LCO

The LCO requires all instrumentation performing an RPS Function to be OPERABLE. Failure of any required portion of the instrument channel renders the affected channel(s) inoperable and reduces the reliability of the affected Functions. The specific criteria for determining channel OPERABILITY differ slightly between Functions. These criteria are discussed on a Function by Function basis below.

Actions allow maintenance (trip channel) bypass of individual channels, but the bypass activates interlocks that prevent operation with a second channel in the same Function bypassed. Plants are restricted to 48 hours in a trip channel bypass condition before either restoring the Function to four channel operation (two-out-of-four logic) or placing the channel in trip (one-out-of-three logic). At plants where adequate channel to channel independence has been demonstrated, specific exceptions may be approved by the NRC staff to permit one of the two-out-of-four channels to be bypassed for an extended period of time.

Only the Allowable Values are specified for each RPS trip Function in the LCO. ~~Nominal trip setpoints are specified in the plant specific setpoint calculations. The nominal setpoints~~The [LTSP] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure ~~the setpoints~~ that the setpoint measured by CHANNEL FUNCTIONAL TESTS ~~do~~does not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the ~~nominal trip setpoint~~[LTSP], but within its Allowable Value, is acceptable, provided that operation and testing are consistent with the assumptions of the plant specific setpoint calculations. Therefore, the Allowable Value specified in Table 3.3.1-1 is the least conservative value of the as-found setpoint that the channel can have when tested,. ~~Each Allowable Value specified is more conservative than the analytical limit assumed in the safety analysis~~

~~in order to account for instrument uncertainties appropriate to the trip Function. These uncertainties are defined in the "Plant Protection System Selection of Trip Setpoint Values" (Ref. 7).~~

Bases

LCO (continued)

The following Bases for each trip Function identify the above RPS trip Function criteria items that are applicable to establish the trip Function OPERABILITY.

----------------------------------REVIEWER'S NOTE----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."
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1. Variable High Power Trip (VHPT) - High

   This LCO requires all four channels of the VHPT to be OPERABLE in MODES 1 and 2.

   The Allowable Value is high enough to provide an operating envelope that prevents unnecessary Linear Power Level - High reactor VHPT - High trips during normal plant operations. The Allowable Value is low enough for the system to maintain a margin to unacceptable fuel cladding damage should a CEA ejection accident occur.

   The VHPT setpoint is operator adjustable and can be set at a fixed increment above the indicated THERMAL POWER level. Operator action is required to increase the trip setpoint as THERMAL POWER is increased. The trip setpoint is automatically decreased as THERMAL POWER decreases. The ~~trip setpoint~~[LTSP] has a maximum and a minimum setpoint.

   Adding to this maximum value the possible variation in ~~trip setpoint~~[LTSP] due to calibration and instrument errors, the maximum actual steady state THERMAL POWER level at which a trip would be actuated is 112% RTP, which is the value used in the safety analyses.

BASES

APPLICABILITY

This LCO is applicable in accordance with Table 3.3.1-1. Most RPS trips are required ~~-~~to be OPERABLE in MODES 1 and 2 because the reactor is critical in these MODES. The trips are designed to take the reactor subcritical, maintaining the SLs during AOOs and assisting the ESFAS in providing acceptable consequences during accidents. Exceptions are addressed in footnotes to the table. Exceptions to this APPLICABILITY are:

- The APD - High Trip and Loss of Load are only applicable in MODE 1 ≥ 15% RTP because they may be automatically bypassed at < 15% RTP, where they are no longer needed.
- The Power Rate of Change - High trip, RPS Logic, RTCBs, and Manual Trip are also required in MODES 3, 4, and 5, with the RTCBs closed, to provide protection for boron dilution and CEA withdrawal events. The Power Rate of Change - High trip in these lower MODES is addressed in LCO 3.3.2, "Reactor Protective System (RPS) Instrumentation - Shutdown." The RPS Logic in MODES 1, 2, 3, 4, and 5 is addressed in LCO 3.3.3.

Most trips are not required to be OPERABLE in MODES 3, 4, and 5. In MODES 3, 4, and 5, the emphasis is placed on return to power events. The reactor is protected in these MODES by ensuring adequate SDM.

ACTIONS

The most common causes of channel inoperability are outright failure or drift of the bistable or process module sufficient to exceed the tolerance allowed by the plant specific setpoint analysis. Typically, the drift is found to be small and results in a delay of actuation rather than a total loss of function. This determination is generally made during the performance of a CHANNEL FUNCTIONAL TEST when the process instrument is set up for adjustment to bring it to within specification. If the trip setpoint is ~~less~~ non-conservative ~~than~~with respect to the Allowable Value in Table 3.3.1-1, the channel is declared inoperable immediately, and the appropriate Condition(s) must be entered immediately.

In the event a channel's trip setpoint is found non-conservative with respect to the Allowable Value, or the transmitter, instrument loop, signal processing electronics, or RPS bistable trip unit is found inoperable, then all affected Functions provided by that channel must be declared inoperable, and the plant must enter the Condition for the particular protection Function affected.

When the number of inoperable channels in a trip Function exceeds that specified in any related Condition associated with the same trip Function, then the plant is outside the safety analysis. Therefore, LCO 3.0.3 is immediately entered if applicable in the current MODE of operation.

BASES

ACTIONS (continued)

G.1

Condition G is entered when the Required Action and associated Completion Time of Conditions A, B, C, D, E, or F are not met.

If the Required Actions associated with these Conditions cannot be completed within the required Completion Times, the reactor must be brought to a MODE in which the Required Actions do not apply. The allowed Completion Time of 6 hours to be in MODE 3 is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

The SRs for any particular RPS Function are found in the SR column of Table 3.3.1-1 for that Function. Most Functions are subject to CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, CHANNEL CALIBRATION, and response time testing.

-----------------------------------REVIEWER'S NOTE-----------------------------------
In order for a plant to take credit for topical reports as the basis for justifying Frequencies, topical reports must be supported by an NRC staff SER that establishes the acceptability of each topical report for that plant (Ref. 9).

-------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.1-1 requiring reset of the channel to a predefined as-left tolerance and the verification of the as-found tolerance are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with allowable values in the table, but doing so is not required to comply with 10 CFR 50.36.

-------------------------------- REVIEWER'S NOTE -----------------------------------
Notes a and b are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes a and b are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors,

manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note b requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes a and b are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes a and b may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

SR 3.3.1.1

Performance of the CHANNEL CHECK once every 12 hours 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.3

It is necessary to calibrate the excore power range channel upper and lower subchannel amplifiers such that the internal ASI used in the TM/LP and APD - High trips reflects the true core power distribution as determined by the incore detectors. A Note to the Frequency indicates the Surveillance is required within 12 hours after THERMAL POWER is ≥ [20]% RTP. Uncertainties in the excore and incore measurement process make it impractical to calibrate when THERMAL POWER is < [20]% RTP. The Completion Time of 12 hours allows time for plant stabilization, data taking, and instrument calibration. If the excore detectors are not properly calibrated to agree with the incore detectors, power is restricted during subsequent operations because of increased uncertainty associated with using uncalibrated excore detectors. The 31 day Frequency is adequate, based on operating experience of the excore linear amplifiers and the slow burnup of the detectors. The excore readings are a strong function of the power produced in the peripheral fuel bundles and do not represent an integrated reading across the core. Slow changes in neutron flux during the fuel cycle can also be detected at this Frequency.

SR 3.3.1.4

A CHANNEL FUNCTIONAL TEST is performed on each RPS instrument channel, except Loss of Load and Power Rate of Change, every [92] days to ensure the entire channel will perform its intended function when needed. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

In addition to power supply tests, The RPS CHANNEL FUNCTIONAL TEST consists of three overlapping tests as described in Reference 8. These tests verify that the RPS is capable of performing its intended function, from bistable input through the RTCBs. They include:

BASES

SURVEILLANCE REQUIREMENTS (continued)

Bistable Tests

The bistable setpoint must be found to trip ~~within~~conservative with respect to the Allowable Values specified in the LCO and left set consistent with the assumptions of the plant specific setpoint analysis (Ref. 7). As~~-~~-found [and as~~-~~-left] values must also be recorded and reviewed for consistency with the assumptions of the frequency extension analysis. The requirements for this review are outlined in Reference 10.

A test signal is superimposed on the input in one channel at a time to verify that the bistable trips within the specified tolerance around the setpoint. This is done with the affected RPS channel trip channel bypassed. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint analysis.

SR 3.3.1.4 for SL-LSSS Functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

Matrix Logic Tests

Matrix Logic tests are addressed in LCO 3.3.3. This test is performed one matrix at a time. It verifies that a coincidence in the two input channels for each Function removes power from the matrix relays. During testing, power is applied to the matrix relay test coils and prevents the matrix relay contacts from assuming their de-energized state. This test will detect any short circuits around the bistable contacts in the coincidence logic, such as may be caused by faulty bistable relay or trip channel bypass contacts.

Trip Path Tests

Trip Path (Initiation Logic) tests are addressed in LCO 3.3.3. These tests are similar to the Matrix Logic tests, except that test power is withheld from one matrix relay at a time, allowing the initiation circuit to de-energize, opening the affected set of RTCBs. The RTCBs must then be closed prior to testing the other three initiation circuits, or a reactor trip may result.

The Frequency of [92] days is based on the reliability analysis presented in topical report CEN-327, "RPS/ESFAS Extended Test Interval Evaluation" (Ref. 10).

ASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.5

A CHANNEL CALIBRATION of the excore power range channels every 92 days ensures that the channels are reading accurately and within tolerance. The Surveillance verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift between successive calibrations to ensure that the channel remains operational between successive tests. CHANNEL CALIBRATIONS must be performed consistent with the plant specific setpoint analysis.

The as~~-~~-found and as~~-~~-left values must also be recorded and reviewed for consistency with the assumptions of the frequency extension analysis. The requirements for this review are outlined in Reference [10].

A Note is added stating that the neutron detectors are excluded from CHANNEL CALIBRATION because they are passive ~~devices~~channels with minimal drift and because of the difficulty of simulating a meaningful signal. Slow changes in detector sensitivity are compensated for by performing the daily calorimetric calibration (SR 3.3.1.2) and the monthly linear subchannel gain check (SR 3.3.1.3). In addition, associated control room indications are continuously monitored by the operators.

SR 3.3.1.5 for SL-LSSS Functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

The Frequency of 92 days is acceptable, based on plant operating experience, and takes into account indications and alarms available to the operator in the control room.

SR 3.3.1.6

A CHANNEL FUNCTIONAL TEST on the Loss of Load and Power Rate of Change channels is performed prior to a reactor startup to ensure the entire channel will perform its intended function if required. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The Loss of Load pressure sensor cannot be tested during reactor operation without closing the high pressure TSV, which would result in a turbine trip or reactor trip. The Power Rate of Change - High trip Function is required during startup operation and is bypassed when shut down or > 15% RTP.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.7

SR 3.3.1.7 is a CHANNEL FUNCTIONAL TEST similar to SR 3.3.1.4, except SR 3.3.1.7 is applicable only to bypass Functions and is performed once within 92 days prior to each startup. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Proper operation of bypass permissives is critical during plant startup because the bypasses must be in place to allow startup operation and must be removed at the appropriate points during power ascent to enable certain reactor trips. Consequently, the appropriate time to verify bypass removal function OPERABILITY is just prior to startup. The allowance to conduct this test within 92 days of startup is based on the reliability analysis presented in topical report CEN-327, "RPS/ESFAS Extended Test Interval Evaluation" (Ref. 10). Once the operating bypasses are removed, the bypasses must not fail in such a way that the associated trip Function gets inadvertently bypassed. This feature is verified by the trip Function CHANNEL FUNCTIONAL TEST, SR 3.3.1.4. Therefore, further testing of the bypass function after startup is unnecessary.

SR 3.3.1.8

SR 3.3.1.8 is the performance of a CHANNEL CALIBRATION every [18] months.

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The Surveillance verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift between successive calibrations to ensure that the channel remains operational between successive tests. CHANNEL CALIBRATIONS must be performed consistent with the plant specific setpoint analysis.

The as-~~-~~found [and as-~~-~~left] values must also be recorded and reviewed for consistency with the assumptions of the frequency extension analysis. The requirements for this review are outlined in Reference [10].

SR 3.3.1.8 for SL-LSSS Functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

The Frequency is based upon the assumption of an 18 month calibration interval for the determination of the magnitude of equipment drift.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance is modified by a Note to indicate that the neutron detectors are excluded from CHANNEL CALIBRATION because they are passive ~~devices~~channels with minimal drift and because of the difficulty of simulating a meaningful signal. Slow changes in detector sensitivity are compensated for by performing the daily calorimetric calibration (SR 3.3.1.2) and the monthly linear subchannel gain check (SR 3.3.1.3).

SR 3.3.1.9

This SR ensures that the RPS RESPONSE TIMES are verified to be less than or equal to the maximum values assumed in the safety analysis. 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

A Note is added to indicate that the neutron detectors are excluded from RPS RESPONSE TIME testing because they are passive ~~devices~~channels with minimal drift and because of the difficulty of simulating a meaningful signal. Slow changes in detector sensitivity are compensated for by performing the daily calorimetric calibration (SR 3.3.1.2).

REFERENCES

1. Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation."
2. 10 CFR 50, Appendix A, GDC 21.
3. 10 CFR 100.
4. IEEE Standard 279-1971, April 5, 1972.
5. FSAR, Chapter [14].
6. 10 CFR 50.49.
7. "Plant Protection System Selection of Trip Setpoint Values."
8. FSAR, Section [7.2].
9. NRC Safety Evaluation Report, [Date].
10. CEN-327, June 2, 1986, including Supplement 1, March 3, 1989.
11. CEOG Topical Report CE NPSD-1167-A, "Elimination of Pressure Sensor Response Time Testing Requirements."

B 3.3 INSTRUMENTATION

B 3.3.4 Engineered Safety Features Actuation System (ESFAS) Instrumentation (Analog)

BASES

BACKGROUND

The ESFAS initiates necessary safety systems, based upon the values of selected unit parameters, to protect against violating core design limits and the Reactor Coolant System (RCS) pressure boundary and to mitigate accidents. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE -----------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.4-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.4-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-

found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of a SL-LSSS (Ref. 11).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as-found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as-found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel to the [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel would have not been able to perform its function due to, for example, greater than expected drift. The Allowable Value specified in Table 3.3.4-1 is the least conservative value of the as-found setpoint that a channel can have during testing such that a channel is OPERABLE if the trip setpoint is found conservative with respect to the Allowable Value during the CHANNEL FUNCTIONAL TEST (CFT). As such, the Allowable Value differs from the [LTSP] by an amount [greater than or] equal to the expected instrument channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the channel will ensure that a SL is not exceeded at any given point of time as long as the channel has

not drifted beyond that expected during the surveillance interval. Note that, although the channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established as-left tolerance, in accordance with uncertainty assumptions (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable..

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

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

- The departure from nucleate boiling ratio (DNBR) shall be maintained above the Safety Limit (SL) value to prevent departure from nucleate boiling,
- Fuel centerline melting shall not occur, and
- The Reactor Coolant System (RCS) pressure SL of 2750 psia shall not be exceeded.

Maintaining the parameters within the above values ensures that the offsite dose will be within the 10 CFR 50 (Ref. 2) and 10 CFR 100 (Ref. 3) criteria during AOOs.

Accidents are events that are analyzed even though they are not expected to occur during the plant life. The acceptable limit during accidents is that the offsite dose shall be maintained within an acceptable fraction of 10 CFR 100 (Ref. 3) limits. Different accident categories allow 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. However, the acceptable accident dose limit for an accident category and their associated [LTSPs] are not considered to be LSSS as defined in 10 CFR 50.36.

The ESFAS contains devices and circuitry that generate the following signals when the monitored variables reach levels that are indicative of conditions requiring protective action:

1. Safety Injection Actuation Signal (SIAS),

2. Containment Spray Actuation Signal (CSAS),

3. Containment Isolation Actuation Signal (CIAS),

4. Main Steam Isolation Signal (MSIS),

5. Recirculation Actuation Signal (RAS), and

6. Auxiliary Feedwater Actuation Signal (AFAS).

Equipment actuated by each of the above signals is identified in the FSAR (Ref. 1).

Each of the above ESFAS actuation systems is segmented into four sensor subsystems and two actuation subsystems. Each sensor subsystem includes measurement channels and bistables. The actuation subsystems include two logic subsystems for sequentially loading the diesel generators.

Each of the four sensor subsystem channels monitors redundant and independent process measurement channels. Each sensor is monitored by at least one bistable. The bistable associated with each ESFAS Function will trip when the monitored variable exceeds the ~~trip setpoint.~~[LTSP]. When tripped, the sensor subsystems provide outputs to the two actuation subsystems.

BASES

BACKGROUND (continued)

The two independent actuation subsystems compare the four sensor subsystem outputs. If a trip occurs in the same parameter in two or more sensor subsystem channels, the two-out-of-four logic in each actuation subsystem will initiate one train of ESFAS. Each train can provide protection to the public in the case of a Design Basis Event. Actuation Logic is addressed in LCO 3.3.5, "Engineered Safety Features Actuation System (ESFAS) Logic and Manual Trip."

Each of the four sensor subsystems is mounted in a separate cabinet, excluding the sensors and field wiring.

The role of the sensor subsystem (measurement channels and bistables) is discussed below; actuation subsystems are discussed in LCO 3.3.5.

Measurement Channels

Measurement channels, consisting of field transmitters or process sensors and associated instrumentation, provide a measurable electronic signal based upon the physical characteristics of the parameter being measured.

Four identical measurement channels with electrical and physical separation are provided for each parameter used in the generation of trip signals. These are designated Channels A through D. Measurement channels provide input to ESFAS bistables within the same ESFAS channel. In addition, some measurement channels may also be used as inputs to Reactor Protective System (RPS) bistables, and most provide indication in the control room. Measurement channels used as an input to the RPS or ESFAS are not used for control Functions.

When a channel monitoring a parameter indicates an unsafe condition, the bistable monitoring the parameter in that channel will trip. Tripping two or more channels of bistables monitoring the same parameter will de-energize both channels of Actuation Logic of the associated Engineered Safety Features (ESF) equipment.

Three of the four measurement and bistable channels are necessary to meet the redundancy and testability of GDC 21 in Appendix A to 10 CFR 50 (Ref. 2). The fourth channel provides additional flexibility by allowing one channel to be removed from service (trip channel bypass) for maintenance or testing while still maintaining a minimum two-out-of-three logic.

BASES

BACKGROUND (continued)

In order to take full advantage of the four channel design, adequate channel to channel independence must be demonstrated, and approved by the NRC staff. Plants not currently licensed ~~as~~ to credit four channel independence that may desire this capability must have approval of the NRC staff documented by an NRC Safety Evaluation Report (Ref. 3). Adequate channel to channel independence includes physical and electrical independence of each channel from the others. Furthermore, each channel must be energized from separate inverters and station batteries. Plants not demonstrating four channel independence may operate in a two-out-of-three logic configuration for 48 hours.

Since no single failure will either cause or prevent a protective system actuation and no protective channel feeds a control channel, this arrangement meets the requirements of IEEE Standard 79-1971 (Ref. 4).

Bistable Trip Units

Bistable trip units receive an analog input from the measurement channels, compare the analog input to trip setpoints, and provide contact output to the Actuation Logic. They also provide local trip indication and remote annunciation.

There are four channels of bistables, designated A through D, for each ESF Function, one for each measurement channel. In cases where two ESF Functions share the same input and trip setpoint (e.g., containment pressure input to CSAS, CIAS, and SIAS and a Pressurizer Pressure - Low input to the RPS and SIAS), the same bistable may be used to satisfy both Functions.

The trip setpoints and Allowable Values used in the bistables are based on the analytical limits stated in Reference 5. The selection of these ~~trip setpoints~~analytical limits 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 effects, for those ESFAS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 6), Allowable Values specified in Table 3.3.4-1, in the accompanying LCO, are conservatively adjusted with respect to the analytical limits. A detailed description of the method used to calculate the trip setpoints, including their explicit uncertainties, is provided in the "Plant Protection System Selection of Trip Setpoint Values" (Ref. 7). The actual ~~nominal~~ trip

BASES

BACKGROUND (continued)

setpoint entered into the bistable is normally still more conservative than that specified by the Allowable Value to account for changes in random measurement errors detectable by a CHANNEL FUNCTIONAL TEST. If the measured setpoint ~~does not exceed~~is conservative with respect to the Allowable Value, the bistable is considered OPERABLE.

~~Setpoints~~[LTSPs] in accordance with the Allowable Value will ensure that Safety Limits of Chapter 2.0, "SAFETY LIMITS (SLs)," are not violated during anticipated operational occurrences (AOOs) and that the consequences of Design Basis Accidents (DBAs) will be acceptable, providing the plant is operated from within the LCOs at the onset of the AOO or DBA and the equipment functions as designed.

Note that in the accompanying LCO 3.3.4, the Allowable Values of Table 3.3.4-1 are the least conservative value of the as-found setpoint that a channel can have during a periodic CHANNEL CALIBRATION or CHANNEL FUNCTIONAL TEST, such that a channel is operable if the as-found setpoint is conservative with respect to the Allowable Value.

ESFAS Logic

It is possible to change the two-out-of-four ESFAS logic to a two-out-of-three logic for a given input parameter in one channel at a time by disabling one channel input to the logic. Thus, the bistables will function normally, producing normal trip indication and annunciation, but ESFAS actuation will not occur since the bypassed channel is effectively removed from the coincidence logic. Trip channel bypassing can be simultaneously performed on any number of parameters in any number of channels, providing each parameter is bypassed in only one channel at a time. At some plants an interlock prevents simultaneous trip channel bypassing of the same parameter in more than one channel. Trip channel bypassing is normally employed during maintenance or testing.

ESFAS Logic is addressed in LCO 3.3.5.

APPLICABLE SAFETY ANALYSES

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. Functions such as Manual Initiation, not specifically credited in the accident analysis, serve as backups to Functions and are part of the NRC approved licensing basis for the plant.

Trip Setpoints for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core

Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

ESFAS protective Functions are as follows:

APPLICABLE SAFETY ANALYSES (continued)

1. Safety Injection Actuation Signal

   The SIAS ensures acceptable consequences during loss of coolant accident (LOCA) events, including steam generator tube rupture, and main steam line breaks (MSLBs) or feedwater line breaks (FWLBs) (inside containment). To provide the required protection, either a high containment pressure or a low pressurizer pressure signal will initiate SIAS. SIAS initiates the Emergency Core Cooling Systems (ECCS), control room isolation, and several other Functions, such as starting the emergency diesel generators.

2. Containment Spray Actuation Signal

   The CSAS initiates containment spray, preventing containment overpressurization during a LOCA or MSLB. At some plants, both a high containment pressure signal and an SIAS have to actuate to provide the required protection. This configuration reduces the likelihood of inadvertent containment spray.

3. Containment Isolation Actuation Signal

   The CIAS actuates the Containment Isolation System, ensuring acceptable consequences during LOCAs and MSLBs or FWLBs (inside containment). To provide protection, a high containment pressure signal will initiate CIAS at the same setpoint at which an SIAS is generated.

4. Main Steam Isolation Signal

MSLBs and FWLBs. This prevents containment overpressurization during these events.

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

BASES

LCO

The LCO requires all channel components necessary to provide an ESFAS actuation to be OPERABLE. Failure of any required portion of the instrument channel renders the affected channel(s) inoperable and reduces the reliability of the affected Functions. The specific criteria for determining channel OPERABILITY differ slightly between Functions. These criteria are discussed on a Function by Function basis below.

Actions allow maintenance (trip channel) bypass of individual channels, but the bypass activates interlocks that prevent operation with a second channel in the same Function bypassed. Plants are restricted to 48 hours in a trip channel bypass condition before either restoring the Function to four channel operation (two-out-of-four logic) or placing the channel in trip (one-out-of-three logic). At plants where adequate channel to channel independence has been demonstrated, specific exceptions may be approved by the NRC staff to permit one of the two-out-of-four channels to be bypassed for an extended period of time.

Only the Allowable Values are specified for each ESFAS trip Function in the LCO. The [LTSP] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure that the setpoint measured by CHANNEL FUNCTIONAL TESTS does not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the [LTSP], but within its Allowable Value, is acceptable, provided that operation and testing are consistent with the assumptions of the plant specific setpoint calculations. Therefore, the Allowable Value specified in Table 3.3.4-1 is the least conservative value of the as-found setpoint that the channel can have when tested.

The Bases for the LCO on ESFAS Functions are:

-----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."
----

1. Safety Injection Actuation Signal

a. Containment Pressure - High

This LCO requires four channels of SIAS Containment Pressure - High to be OPERABLE in MODES 1, 2, and 3.

The Allowable Value for this trip is set high enough to allow for small pressure increases in containment expected during normal operation (i.e., plant heatup) and is not indicative of an offnormal condition. The setting is low enough to initiate the ESF Functions when an offnormal condition is indicated. This allows the ESF systems to perform as expected in the accident analyses to mitigate the consequences of the analyzed accidents.

b. Pressurizer Pressure - Low

This LCO requires four channels of SIAS Pressurizer Pressure - Low to be OPERABLE in MODES 1, 2, and 3.

The Allowable Value for this trip is set low enough to prevent actuating the SIAS during normal plant operation and pressurizer pressure transients. The setting is high enough that with a LOCA or MSLB it will actuate to perform as expected, mitigating the consequences of the accidents.

The Pressurizer Pressure - Low trip may be blocked when pressurizer pressure is reduced during controlled plant shutdowns. This block is permitted below 1800 psia, and block permissive responses are annunciated in the control room. This allows for a controlled depressurization of the RCS, while maintaining administrative control of ESF protection. From a blocked condition, the block will be automatically removed as pressurizer pressure increases above 1800 psia, as sensed by two of the four sensor subsystems, in accordance with the bypass philosophy of removing bypasses when the enabling conditions are no longer satisfied.

BASES

LCO (continued)

b. Steam Generator Pressure Difference - High (SG-A > SG-B) or (SG-B > SG-A)

This LCO requires four channels per steam generator of Steam Generator Pressure Difference - High to be OPERABLE in MODES 1, 2, and 3.

The Allowable Value for this trip is high enough to allow for small pressure differences and normal instrumentation errors between the steam generator channels during normal operation without an actuation. The setting is low enough to detect and inhibit feeding of a ruptured steam generator in the event of an MSLB or FWLB, while permitting the feeding of the intact steam generator.

The ESFAS channels satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

APPLICABILITY

All ESFAS Functions are required to be OPERABLE in MODES 1, 2, and 3. In MODES 1, 2, and 3 there is sufficient energy in the primary and secondary systems to warrant automatic ESF System responses to:

- Close the main steam isolation valves to preclude a positive reactivity addition,
- Actuate AFW to preclude the loss of the steam generators as a heat sink (in the event the normal feedwater system is not available),
- Actuate ESF systems to prevent or limit the release of fission product radioactivity to the environment by isolating containment and limiting the containment pressure from exceeding the containment design pressure during a design basis LOCA or MSLB, and
- Actuate ESF systems to ensure sufficient borated inventory to permit adequate core cooling and reactivity control during a design basis LOCA or MSLB accident.

In MODES 4, 5, and 6, automatic actuation of ESFAS Functions is not required because adequate time is available for plant operators to evaluate plant conditions and respond by manually operating the ESF components, if required, as addressed by LCO 3.3.5. In LCO 3.3.5, manual capability is required for Functions other than AFAS in MODE 4, even though automatic actuation is not required. Because of the large number of components actuated on each ESFAS, actuation is simplified by the use of the Manual Trip push buttons. Manual Trip of AFAS is not required in MODE 4 because AFW or shutdown cooling will already be in operation in this MODE.

BASES

APPLICABILITY (continued)

The ESFAS Actuation Logic must be OPERABLE in the same MODES as the automatic and Manual Trip. In MODE 4, only the portion of the ESFAS logic responsible for the required Manual Trip must be OPERABLE.

In MODES 5 and 6, ESFAS initiated systems are either reconfigured or disabled for shutdown cooling operation. Accidents in these MODES are slow to develop and would be mitigated by manual operation of individual components.

ACTIONS

The most common cause of channel inoperability is outright failure or drift of the bistable or process module sufficient to exceed the tolerance allowed by the plant specific setpoint analysis.

Typically, the drift is small and results in a delay of actuation rather than a total loss of function. Determination of setpoint drift is generally made during the performance of a CHANNEL FUNCTIONAL TEST when the process instrument is set up for adjustment to bring it to within specification. If the actual trip setpoint is not ~~within~~conservative with respect to the Allowable Value in Table 3.3.4-1, the channel is inoperable and the appropriate Condition(s) are entered.

In the event a channel's trip setpoint is found nonconservative with respect to the Allowable Value in Table 3.3.4-1, or the sensor, instrument loop, signal processing electronics, or ESFAS bistable is found inoperable, then all affected Functions provided by that channel must be declared inoperable and the plant must enter the Condition statement for the particular protection Function affected.

When the number of inoperable channels in a trip Function exceeds those specified in any related Condition associated with the same trip Function, then the plant is outside the safety analysis. Therefore, LCO 3.0.3 should be immediately entered if applicable in the current MODE of operation.

A Note has been added to clarify the application of the Completion Time rules. The Conditions of this Specification may be entered independently for each Function in Table 3.3.4-1. Completion Times for the inoperable channel of a Function will be tracked separately.

BASES

ACTIONS (continued)

F.1 and F.2

If the Required Actions and associated Completion Times of Condition A, B, C, D, or E are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 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

The SRs for any particular ESFAS Function are found in the SRs column of Table 3.3.4-1 for that Function. Most functions are subject to CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, CHANNEL CALIBRATION, and response time testing.

-----------------------------------REVIEWER'S NOTE-----------------------------------
In order for a unit to take credit for topical reports as the basis for justifying Frequencies, topical reports should be supported by an NRC staff Safety Evaluation Report that establishes the acceptability of each topical report for that unit.

-------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.4-1 requiring reset of the channel to a predefined as-left tolerance and the verification of the as-found tolerance are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with allowable values in the table, but doing so is not required to comply with 10 CFR 50.36.

-------------------------------- REVIEWER'S NOTE -----------------------------------
Notes a and b are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes a and b are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally

only checked on a "go/no go" basis. Note b requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes a and b are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes a and b may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.4. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

SR 3.3.4.1

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

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit. If the channels are within the criteria, it is an indication that the channels are OPERABLE. If the channels are normally off scale during

times when Surveillance is required, the CHANNEL CHECK will only verify that they are off scale in the same direction. Offscale low current loop channels are verified to be reading at the bottom of the range and not failed downscale.

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

SR 3.3.4.2

A CHANNEL FUNCTIONAL TEST is performed every [92] days to ensure the entire channel will perform its intended function when needed. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The CHANNEL FUNCTIONAL TEST tests the individual sensor subsystems using an analog test input to each bistable.

A test signal is superimposed on the input in one channel at a time to verify that the bistable trips within the specified tolerance around the setpoint. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint analysis.

The as--found [and as--left] values must also be recorded and reviewed for consistency with the assumptions of the surveillance interval extension analysis. The requirements for this review are outlined in Reference [8].

SR 3.3.4.2 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.4-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.4.3

SR 3.3.4.3 is a CHANNEL FUNCTIONAL TEST similar to SR 3.3.4.2, except 3.3.4.3 is performed within 92 days prior to startup and is only applicable to bypass Functions. These include the Pressurizer Pressure - Low bypass and the MSIS Steam Generator Pressure - Low bypass. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The CHANNEL FUNCTIONAL TEST for proper operation of the bypass removal Functions is critical during plant heatups because the bypasses may be in place prior to entering MODE 3 but must be removed at the appropriate points during plant startup to enable the ESFAS Function. Consequently, just prior to startup is the appropriate time to verify bypass removal Function OPERABILITY. Once the bypasses are removed, the bypasses must not fail in such a way that the associated ESFAS Function is inappropriately bypassed. This feature is verified by the appropriate ESFAS Function CHANNEL FUNCTIONAL TEST.

The allowance to conduct this Surveillance within 92 days of startup is based upon the reliability analysis presented in topical report CEN-327, "RPS/ESFAS Extended Test Interval Evaluation" (Ref. 9).

SR 3.3.4.4

CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The Surveillance verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift between successive calibrations to ensure that the channel remains operational between successive surveillances. CHANNEL CALIBRATIONS must be performed consistent with the plant specific setpoint analysis.

The as-~~-~~found [and as-~~-~~left] values must also be recorded and reviewed for consistency with the assumptions of the ~~-~~extension analysis. The requirements for this review are outlined in Reference [8].

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency is based upon the assumption of an [18] month calibration interval for the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.4.4 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.4-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued

OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.4.5

This Surveillance ensures that the train actuation response times are the maximum values assumed in the safety analyses. Individual component response times are not modeled in the analyses. The analysis models 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 both trains reaches the required functional state (e.g., pumps at rated discharge pressure, valves in full open or closed position). Response time testing acceptance criteria are included in Reference 3. The test may be performed in one measurement or in overlapping segments, with verification that all components are measured.

----------------------------------REVIEWER'S NOTE----------------------------------
Applicable portions of the following TS Bases are applicable to plants adopting CEOG Topical Report CE NPSD-1167-1, "Elimination of Pressure Sensor Response Time Testing Requirements."

Response time may be verified by any series of sequential, overlapping or total channel measurements, including allocated sensor response time, such that the response time is verified. Allocations for sensor response times may be obtained from records of test results, vendor test data, or vendor engineering specifications. Topical Report CE NPSD-1167-A, "Elimination of Pressure Sensor Response Time Testing Requirements," (Ref. 10) provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the Topical Report. Response time verification for other sensor types must be demonstrated by test. The allocation of sensor response times must be verified prior to placing a new component in operation and reverified after maintenance that may adversely affect the sensor response time.

BASES

SURVEILLANCE REQUIREMENTS (continued)

ESF RESPONSE TIME tests are conducted on a STAGGERED TEST BASIS of once every [18] months. This results in the interval between successive tests of a given channel of n x 18 months, where n is the number of channels in the Function. Surveillance of the final actuation devices, which make up the bulk of the response time, is included in the testing of each channel. Therefore, staggered testing results in response time verification of these devices every [18] months. The [18] month STAGGERED TEST BASIS Frequency is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

REFERENCES

1. FSAR, Section [7.3].

2. 10 CFR 50, Appendix A.

3. NRC Safety Evaluation Report, [Date].

4. IEEE Standard 279-1971.

5. FSAR, Chapter [14].

6. 10 CFR 50.49.

7. "Plant Protection System Selection of Trip Setpoint Values."

8. FSAR, Section [7.2].

9. CEN-327, June 2, 1986, including Supplement 1, March 3, 1989.

10. ~~10.~~ CEOG Topical Report CE NPSD-1167-A, "Elimination of Pressure Sensor Response Time Testing Requirements."

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

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

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Linear Power Level - High	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 [(a) (b)] SR 3.3.1.8 [(a) (b)] SR 3.3.1.10 [(a) (b)] SR 3.3.1.14	≤ [111.3]% RTP
2. Logarithmic Power Level - High(~~a~~c)	2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10 [(a) (b)] SR 3.3.1.13 SR 3.3.1.14	≤ [.96]%
3. Pressurizer Pressure - High	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10 [(a) (b)] SR 3.3.1.14	≤ [2389] psia
4. Pressurizer Pressure - Low(~~c~~d)	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10 [(a) (b)] SR 3.3.1.13 SR 3.3.1.14	≥ [1763] psig
5. Containment Pressure - High	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10 [(a) (b)] SR 3.3.1.14	≤ [3.14] psig
6. Steam Generator #1 Pressure - Low	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10 [(a) (b)] SR 3.3.1.14	≥ [711] psia

(a) [INSERT 1]

(b) [INSERT 2]

(~~a~~c) Bypass may be enabled when logarithmic power is > [1E-4]% and shall be capable of automatic removal whenever logarithmic power is > [1E-4]%. Bypass shall be removed prior to reducing logarithmic power to a value ≤ [1E-4]%. Trip may be manually bypassed during physics testing pursuant to LCO 3.4.17, "RCS Loops - Test Exceptions."

~~(b) Not used.~~

(~~c~~d) The setpoint may be decreased to a minimum value of [300] psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ [400] psi. Bypass may be enabled when pressurizer pressure is < [500] psia and shall be capable of automatic removal whenever pressurizer pressure is < [500] psia. Bypass shall be removed prior to raising pressurizer pressure to a value

≥ [500] psia. The setpoint shall be automatically increased to the normal setpoint as pressurizer pressure is increased.

Table 3.3.1-1 (page 2 of 3)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7. Steam Generator #2 Pressure ~~—~~ - Low	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10[(a) (b)] SR 3.3.1.14	≥ [711] psia
8. Steam Generator #1 Level - Low	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10[(a) (b)] SR 3.3.1.14	≥ [24.23]%
9. Steam Generator #2 Level - Low	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10[(a) (b)] SR 3.3.1.14	≥ [24.23]%
[10. Reactor Coolant Flow, Steam Generator #1 - Low(e~~d~~)	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10[(a) (b)] [SR 3.3.1.13] SR 3.3.1.14	Ramp: ≤ [0.231] psid/sec. Floor: ≥ [12.1] psid Step: ≤ [7.231] psid]
[11. Reactor Coolant Flow, Steam Generator #2 - Low(e~~d~~)	1,2	SR 3.3.1.1 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10[(a) (b)] [SR 3.3.1.13] SR 3.3.1.14	Ramp: ≤ [0.231] psid/sec. Floor: ≥ [12.1] psid Step: ≤ [7.231] psid]
[12. Loss of Load (turbine stop valve control oil pressure)(f~~e~~)	1	SR 3.3.1.9 SR 3.3.1.10[(a) (b)] [SR 3.3.1.13]	≥ [100] psig]

(a) [INSERT 1]

(b) [INSERT 2]

(~~d~~e) Bypass may be enabled when logarithmic power is < [1E-04]% and shall be capable of automatic removal whenever logarithmic power is < [1E-4]%. Bypass shall be removed prior to raising logarithmic power to a value ≥ [1E-4]%. During testing pursuant to LCO 3.4.17, bypass may be enabled when THERMAL POWER is < [5]% RTP and shall be capable of automatic removal whenever THERMAL POWER is < [5]% RTP. Bypass shall be removed above 5% RTP.

(~~e~~f) Bypass may be enabled when THERMAL POWER is < [55]% RTP and shall be capable of automatic removal whenever THERMAL POWER is < [55]% RTP. Bypass shall be removed prior to raising THERMAL POWER to a value ≥ [55]% RTP.

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

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
13. Local Power Density - High(~~d~~e)	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10[(a) (b)] SR 3.3.1.11[(a) (b)] SR 3.3.1.12 SR 3.3.1.13 SR 3.3.1.14	≤ [21.0] kW/ft
14. Departure From Nucleate Boiling Ratio (DNBR) - Low(~~d~~e)	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 [(a) (b)] SR 3.3.1.10[(a) (b)] SR 3.3.1.11[(a) (b)] SR 3.3.1.12 SR 3.3.1.13 SR 3.3.1.14	≥ [1.31]

(a) [INSERT 1]

(b) [INSERT 2]

(~~d~~e) Bypass may be enabled when logarithmic power is < [1E-04]% and shall be capable of automatic removal whenever logarithmic power is < [1E-4]%. Bypass shall be removed prior to raising logarithmic power to a value ≥ [1E-4]%. During testing pursuant to LCO 3.4.17, bypass may be enabled when THERMAL POWER is < [5]% RTP and shall be capable of automatic removal whenever THERMAL POWER is < [5]% RTP. Bypass shall be removed above 5% RTP.

Table 3.3.5-1 (page 1 of 2)
Engineered Safety Features Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	ALLOWABLE VALUE
1. Safety Injection Actuation Signal[a]		
a. Containment Pressure - High	1,2,3	≤ [3.14] psig[(b) (c)]
b. Pressurizer Pressure - Low(~~bd~~d)	1,2,3	≥ [1763] psia[(b) (c)]
2. Containment Spray Actuation Signal		
a. Containment Pressure ~~-~~ - High High	1,2,3	≤ [16.83] psia [(b) (c)]
b. Automatic SIAS	1,2,3	NA
3. Containment Isolation Actuation Signal		
a. Containment Pressure ~~-~~ - High	1,2,3	≤ [3.14] psig[(b) (c)]
b. Pressurizer Pressure - Low(d~~db~~)	1,2,3	≥ [1763] psia[(b) (c)]
4. Main Steam Isolation Signal		
a. Steam Generator Pressure - Low(~~c~~e)	1,2(~~d~~f),3(~~d~~f)	≥ [711] psig[(b) (c)]
b. Containment Pressure ~~-~~ - High	1,2(~~d~~f),3(~~d~~f)	≤ [3.14] psig[(b) (c)]
5. Recirculation Actuation Signal		
a. Refueling Water Storage Tank Level – Low	1,2,3	[≥ 17.73 and ≤ 19.27]%[(b) (c)]

(a) Automatic SIAS also initiates a Containment Cooling Actuation Signal (CCAS).

(b) [INSERT 1]

(c) [INSERT 2]

(~~b~~d) The setpoint may be decreased to a minimum value of [300] psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ [400] psia. Trips may be bypassed when pressurizer pressure is < [400] psia. Bypass shall be automatically removed when pressurizer pressure is ≥ [500] psia. The setpoint shall be automatically increased to the normal setpoint as pressurizer pressure is increased.

(e~~c~~) The setpoint may be decreased as steam pressure is reduced, provided the margin between steam pressure and the setpoint is maintained ≤ [200] psig. The setpoint shall be automatically increased to the normal setpoint as steam pressure is increased.

(f) The Main Steam Isolation Signal (MSIS) Function (Steam Generator Pressure - Low and Containment Pressure - High signals) is not required to be OPERABLE when all associated valves isolated by the MSIS Function are closed and [de-activated].

Table 3.3.5-1 (page 2 of 2)
Engineered Safety Features Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	ALLOWABLE VALUE
6. Emergency Feedwater Actuation Signal SG #1 (EFAS-1)		
a. Steam Generator Level - Low	1,2,3	≥ [24.23]% [(b) (c)]
b. SG Pressure Difference - High	1,2,3	≤ [66.25] psid [(b) (c)]
[c. Steam Generator Pressure - Low	1,2,3	≥ [711] psig] [(b) (c)]
7. Emergency Feedwater Actuation Signal SG #2 (EFAS-2)		
a. Steam Generator Level - Low	1,2,3	≥ [24.23]% [(b) (c)]
b. SG Pressure Difference - High	1,2,3	≤ [66.25] psid [(b) (c)]
[c. Steam Generator Pressure – Low	1,2,3	≥ [711] psig] [(b) (c)]

B 3.3 INSTRUMENTATION

B 3.3.1 Reactor Protective System (RPS) Instrumentation - Operating (Digital)

BASES

BACKGROUND

The Reactor Protective System (RPS) initiates a reactor trip to protect against violating the core specified acceptable fuel design limits and breaching the reactor coolant pressure boundary (RCPB) during anticipated operational occurrences (AOOs). By tripping the reactor, the RPS also assists the Engineered Safety Features (ESF) systems in mitigating accidents.

The protection and monitoring systems have been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

~~Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "…settings for automatic protective devices…so chosen that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded.~~ 10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic ~~protective devices~~ protection channels must be chosen to be more conservative than the Analytical Limit to account for ~~instrument loop~~channel uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE -----------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the

Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.1-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

The ~~trip setpoint~~[Limiting Trip Setpoint (LTSP)] is a predetermined setting for a ~~protective device~~protection channel chosen to ensure automatic actuation prior to the process variable reaching the ~~Analytic~~Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the ~~trip setpoint~~[LTSP] accounts for uncertainties in setting the ~~device~~channel (e.g., calibration), uncertainties in how the ~~device~~channel might actually perform (e.g., repeatability), changes in the point of action of the ~~device~~channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the ~~trip setpoint plays an important role in ensuring~~[LTSP] ensures that SLs are not exceeded. As such, the ~~trip setpoint~~[LTSP] meets the definition of ~~an~~ a SL-LSSS (Ref. 1~~) and could be used to meet the requirement that they be contained in the Technical Specifications.~~).

BASES

BACKGROUND (continued)

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." ~~For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for these devices.~~ However, use of the ~~trip setpoint~~[LTSP] to define OPERABILITY in Technical Specifications ~~and its corresponding designation as the LSSS required by 10 CFR 50.36~~ would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as~~-~~-found" value of a ~~protective device~~ protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic ~~protective device~~protection channel with a setting that has been found to be different from the ~~trip setpoint~~[LTSP] due to some drift of the setting may still be OPERABLE ~~since~~ because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the ~~trip setpoint~~[LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as~~-~~-found" setting of the ~~protective device.~~protection channel. Therefore, the ~~device~~channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the ~~device~~channel to the trip setpoint to account for further drift during the next surveillance interval.

~~Use of the trip setpoint to define "as found" OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted. 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 which, as stated above, is the same as the LSSS.~~

~~The Allowable Valuable specified in Table 3.3.1-1 serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value.~~However, there is also some point beyond which the channel would have not been able to perform its function due to, for example, greater than expected drift. The Allowable Value specified in Table 3.3.1-1 is the least conservative value of the as-found setpoint that a channel can have during testing such that a channel is OPERABLE if the trip setpoint is found conservative with respect to the Allowable Value during the CHANNEL FUNCTIONAL TEST (CFT). As such, the Allowable Value differs from the ~~trip setpoint~~[LTSP] by an amount ~~primarily~~[greater than or equal to the expected instrument ~~loop~~channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the ~~device~~channel 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~~channel has not drifted beyond that expected during the surveillance interval.

~~surveillance interval.~~ Note that, although the channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance, and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.~~If the actual setting 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. Note that, although the channel is "OPERABLE" under these circumstances, the trip setpoint should be left adjusted to a value within the established trip setpoint 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.~~

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

- The departure from nucleate boiling ratio (DNBR) shall be maintained above the Safety Limit (SL) value to prevent departure from nucleate boiling (DNB),
- Fuel centerline melting shall not occur, and
- The Reactor Coolant System (RCS) pressure SL of 2750 psia shall not be exceeded.

Maintaining the parameters within the above values ensures that the offsite dose will be within the 10 CFR 50 (Ref. 2) and 10 CFR 100 (Ref. 3) criteria during AOOs.

Accidents are events that are analyzed even though they are not expected to occur during the plant life. The acceptable limit during accidents is that the offsite dose shall be maintained within an acceptable fraction of 10 CFR 100 (Ref. 3) limits. Different accident categories allow 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. However, the acceptable dose limit for an accident category and their associated [LTSPs] are not considered to be LSSS as defined in 10 CFR 50.36.

The RPS is segmented into four interconnected modules. These modules are:

- Measurement channels,

- Bistable trip units,
- RPS Logic, and
- Reactor trip circuit breakers (RTCBs).

This LCO addresses measurement channels and bistable trip units. It also addresses the automatic bypass removal feature for those trips with operating bypasses. The RPS Logic and RTCBs are addressed in LCO 3.3.4, "Reactor Protective System (RPS) Logic and Trip Initiation." The CEACs are addressed in LCO 3.3.3, "Control Element Assembly Calculators (CEACs)."

Measurement Channels

Adequate channel to channel independence includes physical and electrical independence of each channel from the others. This allows operation in two-out-of-three logic with one channel removed from service until following the next MODE 5 entry. Since no single failure will either cause or prevent a protective system actuation, and no ~~protective~~protection channel feeds a control, this arrangement meets the requirements of IEEE Standard 279-1971 (Ref. 5).

The CPCs perform the calculations required to derive the DNBR and LPD parameters and their associated RPS trips. Four separate CPCs perform the calculations independently, one for each of the four RPS channels. The CPCs provide outputs to drive display indications (DNBR margin, LPD margin, and calibrated neutron flux power levels) and provide DNBR - Low and LPD - High pretrip and trip signals. The CPC channel outputs for the DNBR - Low and LPD - High trips operate contacts in the Matrix Logic in a manner identical to the other RPS trips.

Each CPC receives the following inputs:

- Hot leg and cold leg temperatures,
- Pressurizer pressure,
- Reactor coolant pump speed,

- Excore neutron flux levels,
- Target CEA positions, and
- CEAC penalty factors.

Each CPC is programmed with "addressable constants." These are various alignment values, correction factors, etc., that are required for the CPC computations. They can be accessed for display or for the purpose of changing them as necessary.

The CPCs use this constant and variable information to perform a number of calculations. These include the calculation of CEA group and subgroup deviations (and the assignment of conservative penalty factors), correction and calculation of average axial power distribution (APD) (based on excore flux levels and CEA positions), calculation of coolant flow (based on pump speed), and calculation of calibrated average power level (based on excore flux levels and ΔT power).

parameter in at least two channels trip, the Matrix Logic will generate a reactor trip (two-out-of-four logic)..

Some measurement channels provide contact outputs to the PPS. In these cases, there is no bistable card, and opening the contact input directly de-energizes the associated bistable relays. These include the Loss of Load trip and the CPC generated DNBR - Low and LPD - High trips.

The trip setpoints used in the bistables are based on the analytical limits derived from the accident analysis (Ref. 6). The selection of these ~~trip setpoints~~ analytical limits 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 RPS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 7), Allowable Values specified in Table 3.3.1-1, in the accompanying LCO, are

conservatively adjusted with respect to the analytical limits. A detailed description of the methodology used to calculate the trip setpoints, including their explicit uncertainties, is provided in "Plant Protection System Selection of Trip Setpoint Values" (Ref. 8). The ~~nominal~~ trip setpoint entered into the bistable is normally still more conservative than that specified by the Allowable Value to account for changes in random measurement errors detectable by a CHANNEL FUNCTIONAL TEST. One example of such a change in measurement error is drift during the interval between surveillances. ~~A channel is inoperable if its actual setpoint is not within its Allowable Value.~~

[LTSPs~~Setpoints~~] in accordance with the Allowable Value will ensure that SLs of Chapter 2.0, "SAFETY LIMITS (SLs)," are not violated during AOOs, and the consequences of DBAs will be acceptable, providing the plant is operated from within the LCOs at the onset of the AOO or DBA and the equipment functions as designed.

Note that in LCO 3.3.1, the Allowable Values of Table 3.3.1-1 are the ~~LSSS~~least conservative value of the as-found setpoint that a channel can have during a periodic CHANNEL CALIBRATION or CHANNEL FUNCTIONAL TEST, such that a channel is operable if the as-found setpoint is conservative with respect to the Allowable Value.

Functional testing of the entire RPS, from bistable input through the opening of individual sets of RTCBs, can be performed either at power or shutdown and is normally performed on a quarterly basis. Nuclear instrumentation, the CPCs, and the CEACs can be similarly tested.

- Separation and redundancy are maintained to permit a channel to be out of service for testing or maintenance while still maintaining redundancy within the RPS instrumentation network.

Each of the analyzed accidents and transients can be detected by one or more RPS Functions. The accident analysis takes credit for most of the RPS trip Functions. Those functions for which no credit is taken, termed equipment protective functions, are not needed from a safety perspective.

APPLICABLE SAFETY ANALYSES (continued)

Each RPS setpoint is chosen to be consistent with the function of the respective trip. The basis for each trip setpoint falls into one of three general categories:

Category 1: To ensure that the SLs are not exceeded during AOOs,

Category 2: To assist the ESFAS during accidents, and

Category 3: To prevent material damage to major plant components (equipment protective).

The RPS maintains the SLs during AOOs and mitigates the consequences of DBAs in all MODES in which the RTCBs are closed.

Each of the analyzed transients and accidents can be detected by one or more RPS Functions. Functions not specifically credited in the accident analysis are part of the NRC staff approved licensing basis for the plant. Noncredited Functions include the Loss of Load. This trip is purely equipment protective, and its use minimizes the potential for equipment damage.

Trip Setpoints for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

BASES

LCO

The LCO requires all instrumentation performing an RPS Function to be OPERABLE. Failure of any required portion of the instrument channel renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

Actions allow maintenance (trip channel) bypass of individual channels, but the bypass activates interlocks that prevent operation with a second channel in the same Function bypassed. With one channel in each Function trip channel bypassed, this effectively places the plant in a two-out-of-three logic configuration in those Functions.

Only the Allowable Values are specified for each RPS trip Function in the LCO. ~~Nominal trip setpoints are specified in the plant specific setpoint calculations. The nominal setpoints~~The [LTSP] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure ~~the setpoints~~ that the setpoint measured by CHANNEL FUNCTIONAL TESTS ~~do~~does not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the ~~nominal trip setpoint~~ [LTSP], but within its Allowable Value, is acceptable, provided that operation and testing are consistent with the assumptions of the plant specific setpoint calculations. ~~A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. Each Allowable Value specified is more conservative than the analytical limit assumed in the safety analysis in order to account for instrument uncertainties appropriate to the trip Function. These uncertainties are defined in the "Plant Protection System Selection of Trip Setpoint Values" (Ref. 8).~~Therefore, the Allowable Value specified in Table 3.3.1-1 is the least conservative value of the as-found setpoint that the channel can have when tested.

The Bases for the individual Function requirements are as follows:

----------------------------------REVIEWER'S NOTE----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."
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1. Linear Power Level - High

BASES

APPLICABILITY

Most RPS trips are required to be OPERABLE in MODES 1 and 2 because the reactor is critical in these MODES. The reactor trips are designed to take the reactor subcritical, which maintains the SLs during AOOs and assists the ESFAS in providing acceptable consequences during accidents. Most trips are not required to be OPERABLE in MODES 3, 4, and 5. In MODES 3, 4, and 5, the emphasis is placed on return to power events. The reactor is protected in these MODES by ensuring adequate SDM. Exceptions to this are:

- The Logarithmic Power Level - High trip, RPS Logic RTCBs, and Manual Trip are required in MODES 3, 4, and 5, with the RTCBs closed, to provide protection for boron dilution and CEA withdrawal events.

The Logarithmic Power Level - High trip in these lower MODES is addressed in LCO 3.3.2. The Logarithmic Power Level - High trip is bypassed prior to MODE 1 entry and is not required in MODE 1. The RPS Logic in MODES 1, 2, 3, 4, and 5 is addressed in LCO 3.3.4.

ACTIONS

The most common causes of channel inoperability are outright failure or drift of the bistable or process module sufficient to exceed the tolerance allowed by the plant specific setpoint analysis. Typically, the drift is found to be small and results in a delay of actuation rather than a total loss of function. This determination is generally made during the performance of a CHANNEL FUNCTIONAL TEST when the process instrument is set up for adjustment to bring it to within specification. If the trip setpoint is ~~less~~ non-conservative ~~than~~with respect to the Allowable Value in Table 3.3.1-1, the channel is declared inoperable immediately, and the appropriate Condition(s) must be entered immediately.

In the event a channel's trip setpoint is found non-conservative with respect to the Allowable Value, or the transmitter, instrument loop, signal processing electronics, or RPS bistable trip unit is found inoperable, then all affected functions provided by that channel must be declared inoperable, and the unit must enter the Condition for the particular protection Function affected.

When the number of inoperable channels in a trip Function exceeds that specified in any related Condition associated with the same trip Function, then the plant is outside the safety analysis. Therefore, LCO 3.0.3 is immediately entered if applicable in the current MODE of operation.

BASES

ACTIONS (continued)

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

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

Condition C applies to one automatic bypass removal channel inoperable. If the inoperable bypass removal channel for any bypass channel cannot be restored to OPERABLE status within 1 hour, the associated RPS channel may be considered OPERABLE only if the bypass is not in effect. Otherwise, the affected RPS channel must be declared inoperable, as in

Condition A, and the affected automatic trip channel placed in bypass or trip. The bypass removal channel and the automatic trip channel must be repaired prior to entering MODE 2 following the next MODE 5 entry. The Bases for the Required Actions and required Completion Times are consistent with Condition A.

D.1 and D.2

Condition D applies to two inoperable automatic bypass removal channels. If the bypass removal channels for two operating bypasses cannot be restored to OPERABLE status within 1 hour, the associated RPS channel may be considered OPERABLE only if the bypass is not in effect. Otherwise, the affected RPS channels must be declared inoperable, as in Condition B, and the bypass either removed or one automatic trip channel placed in bypass and the other in trip within 1 hour. The restoration of one affected bypassed automatic trip channel must be completed prior to the next CHANNEL FUNCTIONAL TEST, or the plant must shut down per LCO 3.0.3 as explained in Condition B.

BASES

ACTIONS (continued)

If the Required Actions associated with these Conditions cannot be completed within the required Completion Time, the reactor must be brought to a MODE where the Required Actions do not apply. The allowed Completion Time of 6 hours is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

The SRs for any particular RPS Function are found in the SR column of Table 3.3.1-1 for that Function. Most Functions are subject to CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, CHANNEL CALIBRATION, and response time testing.

----------------------------------REVIEWER'S NOTE----------------------------------
In order for a plant to take credit for topical reports as the basis for justifying Frequencies, topical reports must be supported by an NRC staff SER that establishes the acceptability of each topical report for that unit.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.1-1 requiring reset of the channel to a predefined as-left tolerance and the verification of the as-found tolerance are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with allowable values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------
Notes a and b are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes a and b are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note b requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a

change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes a and b are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes a and b may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

SR 3.3.1.1

Performance of the CHANNEL CHECK once every 12 hours 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. CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

compensated for after every refueling by performing SR 3.3.1.12, which adjusts the gains of the three detector amplifiers for shape annealing. SR 3.3.1.6 ensures that the preassigned gains are still proper. Power must be > 15% because the CPCs do not use the excore generated signals for axial flux shape information at low power levels. The Note allowing 12 hours after reaching 15% RTP is required for plant stabilization and testing.

The 31 day Frequency is adequate because the demonstrated long term drift of the instrument channels is minimal.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.7

A CHANNEL FUNCTIONAL TEST on each channel except Loss of Load, power range neutron flux, and logarithmic power level channels is performed every 92 days to ensure the entire channel will perform its intended function when needed. The SR is modified by two Notes. Note 1 is a requirement to verify the correct CPC addressable constant values are installed in the CPCs when the CPC CHANNEL FUNCTIONAL TEST is performed. Note 2 allows the CHANNEL FUNCTIONAL TEST for the Logarithmic Power Level - High channels to be performed 2 hours after logarithmic power drops below 1E-4% and is required to be performed only if the RTCBs are closed.

In addition to power supply tests, the RPS CHANNEL FUNCTIONAL TEST consists of three overlapping tests as described in Reference 9. These tests verify that the RPS is capable of performing its intended function, from bistable input through the RTCBs. They include:

Bistable Tests

A test signal is superimposed on the input in one channel at a time to verify that the bistable trips within the specified tolerance around the setpoint. This is done with the affected RPS channel trip channel bypassed. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint analysis.

The as-found and as-left values must also be recorded and reviewed for consistency with the assumptions of the interval between surveillance interval extension analysis. The requirements for this review are outlined in Reference [10].

Matrix Logic Tests

Matrix Logic tests are addressed in LCO 3.3.4. This test is performed one matrix at a time. It verifies that a coincidence in the two input channels for each Function removes power from the matrix relays. During testing, power is applied to the matrix relay test coils and prevents the matrix relay contacts from assuming their de-energized state. This test will detect any short circuits around the bistable contacts in the coincidence logic, such as may be caused by faulty bistable relay or trip channel bypass contacts.

SR 3.3.1.7 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

BASES

SURVEILLANCE REQUIREMENTS (continued)

Trip Path Tests

Trip path (Initiation Logic) tests are addressed in LCO 3.3.4. These tests are similar to the Matrix Logic tests, except that test power is withheld from one matrix relay at a time, allowing the initiation circuit to de-energize, thereby opening the affected set of RTCBs. The RTCBs must then be closed prior to testing the other three initiation circuits, or a reactor trip may result.

The Frequency of 92 days is based on the reliability analysis presented in topical report CEN-327, "RPS/ESFAS Extended Test Interval Evaluation" (Ref. 10).

The CPC and CEAC channels and excore nuclear instrumentation channels are tested separately.

The excore channels use preassigned test signals to verify proper channel alignment. The excore logarithmic channel test signal is inserted into the preamplifier input, so as to test the first active element downstream of the detector.

The power range excore test signal is inserted at the drawer input, since there is no preamplifier.

The quarterly CPC CHANNEL FUNCTIONAL TEST is performed using software. This software includes preassigned addressable constant values that may differ from the current values. Provisions are made to store the addressable constant values on a computer disk prior to testing and to reload them after testing. A Note is added to the Surveillance Requirements to verify that the CPC CHANNEL FUNCTIONAL TEST includes the correct values of addressable constants. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

SR 3.3.1.8

A Note indicates that neutron detectors are excluded from CHANNEL CALIBRATION. A CHANNEL CALIBRATION of the power range neutron flux channels every 92 days ensures that the channels are reading accurately and within tolerance (Ref. 10). The Surveillance verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift between successive calibrations to ensure that the channel remains operational between successive tests. CHANNEL CALIBRATIONS must be performed consistent with the plant specific setpoint analysis.

The as-found and as-left values must also be recorded and reviewed for consistency with the assumptions of the interval between surveillance interval extension analysis. The requirements for this review are outlined in Reference 10. Operating experience has shown this Frequency to be satisfactory. The detectors are excluded from CHANNEL CALIBRATION because they are passive ~~devices~~channels with minimal drift and because of the difficulty of simulating a meaningful signal. Slow changes in detector sensitivity are compensated for by performing the daily calorimetric calibration (SR 3.3.1.4) and the monthly linear subchannel gain check (SR 3.3.1.6). In addition, the associated control room indications are monitored by the operators.

SR 3.3.1.8 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

[SR 3.3.1.9

The characteristics and Bases for this Surveillance are as described for SR 3.3.1.7. This Surveillance differs from SR 3.3.1.7 only in that the CHANNEL FUNCTIONAL TEST on the Loss of Load functional unit is only required above 55% RTP. When above 55% and the trip is in effect, the CHANNEL FUNCTIONAL TEST will ensure the channel will perform its equipment protective function if needed. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical

Specifications tests at least once per refueling interval with applicable extensions. The Note allowing 2 hours after reaching 55% RTP is necessary for Surveillance performance. This Surveillance cannot be performed below 55% RTP, since the trip is bypassed.]

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.10

SR 3.3.1.10 is the performance of a CHANNEL CALIBRATION every [18] months.

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The Surveillance verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift between successive calibrations to ensure that the channel remains operational between successive tests. CHANNEL CALIBRATIONS must be performed consistent with the plant specific setpoint analysis.

The as-found and as-left values must also be recorded and reviewed for consistency with the assumptions of the surveillance interval extension analysis. The requirements for this review are outlined in Reference [10].

The Frequency is based upon the assumption of an [18] month calibration interval for the determination of the magnitude of equipment drift in the setpoint analysis as well as operating experience and consistency with the typical [18] month fuel cycle.

The Surveillance is modified by a Note to indicate that the neutron detectors are excluded from CHANNEL CALIBRATION because they are passive ~~devices~~channels with minimal drift and because of the difficulty of simulating a meaningful signal. Slow changes in detector sensitivity are compensated for by performing the daily calorimetric calibration (SR 3.3.1.4) and the monthly linear subchannel gain check (SR 3.3.1.6).

SR 3.3.1.10 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will

ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.1.11

Every [18] months, a CHANNEL FUNCTIONAL TEST is performed on the CPCs. The CHANNEL FUNCTIONAL TEST shall include the injection of a signal as close to the sensors as practicable to verify OPERABILITY including alarm and trip Functions. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The basis for the [18] month Frequency is that the CPCs perform a continuous self monitoring function that eliminates the need for frequent CHANNEL FUNCTIONAL TESTS. This CHANNEL FUNCTIONAL TEST essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function. Operating experience has shown that undetected CPC or CEAC failures do not occur in any given [18] month interval.

SR 3.3.1.11 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.1.12

The three excore detectors used by each CPC channel for axial flux distribution information are far enough from the core to be exposed to flux from all heights in the core, although it is desired that they only read their particular level. The CPCs adjust for this flux overlap by using the predetermined shape annealing matrix elements in the CPC software.

After refueling, it is necessary to re-establish or verify the shape annealing matrix elements for the excore detectors based on more accurate incore detector readings. This is necessary because refueling could possibly produce a significant change in the shape annealing matrix coefficients.

Incore detectors are inaccurate at low power levels. THERMAL POWER should be significant but < 70% to perform an accurate axial shape calculation used to derive the shape annealing matrix elements.

By restricting power to ≤ 70% until shape annealing matrix elements are verified, excessive local power peaks within the fuel are avoided. Operating experience has shown this Frequency to be acceptable.

SR 3.3.1.13

SR 3.3.1.13 is a CHANNEL FUNCTIONAL TEST similar to SR 3.3.1.7, except SR 3.3.1.13 is applicable only to bypass functions and is performed once within 92 days prior to each startup. A successful test of the required contact(s) of a channel relay may be performed by the

BASES

SURVEILLANCE REQUIREMENTS (continued)

Response time may be verified by any series of sequential, overlapping or total channel measurements, including allocated sensor response time, such that the response time is verified. Allocations for sensor response times may be obtained from records of test results, vendor test data, or vendor engineering specifications. Topical Report CE NPSD-1167-A, "Elimination of Pressure Sensor Response Time Testing Requirements," (Ref. 11) provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the Topical Report. Response time verification for other sensor types must be demonstrated by test. The allocation of sensor response times must be verified prior to placing a new component in operation and reverified after maintenance that may adversely affect the sensor response time.

A Note is added to indicate that the neutron detectors are excluded from RPS RESPONSE TIME testing because they are passive ~~devices~~channels with minimal drift and because of the difficulty of simulating a meaningful signal. Slow changes in detector sensitivity are compensated for by performing the daily calorimetric calibration (SR 3.3.1.4).

REFERENCES

1. Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation."
2. 10 CFR 50, Appendix A, GDC 21.
3. 10 CFR 100.
4. NRC Safety Evaluation Report.
5. IEEE Standard 279-1971, April 5, 1972.
6. FSAR, Chapter [14].
7. 10 CFR 50.49.
8. "Plant Protection System Selection of Trip Setpoint Values."
9. FSAR, Section [7.2].
10. CEN-327, June 2, 1986, including Supplement 1, March 3, 1989.
11. CEOG Topical Report CE NPSD-1167-A, "Elimination of Pressure Sensor Response Time Testing Requirements."

B 3.3 INSTRUMENTATION

B 3.3.5 Engineered Safety Features Actuation System (ESFAS) Instrumentation (Digital)

BASES

BACKGROUND

The ESFAS initiates necessary safety systems, based upon the values of selected unit parameters, to protect against violating core design limits and the Reactor Coolant System (RCS) pressure boundary during anticipated operational occurrences (AOOs) and ensures acceptable consequences during accidents. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during Anticipated Operational Occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for channel uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE -----------------------------------

The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.5-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note c of Table 3.3.5-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements

Manual or any document incorporated into the facility FSAR]" throughout these Bases.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of a SL-LSSS (Ref. 12).

BASES

BACKGROUND (continued)

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." However, use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as-found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as-found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel to the [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel would have not been able to perform its function due to, for example, greater than expected drift. The Allowable Value specified in Table 3.3.5-1 is the least conservative value of the as-found setpoint that a channel can have during testing such that a channel is OPERABLE if the trip setpoint is found conservative with respect to the Allowable Value during the CHANNEL FUNCTIONAL TEST (CFT). As such, the Allowable Value differs from the [LTSP] by an amount [greater than or] equal to the expected instrument channel uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the channel will ensure that a SL is not exceeded at any given point of time as long as the channel has not drifted beyond that expected during the surveillance interval.

BASES

BACKGROUND (continued)

Note that, although the channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance, and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable..

If the actual setting of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

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

- The departure from nucleate boiling ratio (DNBR) shall be maintained above the Safety Limit (SL) value to prevent departure from nucleate boiling,
- Fuel centerline melting shall not occur, and
- The Reactor Coolant System (RCS) pressure SL of 2750 psia shall not be exceeded.

Maintaining the parameters within the above values ensures that the offsite dose will be within the 10 CFR 50 (Ref. 2) and 10 CFR 100 (Ref. 3) criteria during AOOs.

Accidents are events that are analyzed even though they are not expected to occur during the plant life. The acceptable limit during accidents is that the offsite dose shall be maintained within an acceptable fraction of 10 CFR 100 (Ref. 3) limits. Different accident categories allow 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. However, the acceptable dose limit for an accident category and their associated [LTSPs] are not considered to be LSSS as defined in 10 CFR 50.36.

The ESFAS contains devices and circuitry that generate the following signals when monitored variables reach levels that are indicative of conditions requiring protective action:

1. Safety Injection Actuation Signal (SIAS), Containment Cooling Actuation Signal (CCAS) (actuated by an automatic SIAS),

2. Containment Spray Actuation Signal (CSAS),

3. Containment Isolation Actuation Signal (CIAS),

4. Main Steam Isolation Signal (MSIS),

5. Recirculation Actuation Signal (RAS), and

6, 7. Emergency Feedwater Actuation Signal (EFAS).

Equipment actuated by each of the above signals is identified in the FSAR (Ref. 1).

Each of the above ESFAS instrumentation systems is segmented into three interconnected modules. These modules are:

- Measurement channels,
- Bistable trip units, and
- ESFAS Logic:
    - Matrix Logic,
    - Initiation Logic (trip paths), and
    - Actuation Logic.

This LCO addresses measurement channels and bistables. Logic is addressed in LCO 3.3.6, "Engineered Safety Features Actuation System (ESFAS) Logic and Manual Trip."

The role of each of these modules in the ESFAS, including the logic of LCO 3.3.6, is discussed below.

Measurement Channels

BACKGROUND (continued)

The trip setpoints and Allowable Values used in the bistables are based on the analytical limits stated in Reference 5. The selection of these ~~trip setpoints~~analytical limits 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 effects, for those ESFAS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 6), Allowable Values specified in Table 3.3.5-1, in the accompanying LCO, are conservatively adjusted with respect to the analytical limits. A detailed description of the methodology used to calculate the trip setpoints, including their explicit uncertainties, is provided in the "Plant Protection System Selection of Trip Setpoint Values" (Ref. 7). The actual ~~nominal~~ trip setpoint entered into the bistable is normally still more conservative than that specified by the Allowable Value to account for changes in random measurement errors detectable by a CHANNEL FUNCTIONAL TEST. ~~Achannel is inoperable if its actual trip setpoint is not within its required Allowable Value.~~ If the measured setpoint is conservative with respect to the Allowable Value, the bistable is considered OPERABLE.

~~Setpoints~~[LTSPs] in accordance with the Allowable Value will ensure that Safety Limits of LCO Section 2.0, "Safety Limits," are not violated during AOOs and the consequences of Design Basis Accidents (DBAs) will be acceptable, providing the plant is operated from within the LCOs at the onset of the AOO or DBA and the equipment functions as designed.

Functional testing of the ESFAS, from the bistable input through the opening of initiation relay contacts in the ESFAS Actuation Logic, can be performed either at power or at shutdown and is normally performed on a quarterly basis. FSAR, Section [7.2] (Ref. 8), provides more detail on ESFAS testing. Process transmitter calibration is normally performed on a refueling basis. SRs for the channels are specified in the Surveillance Requirements section.

ESFAS Logic

The ESFAS Logic, consisting of Matrix, Initiation and Actuation Logic, employs a scheme that provides an ESF actuation of both trains when bistables in any two of the four channels sense the same input parameter trip. This is called a two-out-of-four trip logic.

BACKGROUND (continued)

Manual ESFAS initiation capability is provided to permit the operator to manually actuate an ESF System when necessary.

Two sets of two push buttons (located in the control room) for each ESF Function are provided, and each set actuates both trains. Each Manual Trip push button opens one trip path, de-energizing one set of two initiation relays, one affecting each train of ESF. Initiation relay contacts are arranged in a selective two-out-of-four configuration in the Actuation Logic. By arranging the push buttons in two sets of two, such that both push buttons in a set must be depressed, it is possible to ensure that Manual Trip will not be prevented in the event of a single random failure. Each set of two push buttons is designated a single channel in LCO 3.3.6.

APPLICABLE SAFETY ANALYSES

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 the secondary, or backup, actuation signal for one or more other accidents.

Trip Setpoints for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

ESFAS protective Functions are as follows:

1. Safety Injection Actuation Signal

SIAS ensures acceptable consequences during large break loss of coolant accidents (LOCAs), small break LOCAs, control element assembly ejection accidents, and main steam line breaks (MSLBs) inside containment. To provide the required protection, either a high containment pressure or a low pressurizer pressure signal will initiate SIAS. SIAS initiates the Emergency Core Cooling Systems (ECCS) and performs several other functions such as initiating a containment cooling actuation, initiating control room isolation, and starting the diesel generators.

EFAS consists of two steam generator (SG) specific signals (EFAS-1 and EFAS-2). EFAS-1 initiates emergency feed to SG #1, and EFAS-2 initiates emergency feed to SG #2.

EFAS maintains a steam generator heat sink during a steam generator tube rupture event and an MSLB or FWLB event either inside or outside containment.

Low steam generator water level initiates emergency feed to the affected steam generator, providing the generator is not identified (by the circuitry) as faulted (a steam or FWLB).

EFAS logic includes steam generator specific inputs from the Steam Generator Pressure - Low bistable comparator (also used in MSIS) and the SG Pressure Difference - High (SG #1 > SG #2 or SG #2 > SG #1, bistable comparators) to determine if a rupture in either generator has occurred.

Rupture is assumed if the affected generator has a low pressure condition, unless that generator is significantly higher in pressure than the other generator.

This latter feature allows feeding the intact steam generator, even if both are below the MSIS setpoint, while preventing the ruptured generator from being fed. Not feeding a ruptured generator prevents containment overpressurization during the analyzed events.

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

LCO

The LCO requires all channel components necessary to provide an ESFAS actuation to be OPERABLE. Failure of any required portion of the instrument channel renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

Actions allow maintenance (trip channel) bypass of individual channels, but the bypass activates interlocks that prevent operation with a second channel in the same Function bypassed. With one channel in each Function trip channel bypassed, this effectively places the plant in a two-out-of-three logic configuration in those Functions.

Only the Allowable Values are specified for each ESFAS trip Function in the LCO. The [LTSP] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure that the setpoint measured by CHANNEL FUNCTIONAL TESTS does not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the [LTSP], but within its Allowable Value, is acceptable, provided that operation and testing are consistent with the assumptions of the plant specific setpoint calculations. Therefore, the Allowable Value specified in Table 3.3.5-1 is the least conservative value of the as-found setpoint that the channel can have when tested.

Plants are restricted to 48 hours in a trip channel bypass condition before restoring the Function to four channel operation (two-out-of-four logic) or placing the channel in trip (two-out-of-three logic).

The Bases for the LCOs on ESFAS Functions are:

----------------------------------REVIEWER'S NOTE----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

LCO (continued)

1. Safety Injection Actuation Signal

a. Containment Pressure - High

This LCO requires four channels of Containment Pressure - High to be OPERABLE in MODES 1, 2, and 3.

The Containment Pressure - High signal is shared among the SIAS (Function 1), CIAS (Function 3), and MSIS (Function 4).

The Allowable Value for this trip is set high enough to allow for small pressure increases in containment expected during normal operation (i.e., plant heatup) and is not indicative of an abnormal condition. The setting is low enough to initiate the ESF Functions when an abnormal condition is indicated. This allows the ESF systems to perform as expected in the accident analyses to mitigate the consequences of the analyzed accidents.

b. Pressurizer Pressure - Low

This LCO requires four channels of Pressurizer Pressure - Low to be OPERABLE in MODES 1 and 2.

The Allowable Value for this trip is set low enough to prevent actuating the ESF Functions (SIAS and CIAS) during normal plant operation and pressurizer pressure transients. The setting is high enough that, with the specified accidents, the ESF systems will actuate to perform as expected, mitigating the consequences of the accident.

ACTIONS (continued)

E.1 and E.2

If the Required Actions and associated Completion Times of Condition A, B, C, or D cannot be met, the plant must be brought to a MODE in which the LCO does not apply. 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 3.3.5.1~~

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.5-1 requiring reset of the channel to a predefined as-left tolerance and the verification of the as-found tolerance are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with allowable values in the table, but doing so is not required to comply with 10 CFR 50.36.

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------------------------------- REVIEWER'S NOTE -----------------------------------
Notes b and c are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes b and c are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note c requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes b and c are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes b and c may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes b and c being applied to the Functions shown in TS 3.3.5. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

SR 3.3.5.1

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

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

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

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.2

A CHANNEL FUNCTIONAL TEST is performed every 92 days to ensure the entire channel will perform its intended function when needed. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The CHANNEL FUNCTIONAL TEST is part of an overlapping test sequence similar to that employed in the RPS. This sequence, consisting of SR 3.3.5.2, SR 3.3.6.1, and SR 3.3.6.2, tests the entire ESFAS from the bistable input through the actuation of the individual subgroup relays. These overlapping tests are described in Reference 1. SR 3.3.5.2 and SR 3.3.6.1 are normally performed together and in conjunction with ESFAS testing. SR 3.3.6.2 verifies that the subgroup relays are capable of actuating their respective ESF components when de-energized.

These tests verify that the ESFAS is capable of performing its intended function, from bistable input through the actuated components.
SRs 3.3.6.1 and 3.3.6.2 are addressed in LCO 3.3.6. SR 3.3.5.2 includes bistable tests.

A test signal is superimposed on the input in one channel at a time to verify that the bistable trips within the specified tolerance around the setpoint. This is done with the affected RPS trip channel bypassed. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint analysis.

The as-found [and as-left] values must also be recorded and reviewed for consistency with the assumptions of the surveillance interval extension analysis. The requirements for this review are outlined in Reference [9].

SR 3.3.5.2 for SL-LSSS functions are modified by two Notes as identified in Table 3.3.5-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.3

CHANNEL CALIBRATION is a complete check of the instrument channel including the detector and the bypass removal functions. The Surveillance verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift between successive calibrations to ensure that the channel remains operational between successive surveillances. CHANNEL CALIBRATIONS must be performed consistent with the plant specific setpoint analysis.

The as-found [and as-left] values must also be recorded and reviewed for consistency with the assumptions of the surveillance interval extension analysis. The requirements for this review are outlined in Reference [9].

The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

SR 3.3.5.3 for SL-LSSS functions are modified by two Notes as identified in Table 3.3.5-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.4

This Surveillance ensures that the train actuation response times are within the maximum values assumed in the safety analyses.

Response time testing acceptance criteria are included in Reference 10.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Applicable portions of the following TS Bases are applicable to plants adopting CEOG Topical Report CE NPSD-1167-1, "Elimination of Pressure Sensor Response Time Testing Requirements."

Response time may be verified by any series of sequential, overlapping or total channel measurements, including allocated sensor response time, such that the response time is verified. Allocations for sensor response times may be obtained from records of test results, vendor test data, or vendor engineering specifications. Topical Report CE NPSD-1167-A,

"Elimination of Pressure Sensor Response Time Testing Requirements," (Ref. 11) provides the basis and methodology for using allocated sensor

6. 10 CFR 50.49.

7. "Plant Protection System Selection of Trip Setpoint Values."

8. FSAR, Section [7.2].

9. CEN-327, May 1986, including Supplement 1, March 1989.

10. Response Time Testing Acceptance Criteria.

11. ~~11.~~ CEOG Topical Report CE NPSD-1167-A, "Elimination of Pressure Sensor Response Time Testing Requirements."

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

Table 3.3.1.1-1 (page 1 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Intermediate Range Monitors					
a. Neutron Flux - High	2	[3]	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.11[(a)(b)] SR 3.3.1.1.13	≤ [120/125] divisions of full scale
	5(~~a~~c)	[3]	H	SR 3.3.1.1.1 SR 3.3.1.1.5 SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [120/125] divisions of full scale
b. Inop	2	[3]	G	SR 3.3.1.1.4 SR 3.3.1.1.13	NA
	5(~~a~~c)	[3]	H	SR 3.3.1.1.5 SR 3.3.1.1.13	NA
2. Average Power Range Monitors					
a. Neutron Flux - High, Setdown	2	[2]	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.6 SR 3.3.1.1.9 SR 3.3.1.1.13	≤ [20]% RTP
b. Flow Biased Simulated Thermal Power - High	1	[2]	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.3 SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.9[(a)(b)] SR 3.3.1.1.12[(a)(b)] SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [0.58 W + 62]% RTP and ≤ [115.5]% RTP(~~b~~d)

(a) [INSERT 1]

(b) [INSERT 2]

(~~a~~c) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(~~b~~d) [0.58 W + 62% - 0.58 ΔW]RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."

Table 3.3.1.1-1 (page 2 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitors					
c. Fixed Neutron Flux - High	1	[2]	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.6 SR 3.3.1.1.7 ~~[(a)(b)]~~ SR 3.3.1.1.9 [(a)(b)] ~~[(c) (d)]~~ SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [120]% RTP
[d. Downscale	1	[2]	F	SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.13	≥ [3]% RTP]
e. Inop	1,2	[2]	G	SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.13	NA
3. Reactor Vessel Steam Dome Pressure - High	1,2	[2]	G	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] [(a)(b)] SR 3.3.1.1.11 [(a)(b)] SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [1054] psig
4. Reactor Vessel Water Level - Low, Level 3	1,2	[2]	G	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] [(a)(b)] SR 3.3.1.1.11 [(a)(b)] SR 3.3.1.1.13 SR 3.3.1.1.15	≥ [10] inches
5. Main Steam Isolation Valve - Closure	1	[8]	F	SR 3.3.1.1.7 SR 3.3.1.1.11 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [10]% closed
6. Drywell Pressure - High	1,2	[2]	G	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [1.92] psig

(a) [INSERT 1]

(b) [INSERT 2]

Table 3.3.1.1-1 (page 3 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7. Scram Discharge Volume Water Level - High					
a. Resistance Temperature Detector	1,2	[2]	G	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [57.15] gallons
	5(~~a~~c)	[2]	H	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [57.15] gallons
b. Float Switch	1,2	[2]	G	SR 3.3.1.1.7 SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [57.15] gallons
	5(~~a~~c)	[2]	H	SR 3.3.1.1.7 SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [57.15] gallons
8. Turbine Stop Valve - Closure	≥ [30]% RTP	[4]	E	SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	≤ [10]% closed
9. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	≥ [30]% RTP	[2]	E	SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11[(a)(b)] SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ [600] psig
10. Reactor Mode Switch - Shutdown Position	1,2	[2]	G	SR 3.3.1.1.10 SR 3.3.1.1.13	NA
	5(~~a~~c)	[2]	H	SR 3.3.1.1.10 SR 3.3.1.1.13	NA

(~~a~~c) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

Table 3.3.1.1-1 (page 4 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
11. Manual Scram	1,2	[2]	G	SR 3.3.1.1.5 SR 3.3.1.1.13	NA
	5(~~a~~c)	[2]	H	SR 3.3.1.1.5 SR 3.3.1.1.13	NA

(~~a~~c) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range - Upscale	(a)	[2]	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7[(b),(c)]	≤ [115.5/125] divisions of full scale
b. Intermediate Power Range - Upscale	(~~b~~d)	[2]	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7[(b),(c)]	≤ [109.7/125] divisions of full scale
c. High Power Range - Upscale	(~~c~~e),(~~d~~f)	[2]	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7[(b),(c)]	≤ [105.9/125] divisions of full scale
d. Inop	(~~d~~f),(~~e~~g)	[2]	SR 3.3.2.1.1	NA
e. Downscale	(~~d~~f),(g~~e~~)	[2]	SR 3.3.2.1.1 SR 3.3.2.1.7	≥ [93/125] divisions of full scale
f. Bypass Time Delay	(f~~d~~),(~~e~~g)	[2]	SR 3.3.2.1.1 SR 3.3.2.1.7	≤ [2.0] seconds
2. Rod Worth Minimizer	1[(h~~f~~)], 2[(h~~f~~)]	[1]	SR 3.3.2.1.2 SR 3.3.2.1.3 SR 3.3.2.1.5 SR 3.3.2.1.8	NA
3. Reactor Mode Switch - Shutdown Position	(~~g~~i)	[2]	SR 3.3.2.1.6	NA

(a) THERMAL POWER ≥ [29]% and ≤ [64]% RTP and MCPR < 1.70.

(b) [INSERT 1]

(c) [INSERT 2]

(~~b~~d) THERMAL POWER > [64]% and ≤ [84]% RTP and MCPR < 1.70.

(~~c~~e) THERMAL POWER > [84]% and < 90% RTP and MCPR < 1.70.

(~~d~~f) THERMAL POWER ≥ 90% RTP and MCPR < 1.40.

(~~e~~g) THERMAL POWER ≥ [64]% and < 90% RTP and MCPR < 1.70.

(~~f~~h) With THERMAL POWER ≤ [10]% RTP.

~~(g)~~(i) Reactor mode switch in the shutdown position.

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.4.1.2	-------------------------------NOTES---------------------------- 1. For the TCV Function, if the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. 2. For the TCV Function, the instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. -- [Calibrate the trip units.	[92] days]
SR 3.3.4.1.3	-------------------------------NOTES---------------------------- 1. For the TCV Function, if the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. 2. For the TCV Function, the instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than	[18] months

	the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. --- Perform CHANNEL CALIBRATION. The Allowable Values shall be: a. TSV - Closure: ≤ [10]% closed and b. TCV Fast Closure, Trip Oil Pressure - Low: ≥ [600] psig.	
SR 3.3.4.1.4	Perform LOGIC SYSTEM FUNCTIONAL TEST including breaker actuation.	[18] months
SR 3.3.4.1.5	Verify TSV - Closure and TCV Fast Closure, Trip Oil Pressure - Low Functions are not bypassed when THERMAL POWER is ≥ [30]% RTP.	[18] months
SR 3.3.4.1.6	------------------------------NOTE------------------------------ Breaker [interruption] time may be assumed from the most recent performance of SR 3.3.4.1.7. --- Verify the EOC-RPT SYSTEM RESPONSE TIME is within limits.	[18] months on a STAGGERED TEST BASIS
SR 3.3.4.1.7	Determine RPT breaker [interruption] time.	60 months

Table 3.3.5.1-1 (page 3 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI System					
[f. Low Pressure Coolant Injection Pump Start - Time Delay Relay	1, 2, 3, 4[(a)], 5[(a)]	[4] [1 per pump]	C	SR 3.3.5.1.5 SR 3.3.5.1.6	
Pumps A,B,D					≥ 9 seconds and ≤ 11 seconds
Pump C					≤ 1 second]
[g. Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass)	1, 2, 3, 4[(a)], 5[(a)]	[4] [1 per pump]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm]
[h. Manual Initiation	1, 2, 3, 4[(a)], 5[(a)]	[2] [1 per subsystem]	C	SR 3.3.5.1.6	NA]
3. High Pressure Coolant Injection (HPCI) System					
a. Reactor Vessel Water Level - Low Low, Level 2	1, 2[(d)], 3[(d)]	[4]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(e)(f)] SR 3.3.5.1.5[(e)(f)] SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [-47] inches
b. Drywell Pressure – High	1, 2[(d)], 3[(d)]	[4]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [1.92] psig
c. Reactor Vessel Water Level - High, Level 8	1, 2[(d)], 3[(d)]	[2]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [56.5] inches

(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."

(d) With reactor steam dome pressure > [150] psig.

(e) [INSERT 1]

(f) [INSERT 2]

Table 3.3.5.2-1 (page 1 of 1)
Reactor Core Isolation Cooling System Instrumentation

FUNCTION	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level - Low Low, Level 2	[4]	B	SR 3.3.5.2.1 SR 3.3.5.2.2 [SR 3.3.5.2.3][(a)(b)] SR 3.3.5.2.5 SR 3.3.5.2.6	≥ [-47] inches
2. Reactor Vessel Water Level - High, Level 8	[2]	C	SR 3.3.5.2.1 SR 3.3.5.2.2 [SR 3.3.5.2.3] SR 3.3.5.2.5 SR 3.3.5.2.6	≤ [56.5] inches
3. Condensate Storage Tank Level - Low	[2]	D	[SR 3.3.5.2.1] SR 3.3.5.2.2 [SR 3.3.5.2.3] [SR 3.3.5.2.4] SR 3.3.5.2.6	≥ [0] inches
[4. Suppression Pool Water Level - High	[2]	D	[SR 3.3.5.2.1] SR 3.3.5.2.2 [SR 3.3.5.2.3] SR 3.3.5.2.5 SR 3.3.5.2.6	≤ [151] inches]
[5. Manual Initiation	[1]	C	SR 3.3.5.2.6	NA]

(a) [INSERT 1]

(b) [INSERT 2]

B 3.3 INSTRUMENTATION

B 3.3.1.1 Reactor Protection System (RPS) Instrumentation

BASES

BACKGROUND

The RPS initiates a reactor scram when one or more monitored parameters exceed their specified limits, to preserve the integrity of the fuel cladding and the Reactor Coolant System (RCS) and minimize the energy that must be absorbed following a loss of coolant accident (LOCA). This can be accomplished either automatically or manually.

The protection and monitoring functions of the RPS have been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance. ~~Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "...settings for automatic protective devices...so chosen that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded."~~ The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

-------------------------------- REVIEWER'S NOTE ----------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.1.1-1 for the purpose of compliance with 10 CFR 50.36, the

plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.1.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

~~The~~ The [Limiting Trip Setpoint (LTSP)]~~trip setpoint~~ is a predetermined setting for a protecti~~ve~~on channel~~device~~ chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP]~~trip setpoint~~ accounts for uncertainties in setting the channel~~device~~ (e.g., calibration), uncertainties in how the channel~~device~~ might actually perform (e.g., repeatability), changes in the point of action of the ~~device~~channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP]~~trip setpoint plays~~ ensures ~~an important role in ensuring~~ that SLs are not exceeded. As such, the ~~trip setpoint~~[LTSP] meets the definition of an LSSS (Ref. 1)~~and could be used to meet the requirement that they be contained in the Technical Specifications~~.

BASES

BACKGROUND (continued)

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." ~~For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for these devices. However, u~~Use of the ~~trip setpoint~~ [LTSP] to define OPERABILITY in Technical Specifications ~~and its corresponding designation as the LSSS required by 10 CFR 50.36~~ would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protecti~~ve device~~on channel setting during a

Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protecti~~ve device~~on channel with a setting that has been found to be different from the [LTSP] ~~trip setpoint~~ due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] ~~trip setpoint~~ and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protecti~~ve~~on channel ~~device~~. Therefore, the channel ~~device~~ would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the ~~device~~channel within the established as-left tolerance around ~~to the~~ [LTSP] ~~trip setpoint~~ to account for further drift during the next surveillance interval.

~~Use of the trip setpoint to define "as found" OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and Technical Specification that are clearly not warranted.~~ However, there is also some point beyond which the channel 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. ~~which, as stated above, is the same as the LSSS.~~

~~The Allowable Value specified in Table 3.3.1-1 serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to 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. If the actual setting 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. Note that although the channel is "OPERABLE" under these circumstances, the trip setpoint should be left adjusted to a value within the established trip setpoint 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.~~

BASES

BACKGROUND (continued)

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

The RPS, as shown in the FSAR, Figure [ ] (Ref. 2), includes sensors, relays, bypass circuits, and switches that are necessary to cause initiation of a reactor scram. Functional diversity is provided by monitoring a wide range of dependent and independent parameters. The input parameters to the scram logic are from instrumentation that monitors reactor vessel water level, reactor vessel pressure, neutron flux, main steam line isolation valve position, turbine control valve (TCV) fast closure, trip oil pressure low, turbine stop valve (TSV) position, drywell pressure, and scram discharge volume (SDV) water level, as well as reactor mode switch in shutdown position and manual scram signals. There are at least four redundant sensor input signals from each of these parameters (with the exception of the reactor mode switch in shutdown scram signal). Most channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs an RPS trip signal to the trip logic. Table B 3.3.1.1-1 summarizes the diversity of sensors capable of initiating scrams during anticipated operating transients typically analyzed.

The RPS is comprised of two independent trip systems (A and B) with two logic channels in each trip system (logic channels A1 and A2, B1 and B2) as shown in Reference 2. The outputs of the logic channels in a trip system are combined in a one-out-of-two logic so that either channel can trip the associated trip system. The tripping of both trip systems will produce a reactor scram. This logic arrangement is referred to as a one-out-of-two taken twice logic. Each trip system can be reset by use of a reset switch. If a full scram occurs (both trip systems trip), a relay prevents reset of the trip systems for 10 seconds after the full scram signal is received. This 10 second delay on reset ensures that the scram function will be completed.

BACKGROUND (continued)

Two scram pilot valves are located in the hydraulic control unit for each control rod drive (CRD). Each scram pilot valve is solenoid operated, with the solenoids normally energized. The scram pilot valves control the air supply to the scram inlet and outlet valves for the associated CRD. When either scram pilot valve solenoid is energized, air pressure holds the scram valves closed and, therefore, both scram pilot valve solenoids must be de-energized to cause a control rod to scram. The scram valves control the supply and discharge paths for the CRD water during a scram. One of the scram pilot valve solenoids for each CRD is controlled by trip system A, and the other solenoid is controlled by trip system B. Any trip of trip system A in conjunction with any trip in trip system B results in de-energizing both solenoids, air bleeding off, scram valves opening, and control rod scram.

The backup scram valves, which energize on a scram signal to depressurize the scram air header, are also controlled by the RPS. Additionally, the RPS System controls the SDV vent and drain valves such that when both trip systems trip, the SDV vent and drain valves close to isolate the SDV.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the RPS are assumed in the safety analyses of References 2, 3, and 4. The RPS initiates a reactor scram when monitored parameter values exceed the Allowable Values specified by the setpoint methodology and listed in Table 3.3.1.1--1 to preserve the integrity of the fuel cladding, the reactor coolant pressure boundary (RCPB), and the containment by minimizing the energy that must be absorbed following a LOCA.

RPS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Functions not specifically credited in the accident analysis are retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The OPERABILITY of the RPS is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.1.1-1. Each Function must have a required number of OPERABLE channels per RPS trip system, with their setpoints set within the ~~specified Allowable Value~~setting tolerance of the [LTSPs], where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable Values are specified for each RPS Function specified in ~~the~~ Table~~. Nominal trip setpoints are specified in the setpoint calculations.~~ 3.3.1.1-1. [Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The ~~nominal setpoint~~[LTSP]s are selected to ensure that the actual setpoints ~~do not exceed the Allowable Value~~ remain conservative with respect to the Allowable Value between successive CHANNEL CALIBRATIONS. ~~Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.~~After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

~~Trip setpoints~~[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated ~~device~~channel (e.g., trip unit) changes state. The ~~analytic~~analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the ~~analytic~~analytical limits, corrected for calibration, process, and some of the instrument errors. The ~~trip setpoints~~[LTSPs] are then determined accounting for the remaining instrument errors (e.g., drift). The ~~trip setpoints~~[LTSPs] derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The OPERABILITY of scram pilot valves and associated solenoids, backup scram valves, and SDV valves, described in the Background section, are not addressed by this LCO.

The individual Functions are required to be OPERABLE in the MODES specified in the table, which may require an RPS trip to mitigate the consequences of a design basis accident or transient. To ensure a reliable scram function, a combination of ~~Functions~~functions are required in each MODE to provide primary and diverse initiation signals.

The RPS is required to be OPERABLE in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies. Control rods withdrawn from a core cell containing no fuel assemblies do not affect the reactivity of the core and, therefore, are not required to have the capability to scram. Provided all other control rods remain inserted, the RPS function is not required. In this condition, the required SDM (LCO 3.1.1) and refuel position one-rod-out interlock (LCO 3.9.2) ensure that no event requiring RPS will occur. During normal operation in

MODES 3 and 4, all control rods are fully inserted and the Reactor Mode Switch Shutdown Position control rod withdrawal block (LCO 3.3.2.1) does not allow any control rod to be withdrawn. Under these conditions, the RPS function is not required to be OPERABLE.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

Intermediate Range Monitor (IRM)

1.a. Intermediate Range Monitor Neutron Flux - High

BASES

ACTIONS (continued)

D.1

Required Action D.1 directs entry into the appropriate Condition referenced in Table 3.3.1.1-1. The applicable Condition specified in the Table is Function and MODE or other specified condition dependent and may change as the Required Action of a previous Condition is completed. Each time an inoperable channel has not met any Required Action of Condition A, B, or C and the associated Completion Time has expired, Condition D will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1, F.1, and G.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. The allowed Completion Times are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems. In addition, the Completion Time of Required Action E.1 is consistent with the Completion Time provided in LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)."

H.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by immediately initiating action to fully insert all insertable control rods in core cells containing one or more fuel assemblies. Control rods in core cells containing no fuel assemblies do not affect the reactivity of the core and are, therefore, not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

BASES

SURVEILLANCE REQUIREMENTS (continued)

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.1.1-1 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes a and b) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------

Notes a and b are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes a and b are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note b requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes a and b are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes a and b may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance

established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.1.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

As noted at the beginning of the SRs, the SRs for each RPS instrument~~ation~~ Function are located in the SRs column of Table 3.3.1.1-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 4) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RPS will trip when necessary.

SR 3.3.1.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift ~~in~~on one of the channels or 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.

is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.6.

A restriction to satisfying this SR when < 25% RTP is provided that requires the SR to be met only at ≥ 25% RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when < 25% RTP. At low power levels, a

high degree of accuracy is unnecessary because of the large inherent margin to thermal limits (MCPR and APLHGR). At ≥ 25% RTP, the Surveillance is required to have been satisfactorily performed within the last 7 days~~,~~ in accordance with SR 3.0.2. A Note is provided which allows an increase in THERMAL POWER above 25% if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after reaching or exceeding 25% RTP. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

SR 3.3.1.1.3

The Average Power Range Monitor Flow Biased Simulated Thermal Power - High Function uses the recirculation loop drive flows to vary the trip setpoint. This SR ensures that the total loop drive flow signals from the flow ~~units~~ unit used to vary the setpoint ~~is~~are appropriately compared to a calibrated flow signal and~~,~~ therefore~~,~~ the APRM Function accurately reflects the required setpoint as a function of flow. Each flow signal from the respective flow unit must be ≤ 105% of the calibrated flow signal. If the flow unit signal is not within the limit, ~~one required APRM~~the APRMs that receive~~s~~ an input from the inoperable flow unit must be declared inoperable.

The Frequency of 7 days is based on engineering judgment, operating experience, and the reliability of this instrumentation.

SR 3.3.1.1.4

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical ~~Specification~~Specifications tests at least once per refueling interval with applicable extensions.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology~~.~~.

BASES

SURVEILLANCE REQUIREMENTS (continued)

As noted, SR 3.3.1.1.4 is not required to be performed when entering MODE 2 from MODE 1~~,~~ since testing of the MODE 2 required IRM and APRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This allows entry into MODE 2 if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after entering MODE 2 from MODE 1. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

A Frequency of 7 days provides an acceptable level of system average unavailability over the Frequency interval and is based on reliability analysis (Ref. ~~9~~10).

SR 3.3.1.1.5

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended ~~function.~~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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical ~~Specification~~Specifications and non-Technical ~~Specification~~Specifications tests at least once per refueling interval with applicable extensions. In accordance with Reference 10, the scram contacts must be tested as part of the Manual Scram Function. A Frequency of 7 days provides an acceptable level of system average availability over the Frequency and is based on the reliability analysis of Reference ~~11.~~10. (The Manual Scram Function's CHANNEL FUNCTIONAL TEST Frequency was credited in the analysis to extend many automatic scram Functions' Frequencies.)

SR 3.3.1.1.6

LPRM gain settings are determined from the local flux profiles measured by the Traversing Incore Probe (TIP) System. This establishes the relative local flux profile for appropriate representative input to the APRM

System. The 1000 MWD/T Frequency is based on operating experience with LPRM sensitivity changes.

BASES

SURVEILLANCE REQUIREMENTS ~~-~~(continued)

SR 3.3.1.1.7 and SR 3.3.1.1.10

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical ~~Specification~~Specifications and non-Technical ~~Specification~~Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. The 92 day Frequency of SR 3.3.1.1.7 is based on the reliability analysis of Reference 10.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

SR 3.3.1.1.8

~~Calibration~~The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.1.1-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is ~~not beyond~~ conservative with respect to the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to ~~be equal to or more conservative than~~ the [LTSP] within the as-left tolerance as accounted for in the appropriate setpoint methodology.

The Frequency of 92 days for SR 3.3.1.1.8 is based on the reliability analysis of Reference 10.

SR 3.3.1.1.8 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.9 and SR 3.3.1.1.11

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to the [LTSP] within the as-left tolerance to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

Note 1 states that neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.6). A second Note is provided that requires the APRM and IRM SRs to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM and IRM

Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

The Frequency of SR 3.3.1.1.9 is based upon the assumption of a 184 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of SR 3.3.1.1.11 is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SRs 3.3.1.1.9 and 3.3.1.1.11 for SL-LSSS functions are modified by two Notes as identified in Table 3.3.1.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.1.1.12

The Average Power Range Monitor Flow Biased Simulated Thermal Power - High Function uses an electronic filter circuit to generate a signal proportional to the core THERMAL POWER from the APRM neutron flux signal. This filter circuit is representative of the fuel heat transfer dynamics that produce the relationship between the neutron flux and the core THERMAL POWER. The Surveillance filter time constant must be verified to be ≤ 7 seconds to ensure that the channel is accurately reflecting the desired parameter.

The Frequency of 18 months is based on engineering judgment considering the reliability of the components.

SR 3.3.1.1.12 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

BACKGROUND

Control rods provide the primary means for control of reactivity changes. Control rod block instrumentation includes channel sensors, logic circuitry, switches, and relays that are designed to ensure that specified fuel design limits are not exceeded for postulated transients and accidents. During high power operation, the rod block monitor (RBM) provides protection for control rod withdrawal error events. During low power operations, control rod blocks from the rod worth minimizer (RWM) enforce specific control rod sequences designed to mitigate the consequences of the control rod drop accident (CRDA). During shutdown conditions, control rod blocks from the Reactor Mode Switch - Shutdown Position Function ensure that all control rods remain inserted to prevent inadvertent criticalities.

The protection and monitoring functions of the control rod block instrumentation has been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

-------------------------------- REVIEWER'S NOTE ----------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.2.1-1 for the purpose of compliance with 10 CFR 50.36, the

plant-specific term for the Limiting or Nominal Trip Setpoint must be cited in Note c of Table 3.3.2.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 10).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel 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.

BASES

BACKGROUND (continued)

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

The purpose of the RBM is to limit control rod withdrawal if localized neutron flux exceeds a predetermined setpoint during control rod manipulations. It is assumed to function to block further control rod withdrawal to preclude a MCPR Safety Limit (SL) violation. The RBM supplies a trip signal to the Reactor Manual Control System (RMCS) to appropriately inhibit control rod withdrawal during power operation above the low power range setpoint. The RBM has two channels, either of which can initiate a control rod block when the channel output exceeds the control rod block setpoint. One RBM channel inputs into one RMCS rod block circuit and the other RBM channel inputs into the second RMCS rod block circuit. The RBM channel signal is generated by averaging a set of local power range monitor (LPRM) signals at various core heights surrounding the control rod being withdrawn. A signal from one average power range monitor (APRM) channel assigned to each Reactor Protection System (RPS) trip system supplies a reference signal for the RBM channel in the same trip system. This reference signal is used to determine which RBM range setpoint (low, intermediate, or high) is enabled. If the APRM is indicating less than the low power range setpoint, the RBM is automatically bypassed. The RBM is also automatically bypassed if a peripheral control rod is selected (Ref. 1).

The purpose of the RWM is to control rod patterns during startup, such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to

10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. Prescribed control rod sequences

are stored in the RWM, which will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the stored sequence. The RWM determines the actual sequence based position indication for each control rod. The RWM also uses feedwater flow and steam flow signals to determine when the reactor power is above the preset power level at which the RWM is automatically bypassed (Ref. 2). The RWM is a single channel system that provides input into both RMCS rod block circuits.

With the reactor mode switch in the shutdown position, a control rod withdrawal block is applied to all control rods to ensure that the shutdown condition is maintained. This Function prevents inadvertent criticality as the result of a control rod withdrawal during MODE 3 or 4, or during MODE 5 when the reactor mode switch is required to be in the shutdown position. The reactor mode switch has two channels, each inputting into a separate RMCS rod block circuit. A rod block in either RMCS circuit will provide a control rod block to all control rods.

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

Allowable Values are specified for each Rod Block Function specified in SR 3.3.2.1.7, [[Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the

Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSP]s are selected to ensure that the actual setpoints remain conservative with respect to the Allowable Value between successive CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated channel (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined accounting for the remaining instrument errors (e.g., drift). The [LTSPs] derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis

----------------------------------REVIEWER'S NOTE----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."
----

1. Rod Block Monitor

The RBM is designed to prevent violation of the MCPR SL and the cladding 1% plastic strain fuel design limit that may result from a single control rod withdrawal error (RWE) event. The analytical methods and assumptions used in evaluating the RWE event are summarized in Reference 3. A statistical analysis of RWE events was performed to determine the RBM response for both channels for each event. From these responses, the fuel thermal performance as a function of RBM Allowable Value was determined. The Allowable Values are chosen as a function of power level. Based on the specified Allowable Values, operating limits are established.

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

Two channels of the RBM are required to be OPERABLE, with their setpoints within the appropriate Allowable Value for the associated power range, to ensure that no single instrument failure can preclude a rod block from this Function. The actual setpoints are calibrated consistent with applicable setpoint methodology.

~~Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the setpoints do not exceed the Allowable Values between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor power), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytic limits, corrected for calibration, process, and some of the instrument errors. The trip setpoints are then determined accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.~~

The RBM is assumed to mitigate the consequences of an RWE event when operating ≥ 29% RTP. Below this power level, the consequences of an RWE event will not exceed the MCPR SL and, therefore, the RBM is not required to be OPERABLE (Ref. 3). When operating < 90% RTP, analyses (Ref. 3) have shown that with an initial MCPR ≥ 1.70, no RWE event will result in exceeding the MCPR SL. Also, the analyses demonstrate that when operating at ≥ 90% RTP with MCPR ≥ 1.40, no RWE event will result in exceeding the MCPR SL (Ref. 3). Therefore, under these conditions, the RBM is also not required to be OPERABLE.

2. Rod Worth Minimizer

The RWM enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, 6, and 7. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

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

ACTIONS (continued)

E.1 and E.2

With one Reactor Mode Switch - Shutdown Position control rod withdrawal block channel inoperable, the remaining OPERABLE channel is adequate to perform the control rod withdrawal block function. However, since the Required Actions are consistent with the normal action of an OPERABLE Reactor Mode Switch - Shutdown Position Function (i.e., maintaining all control rods inserted), there is no distinction between having one or two channels inoperable.

In both cases (one or both channels inoperable), suspending all control rod withdrawal and initiating action to fully insert all insertable control rods in core cells containing one or more fuel assemblies will ensure that the core is subcritical with adequate SDM ensured by LCO 3.1.1. Control rods in core cells containing no fuel assemblies do not affect the reactivity of the core and are therefore not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

---------------------------------REVIEWER'S NOTE---------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

------------------------------ REVIEWER'S NOTE ---------------------------------
The Notes in Table 3.3.2.1-1 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes b and c) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE ---------------------------------
Notes b and c are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes b and c are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note c requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This

comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes b and c are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes b and c may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes b and c being applied to the Functions shown in TS 3.3.2.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

As noted at the beginning of the SRs, the SRs for each Control Rod Block instrumentation Function are found in the SRs column of Table 3.3.2.1-1.

The Surveillances are modified by a Note to indicate that when an RBM channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains control rod block capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 9) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that a control rod block will be initiated when necessary.

SURVEILLANCE REQUIREMENTS (continued)

acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The CHANNEL FUNCTIONAL TEST for the Reactor Mode Switch - Shutdown Position Function is performed by attempting to withdraw any control rod with the reactor mode switch in the shutdown position and verifying a control rod block occurs.

As noted in the SR, the Surveillance is not required to be performed until 1 hour after the reactor mode switch is in the shutdown position, since testing of this interlock with the reactor mode switch in any other position cannot be performed without using jumpers, lifted leads, or movable links. This allows entry into MODES 3 and 4 if the 18 month Frequency is not met per SR 3.0.2. The 1 hour allowance is based on operating experience and in consideration of providing a reasonable time in which to complete the SRs.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 18 month Frequency.

SR 3.3.2.1.7

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

As noted, neutron detectors are excluded from the CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Neutron detectors are adequately tested in SR 3.3.1.1.2 and SR 3.3.1.1.6.

The Frequency is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.2.1.7 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.2.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.1.8

The RWM will only enforce the proper control rod sequence if the rod sequence is properly input into the RWM computer. This SR ensures that the proper sequence is loaded into the RWM so that it can perform its intended function. The Surveillance is performed once prior to declaring RWM OPERABLE following loading of sequence into RWM, since this is when rod sequence input errors are possible.

REFERENCES

1. FSAR, Section [7.6.2.2.5].
2. FSAR, Section [7.6.8.2.6].
3. NEDC-30474-P, "Average Power Range Monitor, Rod Block Monitor, and Technical Specification Improvements (ARTS) Program for Edwin I. Hatch Nuclear Plants," December 1983.
4. NEDE-24011-P-A-9-US, "General Electrical Standard Application for Reload Fuel," Supplement for United States, Section S 2.2.3.1, September 1988.
5. "Modifications to the Requirements for Control Rod Drop Accident Mitigating Systems," BWR Owners' Group, July 1986.
6. NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.

7. NRC SER, "Acceptance of Referencing of Licensing Topical Report NEDE-24011-P-A," "General Electric Standard Application for Reactor Fuel, Revision 8, Amendment 17," December 27, 1987.

8. NEDC-30851-P-A, "Technical Specification Improvement Analysis for BWR Control Rod Block Instrumentation," October 1988.

9. ~~9.~~ GENE-770-06-1, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

10. Reg. Guide 1.105, "Instrument Setpoints for Safety Systems," Rev. 3

B 3.3 INSTRUMENTATION

B 3.3.4.1 End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation

BASES

BACKGROUND

The EOC-RPT instrumentation initiates a recirculation pump trip (RPT) to reduce the peak reactor pressure and power resulting from turbine trip or generator load rejection transients to provide additional margin to core thermal MCPR Safety Limits (SLs).

The need for the additional negative reactivity in excess of that normally inserted on a scram reflects end of cycle reactivity considerations. Flux shapes at the end of cycle are such that the control rods may not be able to ensure that thermal limits are maintained by inserting sufficient negative reactivity during the first few feet of rod travel upon a scram caused by Turbine Control Valve (TCV) Fast Closure, Trip Oil Pressure - Low or Turbine Stop Valve (TSV) - Closure. The physical phenomenon involved is that the void reactivity feedback due to a pressurization transient can add positive reactivity at a faster rate than the control rods can add negative reactivity.

The protection functions of the EOC-RPT have been designed to ensure safe operation of the reactor during load rejection transients. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the EOC-RPT, as well as LCOs on other system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE ---------------------------------

The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used.

The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in SR 3.3.4.1.2 or 3.3.4.1.3 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note 2 of the SRs in the SR table. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 7).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel 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.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

The EOC-RPT instrumentation, as shown in Reference 1, is composed of sensors that detect initiation of closure of the TSVs or fast closure of the TCVs, combined with relays, logic circuits, and fast acting circuit breakers that interrupt power from the recirculation pump motor generator (MG) set generators to each of the recirculation pump motors. The channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs an EOC-RPT signal to the trip logic. When the RPT breakers trip open, the recirculation pumps coast down under their own inertia. The EOC-RPT has two identical trip systems, either of which can actuate an RPT.

Each EOC-RPT trip system is a two-out-of-two logic for each Function; thus, either two TSV - Closure or two TCV Fast Closure, Trip Oil Pressure - Low signals are required for a trip system to actuate. If either trip system actuates, both recirculation pumps will trip. There are two EOC-RPT breakers in series per recirculation pump. One trip system trips one of the two EOC-RPT breakers for each recirculation pump, and the second trip system trips the other EOC-RPT breaker for each recirculation pump.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The TSV - Closure and the TCV Fast Closure, Trip Oil Pressure - Low Functions are designed to trip the recirculation pumps in the event of a turbine trip or generator load rejection to mitigate the neutron flux, heat flux, and pressurize transients, and to increase the margin to the MCPR SL. The ~~analytical~~analytical methods and assumptions used in evaluating the turbine trip and generator load rejection, as well as other safety analyses that ensure EOC-RPT, are summarized in References 2, 3, and 4.

To mitigate pressurization transient effects, the EOC-RPT must trip the recirculation pumps after initiation of closure movement of either the TSVs or the TCVs. The combined effects of this trip and a scram reduce fuel bundle power more rapidly than a scram alone, resulting in an increased margin to the MCPR SL. Alternatively, MCPR limits for an inoperable EOC-RPT, as specified in the COLR, are sufficient to mitigate pressurization transient effects. The EOC-RPT function is automatically disabled when turbine first stage pressure is < [40%] RTP.

EOC-RPT instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The OPERABILITY of the EOC-RPT is dependent on the OPERABILITY of the individual instrumentation channel Functions. Each Function must have a required number of OPERABLE channels in each trip system, with their setpoints set within the setting tolerance of the LTSPs ~~specified Allowable Value of SR 3.3.4.1.3~~where ~~.~~appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Channel OPERABILITY also includes the associated EOC-RPT breakers. Each channel (including the associated EOC-RPT breakers) must also respond within its assumed response time.

Allowable Values are specified for each EOC-RPT Function specified in the LCO. [Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].. ~~Nominal trip setpoints are specified in the setpoint calculations.~~ A channel is OPERABLE~~inoperable~~ if its actual trip setpoint is conservative with respect to the ~~not within its required~~ Allowable Value. The [LTSP]s ~~nominal setpoints~~ are selected to ensure that the setpoints remain conservative with respect to ~~do not exceed the~~ Allowable Value between successive CHANNEL CALIBRATIONS. ~~Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable.~~ After each calibration the trip setpoint shall be left within the as-left band around the [LTSP]. Each Allowable Value specified is more conservative than the ~~analytical~~analytical limit assumed in the transient and accident analysis in order to account for instrument uncertainties appropriate to the Function.

~~Trip setpoints~~[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process

parameter (e.g., TSV position), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The ~~analytic~~analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the ~~analytic~~analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs]~~trip setpoints~~ are then determined accounting for the remaining instrument errors (e.g., drift). The [LTSPs]~~trip setpoints~~ derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The specific Applicable Safety Analysis, LCO, and Applicability discussions are listed below on a Function by Function basis.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

Alternatively, since this instrumentation protects against a MCPR SL violation, with the instrumentation inoperable, modifications to the MCPR limits (LCO 3.2.2) may be applied to allow this LCO to be met. The MCPR penalty for the EOC-RPT inoperable condition is specified in the COLR.

Turbine Stop Valve – Closure

Closure of the TSVs and a main turbine trip result in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, an RPT is initiated on TSV - Closure in anticipation of the transients that would result from closure of these valves. EOC-RPT decreases reactor power and aids the reactor scram in the associated Required Action would be the appropriate Required Action.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

-------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in SR 3.3.4.1.2 or 3.3.4.1.3 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes 1 and 2) are only associated with SL-LSSS values.

-------------------------------- REVIEWER'S NOTE -----------------------------------

Notes 1 and 2 are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes 1 and 2 are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note 2 requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes 1 and 2 are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes 1 and 2 may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes 1 and 2 being applied to SRs 3.3.4.1.2 or 3.3.4.1.3. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains EOC-RPT trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 5) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the recirculation pumps will trip when necessary.

SR 3.3.4.1.1

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based on reliability analysis of Reference 5.

SR 3.3.4.1.2

Calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in SR 3.3.4.1.3. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on assumptions of the reliability analysis (Ref. 5) and on the methodology included in the determination of the trip setpoint.

SR 3.3.4.1.2 for SL-LSSS functions is modified by two Notes in the SR table. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.4.1.3

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

The Frequency is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.4.1.3 for SL-LSSS functions is modified by two Notes in the SR table. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value.

Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.4.1.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The system functional test of the pump breakers is included as a part of this test, overlapping the LOGIC SYSTEM FUNCTIONAL TEST, to provide complete testing of the associated safety function. Therefore, if a breaker is incapable of operating, the associated instrument channel(s) would also be inoperable.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 18 month Frequency.

SR 3.3.4.1.5

This SR ensures that an EOC-RPT initiated from the TSV - Closure and TCV Fast Closure, Trip Oil Pressure - Low Functions will not be inadvertently bypassed when THERMAL POWER is ≥ 30% RTP. This involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodologies are incorporated into the actual setpoint. Because main turbine bypass flow can affect this setpoint nonconservatively (THERMAL POWER is derived from first stage pressure) the main turbine bypass valves must remain closed at THERMAL POWER ≥ 30% RTP to ensure that the calibration remains

5. GENE-770-06-1, "Bases For Changes To Surveillance Test Intervals And Allowed Out-Of-Service Times For Selected Instrumentation Technical Specifications," February 1991.

6. FSAR, Section [5.5.16.2].

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

B 3.3 INSTRUMENTATION

B 3.3.5.1 Emergency Core Cooling System (ECCS) Instrumentation

BASES

BACKGROUND

The purpose of the ECCS instrumentation is to initiate appropriate responses from the systems to ensure that the fuel is adequately cooled in the event of a design basis accident or transient. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the ECCS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE ---------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.5.1-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note f of Table 3.3.5.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-

found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 7).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel 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.

BASES

BACKGROUND (continued)

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

For most anticipated operational occurrences and Design Basis Accidents (DBAs), a wide range of dependent and independent parameters are monitored.

The ECCS instrumentation actuates core spray (CS), low pressure coolant injection (LPCI), high pressure coolant injection (HPCI), Automatic Depressurization System (ADS), and the diesel generators (DGs). The equipment involved with each of these systems is described in the Bases for LCO 3.5.1, "ECCS - Operating."

Core Spray System

The CS System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of Reactor Vessel Water Level - Low Low Low, Level 1 or Drywell Pressure - High. Each of these diverse variables is monitored by four redundant transmitters, which are, in turn, connected to four trip units. The outputs of the eight trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic (i.e., two trip systems) for each Function.

The high drywell pressure initiation signal is a sealed in signal and must be manually reset. The CS System can be reset if reactor water level has

BASES

BACKGROUND (continued)

redundant transmitters, which are, in turn, connected to four trip units. The outputs of the four trip units are connected to relays whose contacts are connected to a one-out-of-two taken twice logic to initiate all three DGs (2A, 1B, and 2C). The DGs receive their initiation signals from the CS System initiation logic. The DGs can also be started manually from the control room and locally from the associated DG room. The DG initiation signal is a sealed in signal and must be manually reset. The DG initiation logic is reset by resetting the associated ECCS initiation logic. Upon receipt of a loss of coolant accident (LOCA) initiation signal, each DG is automatically started, is ready to load in approximately 12 seconds, and will run in standby conditions (rated voltage and speed, with the DG output breaker open). The DGs will only energize their respective Engineered Safety Feature buses if a loss of offsite power occurs. (Refer to Bases for LCO 3.3.8.1.)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the ECCS are explicitly assumed in the safety analyses of References 1, 2, and 3. The ECCS is initiated to preserve the integrity of the fuel cladding by limiting the post LOCA peak cladding temperature to less than the 10 CFR 50.46 limits.

ECCS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The OPERABILITY of the ECCS instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints set within the setting tolerance of the specified ~~Allowable Values~~LTSPs, where appropriate.

The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each ECCS subsystem must also respond within its assumed response time. Table 3.3.5.1-1 is modified by two footnotes. Footnote (a) is added to clarify that the associated functions are required to be OPERABLE in MODES 4 and 5 only when their supported ECCS are required to be OPERABLE per LCO 3.5.2, ECCS - Shutdown. Footnote (b) is added to show that certain ECCS instrumentation Functions also perform DG initiation and actuation of other Technical Specifications (TS) equipment.

Allowable Values are specified for each ECCS Function specified in Table 3.3.5.1-1. [Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]..~~the table. Nominal trip setpoints are specified in the setpoint calculations.~~ The ~~nominal setpoint~~[[LTSP]s are selected to ensure that the setpoints ~~do not exceed the Allowable Value~~remain conservative with respect to the as-found tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

~~Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.~~

[Limiting Trip ~~setpoints~~Setpoints] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated ~~device~~channel (e.g., trip unit) changes state. The ~~analytic~~analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the ~~analytic~~analytical limits, corrected for calibration, process, and some of the instrument errors. The ~~trip setpoints~~[LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

In general, the individual Functions are required to be OPERABLE in the MODES or other specified conditions that may require ECCS (or DG) initiation to mitigate the consequences of a design basis transient or accident. To ensure reliable ECCS and DG function, a combination of Functions is required to provide primary and secondary initiation signals.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Vessel Water Level - Low Low Low, Level 1

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. The low pressure ECCS and associated DGs are initiated at Level 1 to ensure that core spray and flooding functions are available to prevent or minimize fuel damage. The Reactor Vessel Water Level - Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ECCS during the transients analyzed in References 1 and 3. In addition, the Reactor Vessel Water Level - Low Low Low, Level 1 Function is directly assumed in the analysis of the recirculation line break (Ref. 2). The core cooling function of the ECCS, along with the scram action of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

BASES

ACTIONS (continued)

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 8 days has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status if both HPCI and RCIC are OPERABLE (Required Action G.2). If either HPCI or RCIC is inoperable, the time shortens to 96 hours. If the status of HPCI or RCIC changes such that the Completion Time changes from 8 days to 96 hours, the 96 hours begins upon discovery of HPCI or RCIC inoperability. However, the total time for an inoperable channel cannot exceed 8 days. If the status of HPCI or RCIC changes such that the Completion Time changes from 96 hours to 8 days, the "time zero" for beginning the 8 day "clock" begins upon discovery of the inoperable channel. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would not necessarily result in a safe state for the channel in all events.

H.1

With any Required Action and associated Completion Time not met, the associated feature(s) may be incapable of performing the intended function, and the supported feature(s) associated with inoperable untripped channels must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.5.1-1 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes e and f) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------
Notes e and f are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes e and f are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note f requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes e and f are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes e and f may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes e and f being applied to the Functions shown in TS 3.3.5.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

As noted in the beginning of the SRs, the SRs for each ECCS instrument~~ation~~ Function are found in the SRs column of Table 3.3.5.1-1.

_The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours as follows: (a) for Functions 3.c, 3.f, and 3.g; and (b) for Functions other than 3.c, 3.f, and 3.g provided the associated Function or redundant Function maintains ECCS initiation capability. Upon completion of the Surveillance, or expiration of the 6 hour

allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 5) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the ECCS will initiate when necessary.

SR 3.3.5.1.1

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

Agreement criteria are determined by the plant 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 instrument has drifted outside its limit.

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

SR 3.3.5.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based on the reliability analyses of Reference 5.

SR 3.3.5.1.3

Calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.5.1-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is ~~not beyond~~ conservative with respect to the Allowable Value, the channel performance is still within the requirements of the plant safety analyses. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than the setting accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 5.

SR 3.3.5.1.3 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.1.4 and SR 3.3.5.1.5

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

The Frequency of SR 3.3.5.1.4 is based upon the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

The Frequency of SR 3.3.5.1.5 is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.5.1.5 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.1.6

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.1, LCO 3.5.2, LCO 3.8.1, and LCO 3.8.2 overlaps this Surveillance to complete testing of the assumed safety function.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

SR 3.3.5.1.7

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis. Response time testing acceptance criteria are included in Reference 4.

ECCS RESPONSE TIME may be verified by actual response time measurements in any series of sequential, overlapping, or total channel measurements.

----------------------------------REVIEWER'S NOTE----------------------------------
[The following Bases are applicable for plants adopting NEDO-32291-A.

However, the measurement of instrument loop response times may be excluded if the conditions of Reference 6 are satisfied.]

ECCS RESPONSE TIME tests are conducted on an 18 month STAGGERED TEST BASIS. The 18 month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

BASES

REFERENCES

1. FSAR, Section [5.2].

2. FSAR, Section [6.3].

3. FSAR, Chapter [15].

4. NEDC-31376-P, "Edwin I. Hatch Nuclear Power Plant, SAFER/GESTR-LOCA, Loss-of-Coolant Accident Analysis," December 1986.

5. NEDC-30936-P-A, "BWR Owners' Group Technical Specification Improvement Analyses for ECCS Actuation Instrumentation, Part 2," December 1988.

[6. NEDO-32291-A, "System Analyses for the Elimination of Selected Response Time Testing Requirements," October 1995.]

[7 Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation."]

B 3.3 INSTRUMENTATION

B 3.3.5.2 Reactor Core Isolation Cooling (RCIC) System Instrumentation

BASES

BACKGROUND

The purpose of the RCIC System instrumentation is to initiate actions to ensure adequate core cooling when the reactor vessel is isolated from its primary heat sink (the main condenser) and normal coolant makeup flow from the Reactor Feedwater System is unavailable, such that initiation of the low pressure Emergency Core Cooling Systems (ECCS) pumps does not occur. A more complete discussion of RCIC System operation is provided in the Bases of LCO 3.5.3, "RCIC System." This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RCIC, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE ---------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.5.2-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.5.2-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found

and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 2).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel 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.

BASES

BACKGROUND (continued)

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

The RCIC System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of reactor vessel Low Low water level. The variable is monitored by four transmitters that are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic arrangement. Once initiated, the RCIC logic seals in and can be reset by the operator only when the reactor vessel water level signals have cleared.

The RCIC test line isolation valve (which is also a primary containment isolation valve) is closed on a RCIC initiation signal to allow full system flow and maintain primary containment isolated in the event RCIC is not operating.

The RCIC System also monitors the water levels in the condensate storage tank (CST) and the suppression pool since these are the two sources of water for RCIC operation. Reactor grade water in the CST is the normal source. Upon receipt of a RCIC initiation signal, the CST suction valve is automatically signaled to open (it is normally in the open position) unless the pump suction from the suppression pool valves is open. If the water level in the CST falls below a preselected level, first the suppression pool suction valves automatically open, and then the CST suction valve automatically closes. Two level switches are used to detect low water level in the CST. Either switch can cause the suppression pool suction valves to open and the CST suction valve to close. The suppression pool suction valves also automatically open and the CST suction valve closes if high water level is detected in the suppression pool (one-out-of-two logic similar to the CST water level logic). To prevent losing suction to the pump, the suction valves are interlocked so that one suction path must be open before the other automatically closes.

BACKGROUND (continued)

The RCIC System provides makeup water to the reactor until the reactor vessel water level reaches the high water level (Level 8) trip (two-out-of-two logic), at which time the RCIC steam supply, steam supply bypass, and cooling water supply valves close (the injection valve also closes due to the closure of the steam supply valves). The RCIC System restarts if vessel level again drops to the low level initiation point (Level 2).

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The function of the RCIC System to provide makeup coolant to the reactor is used to respond to transient events. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. The RCIC System instrumentation satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The OPERABILITY of the RCIC System instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.2-1. Each Function must have a required number of OPERABLE channels with their setpoints set within the setting tolerance of the [LTSPs] ~~specified Allowable Values~~, where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.
~~A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions~~

Allowable Values are specified for each RCIC System instrumentation Function specified in ~~the~~ Table 3.3.5.2-1. ~~Nominal trip setpoints are specified in the setpoint calculations.~~ [Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The nominal setpoints are selected to ensure that the setpoints ~~do not exceed the Allowable Value~~ remain conservative to the as-left tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].~~Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. Each Allowable Value specified accounts for instrument uncertainties appropriate to the Function.~~

~~These uncertainties are described in the setpoint methodology.~~

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the

measured output value of the process parameter exceeds the setpoint, the associated channel (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The individual Functions are required to be OPERABLE in MODE 1, and in MODES 2 and 3 with reactor steam dome pressure > 150 psig since this is when RCIC is required to be OPERABLE. (Refer to LCO 3.5.3 for Applicability Bases for the RCIC System.)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

----------------------------------REVIEWER'S NOTE----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is set high enough such that for complete loss of feedwater flow, the RCIC System flow with high pressure coolant injection assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

2. Reactor Vessel Water Level - High, Level 8

BASES

SURVEILLANCE REQUIREMENTS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.5.2-1 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes a and b) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------

Notes a and b are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes a and b are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note b requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes a and b are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes a and b may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other

than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.5.2. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

As noted in the beginning of the SRs, the SRs for each RCIC System instrument~~ation~~ Function are found in the SRs column of Table 3.3.5.2-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4, provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 1) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RCIC will initiate when necessary.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a parameter on other similar channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or 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 by the plant 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 instrument has drifted outside its limit.

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

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 1.

SR 3.3.5.2.3

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.5.2-1. If the trip setting is discovered to be less conservative than the setting accounted for in the appropriate setpoint methodology, but is ~~not beyond~~conservative with respect ~~the~~to the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 1.

SR 3.3.5.2.3 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5.2-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.2.4 and SR 3.3.5.2.5

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency of SR 3.3.5.2.4 is based upon the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

The Frequency of SR 3.3.5.2.5 is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.5.2.5 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5.2-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.2.6

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.3 overlaps this Surveillance to provide complete testing of the safety function.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

REFERENCES

1. NEDE-770-06-2, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

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

Table 3.3.1.1-1 (page 1 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Intermediate Range Monitors					
a. Neutron Flux – High	2	[3]	H	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.11 [(a)(b)] SR 3.3.1.1.13	≤ [122/125] divisions of full scale
	5(~~a~~c)	[3]	I	SR 3.3.1.1.1 SR 3.3.1.1.5 SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [122/125] divisions of full scale
b. Inop	2	[3]	H	SR 3.3.1.1.4 SR 3.3.1.1.13	NA
	5(~~a~~c)	[3]	I	SR 3.3.1.1.5 SR 3.3.1.1.13	NA
2. Average Power Range Monitors					
a. Neutron Flux - High, Setdown	2	[3]	H	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.6 SR 3.3.1.1.9 SR 3.3.1.1.13	≤ [20]% RTP
b. Flow Biased Simulated Thermal Power - High	1	[3]	G	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.3 SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.9] [(a)(b)] SR 3.3.1.1.12 [(a)(b)] SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [0.66 W + 67]% RTP and ≤ [113]% RTP[(~~b~~d)]

(a) [INSERT 1]

(b) [INSERT 2]

(~~a~~c) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

[(~~b~~d) Allowable Value is [≤ 0.66 W + 43%] RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."]

Table 3.3.1.1-1 (page 2 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitors (Continued)					
c. Fixed Neutron Flux - High	1	[3]	G	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.9 [(~~c~~a)(~~d~~b)] SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [120]% RTP
d. Inop	1,2	[3]	H	SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.13	NA
3. Reactor Vessel Steam Dome Pressure - High	1,2	[2]	H	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] [(a)(b)] SR 3.3.1.1.11 [(a)(b)] SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [1079.7] psig
4. Reactor Vessel Water Level - Low, Level 3	1,2	[2]	H	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] [(a)(b)] SR 3.3.1.1.11 [(a)(b)] SR 3.3.1.1.13 SR 3.3.1.1.15	≥ [10.8] inches
5. Reactor Vessel Water Level - High, Level 8	≥ 25% RTP	[2]	F	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] [(a)(b)] SR 3.3.1.1.11 [(a)(b)] SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [54.1] inches
6. Main Steam Isolation Valve - Closure	1	[8]	G	SR 3.3.1.1.9 SR 3.3.1.1.11 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ [7]% closed

(~~c~~a) [INSERT 1]

(~~d~~b) [INSERT 2]

Table 3.3.1.1-1 (page 3 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7. Drywell Pressure - High	1,2	[2]	H	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [1.43] psig
8. Scram Discharge Volume Water Level - High					
a. Transmitter/Trip Unit	1,2	[2]	H	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [63]% of full scale
	5(~~a~~c)	[2]	I	SR 3.3.1.1.1 SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [63]% of full scale
b. Float Switch	1,2	[2]	H	SR 3.3.1.1.7 SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [65] inches
	5(~~a~~c)	[2]	I	SR 3.3.1.1.7 SR 3.3.1.1.11 SR 3.3.1.1.13	≤ [65] inches
9. Turbine Stop Valve Closure, Trip Oil Pressure - Low	≥ [40]% RTP	[4]	E	SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 [(a) (b)] SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ [37] psig
10. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	≥ [40]% RTP	[2]	E	SR 3.3.1.1.7 [SR 3.3.1.1.8] SR 3.3.1.1.11 [(a) (b)] SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ [42] psig

(a) [INSERT 1]

(b) [INSERT 2]

(~~a~~c)_With any control rod withdrawn from a core cell containing one or more fuel assemblies.

Table 3.3.1.1-1 (page 4 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
11. Reactor Mode Switch - Shutdown Position	1,2	[2]	H	SR 3.3.1.1.10 SR 3.3.1.1.13	NA
	5(~~a~~c)	[2]	I	SR 3.3.1.1.10 SR 3.3.1.1.13	NA
12. Manual Scram	1,2	[2]	H	SR 3.3.1.1.5 SR 3.3.1.1.13	NA
	5(~~a~~c)	[2]	I	SR 3.3.1.1.5 SR 3.3.1.1.13	NA

(~~a~~c) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS
1. Rod Pattern Control System			
a. Rod withdrawal limiter	[(a)]	2	SR 3.3.2.1.1 SR 3.3.2.1.6 SR 3.3.2.1.7] [(b) (c)]
	[(~~b~~d)]	2	SR 3.3.2.1.2 SR 3.3.2.1.5 SR 3.3.2.1.7] [(b) (c)]
b. Rod pattern controller	1(~~c~~e), 2(~~c~~e)	2	SR 3.3.2.1.3 SR 3.3.2.1.4 SR 3.3.2.1.5 SR 3.3.2.1.7 SR 3.3.2.1.9
2. Reactor Mode Switch - Shutdown Position	(~~d~~f)	2	SR 3.3.2.1.8

(a) THERMAL POWER > [70]% RTP.

(b) [INSERT 1]

(c) [INSERT 2]

(~~b~~d) THERMAL POWER > [35]% RTP and ≤ [70]% RTP.

(~~c~~e) With THERMAL POWER ≤ [10]% RTP.

(~~d~~f) Reactor mode switch in the shutdown position.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. One or more Functions with EOC-RPT trip capability not maintained. AND [MCPR limit for inoperable EOC-RPT not made applicable.]	B.1	Restore EOC-RPT trip capability.	2 hours
	OR		
	[B.2	Apply the MCPR limit for inoperable EOC-RPT as specified in the COLR.	2 hours]
C. Required Action and associated Completion Time not met.	C.1	Remove the associated recirculation pump fast speed breaker from service.	4 hours
	OR		
	C.2	Reduce THERMAL POWER to < [40]% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

---NOTE---
When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains EOC-RPT trip capability.

SURVEILLANCE		FREQUENCY
SR 3.3.4.1.1	Perform CHANNEL FUNCTIONAL TEST.	[92] days
SR 3.3.4.1.2	-------------------------------NOTES--------------------------- 1. If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. 2. The instrument channel setpoint shall be reset	[92] days]

SURVEILLANCE	FREQUENCY
to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. -- [Calibrate the trip units.	

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.4.1.3	-------------------------------NOTES--------------------------- 1. If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. 2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. --- Perform CHANNEL CALIBRATION. The Allowable Values shall be: a. TSV Closure, Trip Oil Pressure - Low: ≥ [37] psig and b. TCV Fast Closure, Trip Oil Pressure - Low: ≥ [42] psig.	[18] months
SR 3.3.4.1.4	Perform LOGIC SYSTEM FUNCTIONAL TEST, including breaker actuation.	[18] months
SR 3.3.4.1.5	Verify TSV Closure, Trip Oil Pressure - Low and TCV Fast Closure, Trip Oil Pressure - Low Functions are not bypassed when THERMAL POWER is ≥ [40]% RTP.	[18] months

Table 3.3.5.1-1 (page 3 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI B and LPCI C Subsystems					
e. [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	1, 2, 3, 4(a), 5(a)	[2] [1 per pump]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm
[f. Manual Initiation	1, 2, 3, 4(a), 5(a)	[1]	C	SR 3.3.5.1.6	NA]
3. High Pressure Core Spray (HPCS) System					
a. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3, 4(a), 5(a)	[4](b)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] [(c)(d)] SR 3.3.5.1.5[(c)(d)] SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [-43.8] inches
b. Drywell Pressure - High	1, 2, 3	[4](b)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [1.44] psig
c. Reactor Vessel Water Level - High, Level 8	1, 2, 3, 4(a), 5(a)	[2]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≤ [55.7] inches
d. Condensate Storage Tank Level - Low	1, 2, 3, 4~~(c)~~(e), 5~~(c)~~(e)	[2]	D	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [-3] inches

(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, “ECCS - Shutdown.”

(b) Also required to initiate the associated [TS required functions].

(c) [INSERT 1]

(d) [INSERT 2]

~~(c)~~(e) When HPCS is OPERABLE for compliance with LCO 3.5.2, "ECCS - Shutdown," and aligned to the condensate storage tank while tank water level is not within the limit of SR 3.5.2.2.

Table 3.3.5.1-1 (page 4 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. HPCS System					
e. Suppression Pool Water Level - High	1, 2, 3	[2]	D	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≤ [7.0] inches
f. [HPCS Pump Discharge Pressure - High (Bypass)]	1, 2, 3, 4(a), 5(a)	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] psig
g. [HPCS System Flow Rate - Low (Bypass)]	1, 2, 3, 4(a), 5(a)	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm
[h. Manual Initiation	1, 2, 3, 4(a), 5(a)	[1]	C	SR 3.3.5.1.6	NA]
4. Automatic Depressurization System (ADS) Trip System A					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [-152.5] inches
b. Drywell Pressure - High	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≤ [1.44] psig
c. ADS Initiation Timer	1, 2~~(d)~~(f), 3~~(d)~~(f)	[1]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≤ [117] seconds

(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, “ECCS - Shutdown.”

~~(d)~~(f) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 5 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. ADS Trip System A					
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2~~(d)~~(f), 3~~(d)~~(f)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [10.8] inches
e. LPCS Pump Discharge Pressure - High	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [125] psig and ≤ [165] psig
f. LPCI Pump A Discharge Pressure - High	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [115] psig and ≤ [135] psig
g. [ADS Bypass Timer (High Drywell Pressure)]	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≤ [9.4] minutes
[h. Manual Initiation	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	G	SR 3.3.5.1.6	NA]
5. ADS Trip System B					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [-152.5] inches
b. Drywell Pressure - High	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≤ [1.44] psig
c. ADS Initiation Timer	1, 2~~(d)~~(f), 3~~(d)~~(f)	[1]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≤ [117] seconds

~~(d)~~(f) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 6 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. ADS Trip System B					
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2~~(d)~~(f), 3~~(d)~~(f)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [10.8] inches
e. LPCI Pumps B & C Discharge Pressure - High	1, 2~~(d)~~(f), 3~~(d)~~(f)	[4] [2 per pump]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [115] psig and ≤ [135] psig
f. [ADS Bypass Timer (High Drywell Pressure)]	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≤ [9.4] minutes
[g. Manual Initiation	1, 2~~(d)~~(f), 3~~(d)~~(f)	[2]	G	SR 3.3.5.1.6	NA]

~~(d)~~(f) With reactor steam dome pressure > [150] psig.

Table 3.3.5.2-1 (page 1 of 1)
Reactor Core Isolation Cooling System Instrumentation

FUNCTION	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level - Low Low, Level 2	[4]	B	SR 3.3.5.2.1 SR 3.3.5.2.2 [SR 3.3.5.2.3][(a) (b)] SR 3.3.5.2.4[(a) (b)] SR 3.3.5.2.5	≥ [-43.8] inches
2. Reactor Vessel Water Level - High, Level 8	[2]	C	SR 3.3.5.2.1 SR 3.3.5.2.2 [SR 3.3.5.2.3] SR 3.3.5.2.4 SR 3.3.5.2.5	≤ [55.7] inches
3. Condensate Storage Tank Level - Low	[2]	D	SR 3.3.5.2.1 SR 3.3.5.2.2 [SR 3.3.5.2.3] SR 3.3.5.2.4 SR 3.3.5.2.5	≥ [-3] inches
[4. Suppression Pool Water Level - High	[2]	D	SR 3.3.5.2.1 SR 3.3.5.2.2 [SR 3.3.5.2.3] SR 3.3.5.2.4 SR 3.3.5.2.5	≤ [7.0] inches]
[5. Manual Initiation	[1]	C	SR 3.3.5.2.5	NA]

(a) [INSERT 1]

(b) [INSERT 2]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.6.5.2	-------------------------------NOTES--------------------------- 1. If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. 2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. --- [Calibrate the trip unit.	[92] days]
SR 3.3.6.5.3	-------------------------------NOTES--------------------------- 1. If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. 2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [Limiting Trip Setpoint (LTSP) or Nominal Trip Setpoint (NTSP)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP or NTSP] are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint	[18] months

	implemented in the Surveillance procedures to confirm channel performance. The [Limiting Trip Setpoint or Nominal Trip Setpoint and the] methodologies used to determine the as-found and the as-left tolerances are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. --- Perform CHANNEL CALIBRATION. The Allowable Values shall be: a. Relief Function Low: [1103 ± 15 psig] Medium: [1113 ± 15 psig] High: [1123 ± 15 psig] b. LLS Function Low open: [1033 ± 15 psig] close: [926 ± 15 psig] Medium open: [1073 ± 15 psig] close [936 ± 15 psig] High open: [1113 ± 15 psig] close: [946 ± 15 psig]	
SR 3.3.6.5.4	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[18] months

B 3.3 INSTRUMENTATION

B 3.3.1.1 Reactor Protection System (RPS) Instrumentation

BASES

BACKGROUND

The RPS initiates a reactor scram when one or more monitored parameters exceed their specified limit, to preserve the integrity of the fuel cladding and the Reactor Coolant System (RCS), and minimize the energy that must be absorbed following a loss of coolant accident (LOCA). This can be accomplished either automatically or manually.

The protection and monitoring functions of the RPS have been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters, and equipment performance. ~~Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "…setting for automatic protective devices…" so chosen that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded.~~ The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSS for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that an SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE -----------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.1.1-1 for the purpose of compliance with 10 CFR 50.36, the

plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.1.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] ~~trip setpoint~~ is a predetermined setting for a protecti~~v~~on~~e~~ channel~~device~~ chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the ~~trip setpoint~~[LTSP] accounts for uncertainties in setting the ~~device~~channel (e.g., calibration), uncertainties in how the ~~device~~channel might actually perform (e.g., repeatability), changes in the point of action of the channel~~device~~ over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the t~~rip setpoint~~[LTSP] ~~plays an important role in~~ ensures ~~ing~~ that SLs are not exceeded. As such, the ~~trip setpoint~~[LTSP] meets the definition of an LSSS (Ref. 1) ~~and could be used to meet the requirement that they be contained in the Technical Specifications~~.

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." ~~For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for these devices. However, u~~Use of the ~~trip setpoint to~~[LTSP] to define OPERABILITY in Technical Specifications ~~and its corresponding designation as the LSSS required by 10 CFR 50.36~~ would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a ~~protective device~~protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic ~~protective device~~protection channel with a setting that has been found to be different from the ~~trip setpoint~~[LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the ~~trip setpoint~~[LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the ~~protective device~~protection channel. Therefore, the ~~device~~ channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the ~~device~~channel within the established as-left tolerance around~~to~~ the ~~trip setpoint~~[LTSP] to account for further drift during the next surveillance interval.

~~Use of the trip setpoint to define "as found" OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted.~~ 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. ~~which, as stated above, is the same as the LSSS.~~

~~The Allowable Valuable specified in Table 3.3.1-1 serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In thismanner, 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. If the actual setting 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.~~

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

The RPS, as shown in the FSAR, Figure [ ] (Ref. 2), includes sensors, relays, bypass circuits, and switches that are necessary to cause initiation of a reactor scram. Functional diversity is provided by monitoring a wide range of dependent and independent parameters. The input parameters to the scram logic are from instrumentation that monitors reactor vessel water level, reactor vessel pressure, neutron flux main steam line isolation valve position, turbine control valve (TCV) fast closure, trip oil pressure low, turbine stop valve (TSV) trip oil pressure low, drywell pressure and scram discharge volume (SDV) water level, as well as reactor mode switch in shutdown position and manual scram signals. There are at least four redundant sensor input signals from each of these parameters (with the exception of the reactor mode switch in shutdown scram signal). Most channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When ~~a~~the setpoint is exceeded, the channel output relay actuates, which then outputs an RPS trip signal to the trip logic. Table B 3.3.1.1-1 summarizes the diversity of sensors capable of initiating scrams during anticipated operating transients typically analyzed.

The RPS is comprised of two independent trip systems (A and B), with two logic channels in each trip system (logic channels A1 and A2, B1 and B2), as shown in Reference 2. The outputs of the logic channels in a trip system are combined in a one-out-of-two logic so either channel can trip the associated trip system. The tripping of both trip systems will produce a reactor scram. This logic arrangement is referred to as one-out-of-two taken twice logic. Each trip system can be reset by use of a reset switch. If a full scram occurs (both trip systems trip), a relay prevents reset of the trip systems for 10 seconds after the full scram signal is received. This 10 second delay on reset ensures that the scram function will be completed.

Two scram pilot valves are located in the hydraulic control unit (HCU) for each control rod drive (CRD). Each scram pilot valve is solenoid operated, with the solenoids normally energized. The scram pilot valves control the air supply to the scram inlet and outlet valves for the associated CRD. When either scram pilot valve solenoid is energized, air pressure holds the scram valves closed and, therefore, both scram pilot valve solenoids must be de-energized to cause a control rod to scram. The scram valves control the supply and discharge paths for the CRD water during a scram. One of the scram pilot valve solenoids for each CRD is controlled by trip system A, and the other solenoid is controlled by trip system B. Any trip of trip system A in conjunction with any trip in trip system B results in de-energizing both solenoids, air bleeding off, scram valves opening, and control rod scram.

The backup scram valves, which energize on a scram signal to depressurize the scram air header, are also controlled by the RPS. Additionally, the RPS System controls the SDV vent and drain valves such that when both trip systems trip, the SDV vent and drain valves close to isolate the SDV.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the RPS are assumed in the safety analyses of References 3, 4, and 5. The RPS initiates a reactor scram when monitored parameter values exceed the Allowable Values specified by the setpoint methodology and listed in Table 3.3.1.1-1 to preserve the integrity of the fuel cladding, the reactor coolant pressure boundary (RCPB), and the containment by minimizing the energy that must be absorbed following a LOCA.

RPS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Functions not specifically credited in the accident analysis are retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

~~BASES~~

~~APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)~~

~~Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.~~

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The OPERABILITY of the RPS is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.1.1-1. Each Function must have a required number of OPERABLE channels per RPS trip system, with their setpoints, set within the setting tolerance of the [LTSPs], where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable Values are specified for each RPS Function in Table 3.3.1.1-1. [Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The ~~setpoints are compared~~[LTSPs] are selected to ensure that the actual ~~process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint,~~setpoints ~~are~~ remain conservative with respect to the Allowable Value~~associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytic limits, corrected for calibration, process, and some of the instrument errors. The trip setpoints are then determined, accounting for the remaining instrument errors (e.g., drift). -found tolerance band~~ between successive CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated channel (e.g., trip unit) changes state. The A~~a~~nalytical L~~l~~imits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The ~~trip setpoints~~[LTSPs] derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The OPERABILITY of scram pilot valves and associated solenoids, backup scram valves, and SDV valves, described in the Background section, are not addressed by this LCO.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The individual Functions are required to be OPERABLE in the MODES specified in the Table that may require an RPS trip to mitigate the consequences of a design basis accident or transient. To ensure a reliable scram function, a combination of ~~F~~functions is required in each MODE to provide primary and diverse initiation signals.

RPS is required to be OPERABLE in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies. Control rods withdrawn from a core cell containing no fuel assemblies do not affect the reactivity of the core and therefore are not required to have the capability to scram. Provided all other control rods remain inserted, the RPS function is not required. In this condition, the required SDM (LCO 3.1.1) and refuel position one-rod-out interlock (LCO 3.9.2) ensure that no event requiring RPS will occur. During normal operation in

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

MODES 3 and 4, all control rods are fully inserted and the Reactor Mode Switch Shutdown Position control rod withdrawal block (LCO 3.3.2.1) does not allow any control rod to be withdrawn. Under these conditions, the RPS function is not required to be OPERABLE.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

1.a. Intermediate Range Monitor (IRM) Neutron Flux - High

The IRMs monitor neutron flux levels from the upper range of the source range monitors (SRMs) to the lower range of the average power range monitors (APRMs). The IRMs are capable of generating trip signals that can be used to prevent fuel damage resulting from abnormal operating transients in the intermediate power range. In this power range, the most significant source of reactivity change is due to control rod withdrawal. The IRM provides diverse protection for the rod withdrawal limiter (RWL),

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Average Power Range Monitor Fixed Neutron Flux - High Function is required to be OPERABLE in MODE 1 where the potential consequences of the analyzed transients could result in the SLs (e.g., MCPR and RCS pressure) being exceeded. Although the Average Power Range Monitor Fixed Neutron Flux - High Function is assumed in the CRDA analysis that is applicable in MODE 2, the Average Power Range Monitor Neutron Flux - High, Setdown Function conservatively bounds the assumed trip and, together with the assumed IRM trips, provides adequate protection. Therefore, the Average Power Range Monitor Fixed Neutron Flux - High Function is not required in MODE 2.

2.d. Average Power Range Monitor - Inop

This signal provides assurance that a minimum number of APRMs are OPERABLE. Anytime an APRM mode switch is moved to any position other than Operate, an APRM module is unplugged, the electronic operating voltage is low, or the APRM has too few LPRM inputs (< 11), an inoperative trip signal will be received by the RPS, unless the APRM is bypassed. Since only one APRM in each trip system may be bypassed, only one APRM in each trip system may be inoperable without resulting in an RPS trip signal. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

Four channels of Average Power Range Monitor - Inop with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal.

There is no Allowable Value for this Function.

This Function is required to be OPERABLE in the MODES where the APRM Functions are required.

3. Reactor Vessel Steam Dome Pressure - High

An increase in the RPV pressure during reactor operation compresses the steam voids and results in a positive reactivity insertion. This causes the neutron flux and THERMAL POWER transferred to the reactor coolant to increase, which could challenge the integrity of the fuel cladding and the RCPB. No specific safety analysis takes direct credit for this Function. However, the Reactor Vessel Steam Dome Pressure - High Function initiates a scram for transients that results in a pressure increase, counteracting the pressure increase by rapidly reducing core

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

ASME Code limits. That is, the direct scram on position switches for MSIV closure events is not assumed in the overpressurization analysis. Additionally, MSIV closure is assumed in the transients analyzed in Reference 5 (e.g., low steam line pressure, manual closure of MSIVs, high steam line flow). The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the ECCS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

MSIV closure signals are initiated from position switches located on each of the eight MSIVs. Each MSIV has two position switches; one inputs to RPS trip system A while the other inputs to RPS trip system B. Thus, each RPS trip system receives an input from eight Main Steam Isolation Valve - Closure channels, each consisting of one position switch. The logic for the Main Steam Isolation Valve - Closure Function is arranged such that either the inboard or outboard valve on three or more of the main steam lines (MSLs) must close in order for a scram to occur.

The Main Steam Isolation Valve - Closure Allowable Value is specified to ensure that a scram occurs prior to a significant reduction in steam flow, thereby reducing the severity of the subsequent pressure transient.

Sixteen channels of the Main Steam Isolation Valve - Closure Function with eight channels in each trip system are required to be OPERABLE to ensure that no single instrument failure will preclude the scram from this Function on a valid signal. This Function is only required in MODE 1 since, with the MSIVs open and the heat generation rate high, a pressurization transient can occur if the MSIVs close. In MODE 2, the heat generation rate is low enough so that the other diverse RPS functions provide sufficient protection.

7. Drywell Pressure - High

High pressure in the drywell could indicate a break in the RCPB. A reactor scram is initiated to minimize the possibility of fuel damage and to reduce the amount of energy being added to the coolant and the drywell. The Drywell Pressure - High Function is a secondary scram signal to Reactor Vessel Water Level - Low, Level 3 for LOCA events inside the drywell. ~~This Function was not specifically credited in the accident analysis, but it~~The value is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

ACTIONS (continued)

D.1

Required Action D.1 directs entry into the appropriate Condition referenced in Table 3.3.1.1-1. The applicable Condition specified in the Table is Function and MODE or other specified condition dependent and may change as the Required Action of a previous Condition is completed. Each time an inoperable channel has not met any Required Action of Condition A, B, or C, and the associated Completion Time has expired, Condition D will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1, F.1, G.1, and H.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. The Completion Times are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems. In addition, the Completion Time of Required Action E.1 is consistent with the Completion Time provided in LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)."

I.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by immediately initiating action to fully insert all insertable control rods in core cells containing one or more fuel assemblies. Control rods in core cells containing no fuel assemblies do not affect the reactivity of the core and are, therefore, not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

BASES

SURVEILLANCE REQUIREMENTS (continued)

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.1.1-1 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes a and b) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------

Notes a and b are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes a and b are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note b requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes a and b are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes a and b may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance

established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.1.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

As noted at the beginning of the SRs, the SRs for each RPS instrument~~ation~~ Function are located in the SRs column of Table 3.3.1.1-1.

The Surveillances are modified by a Note to indicate that~~,~~ when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the RPS reliability analysis (Ref. 10) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RPS will trip when necessary.

SR 3.3.1.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift on one of the channels or 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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.7 and SR 3.3.1.1.10

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. The 92 day Frequency of SR 3.3.1.1.7 is based on the reliability analysis of Reference 10.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

SR 3.3.1.1.8

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.1.1-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is ~~not beyond~~ conservative with respect to the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to ~~be equal to or more conservative than~~the [LTSP] within the as-left tolerance as accounted for in the appropriate setpoint methodology.

The Frequency of 92 days for SR 3.3.1.1.8 is based on the reliability analysis of Reference 10.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.8 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.1.1.9 and SR 3.3.1.1.11

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to the [LTSP] within the as-left tolerance to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

Note 1 states that neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.6). A second Note is provided that requires the APRM and IRM SRs to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM and IRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

The Frequency of SR 3.3.1.1.9 is based upon the assumption of a 184 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of SR 3.3.1.1.11 is based on the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SRs 3.3.1.1.9 and 3.3.1.1.11 for SL-LSSS functions are modified by two Notes as identified in Table 3.3.1.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.1.1.12

The Average Power Range Monitor Flow Biased Simulated Thermal Power - High Function uses an electronic filter circuit to generate a signal proportional to the core THERMAL POWER from the APRM neutron flux signal. This filter circuit is representative of the fuel heat transfer dynamics that produce the relationship between the neutron flux and the core THERMAL POWER. The filter time constant must be verified to ensure that the channel is accurately reflecting the desired parameter.

The Frequency of 18 months is based on engineering judgment and reliability of the components.

SR 3.3.1.1.12 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.1.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.15

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis. The RPS RESPONSE TIME acceptance criteria are included in Reference 11.

RPS RESPONSE TIME may be verified by actual response time measurements in any series of sequential, overlapping, or total channel measurements.

[----------------------------------REVIEWER'S NOTE----------------------------------
The following Bases are applicable for plants adopting NEDO-32291-A and/or Supplement 1.

However, the sensors for Functions 3, 4, and 5 are allowed to be excluded from specific RPS RESPONSE TIME measurement if the conditions of Reference 12 are satisfied. If these conditions are satisfied, sensor response time may be allocated based on either assumed design sensor response time or the manufacturer's stated design response time. When the requirements of Reference 12 are not satisfied, sensor response time must be measured. Furthermore, measurement of the instrument loops response times for Functions 3, 4, and 5 is not required if the conditions of Reference 13 are satisfied.]

As noted, neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time.

RPS RESPONSE TIME tests are conducted on an 18 month STAGGERED TEST BASIS. Note 2 requires STAGGERED TEST BASIS Frequency to be determined based on 4 channels per trip system, in lieu of the 8 channels specified in Table 3.3.1.1-1 for the MSIV Closure Function. This Frequency is based on the logic interrelationships of the various channels required to produce an RPS scram signal. Therefore, staggered testing results in response time verification of these ~~devices~~channels every 18 months. The 18 month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious time degradation, but not channel failure, are infrequent.

Table B 3.3.1.1-1 (page 1 of 1)
RPS Instrumentation Sensor Diversity

Initiation Events	Scram Sensors for Initiating Events						
	RPV Variables			Anticipatory			Fuel
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
MSIV Closure	x		x			x	x
Turbine Trip (w/bypass)	x			x	x		x
Generator Trip (w/bypass)	x			x			x
Pressure Regulator Failure (primary pressure decrease) (MSIV closure trip)	x	x	x			x	x
Pressure Regulator Failure (primary pressure decrease) (Level 8 trip)	x				x		x
Pressure Regulator Failure (primary pressure increase)	x						x
Feedwater Controller Failure (high reactor water level)	x	x			x		x
Feedwater Controller Failure (low reactor water level)	x		x			x	
Loss of Condenser Vacuum	x				x	x	x
Loss of AC Power (loss of transformer)	x		x		x	x	
Loss of AC Power (loss of grid connections)	x		x	x	x	x	x

(a) Reactor Vessel Steam Dome Pressure - High
(b) Reactor Vessel Water Level - High, Level 8
(c) Reactor Vessel Water Level - Low, Level 3
(d) Turbine Control Valve Fast Closure
(e) Turbine Stop Valve - Closure
(f) Main Steam Isolation Valve - Closure
(g) Average Power Range Monitor Neutron Flux - High

---REVIEWER'S NOTE---
This Table for illustration purposes only.

B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

BACKGROUND

Control rods provide the primary means for control of reactivity changes. Control rod block instrumentation includes channel sensors, logic circuitry, switches, and relays that are designed to ensure that specified fuel design limits are not exceeded for postulated transients and accidents. During high power operation, the rod withdrawal limiter (RWL) provides protection for control rod withdrawal error events. During low power operations, control rod blocks from the rod pattern controller (RPC) enforce specific control rod sequences designed to mitigate the consequences of the control rod drop accident (CRDA). During shutdown conditions, control rod blocks from the Reactor Mode Switch - Shutdown Position ensure that all control rods remain inserted to prevent inadvertent criticalities.

The protection and monitoring functions of the control rod block instrumentation have been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE ---------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the

standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.2.1-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific term for the Limiting or Nominal Trip Setpoint must be cited in Note c of Table 3.3.2.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 9).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel 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.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

The purpose of the RWL is to limit control rod withdrawal to preclude a MCPR Safety Limit (SL) violation. The RWL supplies a trip signal to the Rod Control and Information System (RCIS) to appropriately inhibit control rod withdrawal during power operation equal to or greater than the low power setpoint (LPSP). The RWL has two channels, either of which can initiate a control rod block when the channel output exceeds the control rod block setpoint. The rod block logic circuitry in the RCIS is arranged as two redundant and separate logic circuits. These circuits are energized when control rod movement is allowed. The output of each logic circuit is coupled to a comparator by the use of isolation devices in the rod drive control cabinet. The two logic circuit signals are compared and rod blocks are applied when either circuit trip signal is present. Control rod withdrawal is permitted only when the two signals agree. Each rod block logic circuit receives control rod position indication from a separate channel of the Rod Position Information System, each with a set of reed switches for control rod position indication. Control rod position is the primary data input for the RWL. First stage turbine pressure is used to determine reactor power level, with an LPSP and a high power setpoint (HPSP) used to determine allowable control rod withdrawal distances. Below the LPSP, the RWL is automatically bypassed (Ref. 1).

The purpose of the RPC is to ensure control rod patterns during startup are such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to 10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. The RPC, in conjunction with the

RCIS, will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the specified sequence. The rod block logic circuitry is the same as that described above. The RPC also uses the turbine first stage pressure to determine when reactor power is above the power at which the RPC is automatically bypassed (Ref. 1).

With the reactor mode switch in the shutdown position, a control rod withdrawal block is applied to all control rods to ensure that the shutdown condition is maintained. This function prevents criticality resulting from inadvertent control rod withdrawal during MODE 3 or 4, or during MODE 5 when the reactor mode switch is required to be in the shutdown position. The reactor mode switch has two channels, with each providing inputs into a separate rod block circuit. A rod block in either circuit will provide a control rod block to all control rods.

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

Allowable Values are specified for each Rod Block Function specified in SR 3.3.2.1.7, [[Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure that the actual setpoints remain conservative with respect to the Allowable Value between successive CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated channel (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined accounting for the remaining instrument errors (e.g., drift). The [LTSPs] derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

---------------------------------REVIEWER'S NOTE---------------------------------

Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1.a. Rod Withdrawal Limiter

The RWL is designed to prevent violation of the MCPR SL and the cladding 1% plastic strain fuel design limit that may result from a single control rod withdrawal error (RWE) event. The analytical methods and assumptions used in evaluating the RWE event are summarized in Reference 2. A statistical analysis of RWE events was performed to determine the MCPR response as a function of withdrawal distance and initial operating conditions. From these responses, the fuel thermal performance was determined as a function of RWL allowable control rod withdrawal distance and power level.

The RWL satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Two channels of the RWL are available and are required to be OPERABLE to ensure that no single instrument failure can preclude a rod block from this Function.

~~Nominal trip set points are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the setpoints do not exceed the Allowable Values between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor power), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit)~~

~~changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytic limits, corrected for calibration, process, and some of the instrument errors. The trip setpoints are then determined accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drive, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.~~

The RWL is assumed to mitigate the consequences of an RWE event when operating > 35% RTP. Below this power level, the consequences of an RWE event will not exceed the MCPR, and therefore the RWL is not required to be OPERABLE (Ref. 3).

1.b. Rod Pattern Controller

The RPC enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, and 6. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

The Rod Pattern Controller Function satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Since the RPC is a backup to operator control of control rod sequences, only a single channel would be required OPERABLE to satisfy Criterion 3 (Ref. 6). However, the RPC is designed as a dual channel system and will not function without two OPERABLE until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

BASES

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.2.1-1 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes b and c) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE ---------------------------------
Notes b and c are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes b and c are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note c requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes b and c are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes b and c may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in

result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes b and c being applied to the Functions shown in TS 3.3.2.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

As noted at the beginning of the SR, the SRs for each Control Rod Block instrumentation Function are found in the SRs column of Table 3.3.2.1-1.

The Surveillances are also modified by a Note to indicate that when an RWL channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains control rod block capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 8) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that a control rod block will be initiated when necessary.

SR 3.3.2.1.1, SR 3.3.2.1.2, SR 3.3.2.1.3, and SR 3.3.2.1.4

The CHANNEL FUNCTIONAL TESTS for the RPC and RWL are performed by attempting to withdraw a control rod not in compliance with the prescribed sequence and verifying that a control rod block occurs. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency is based upon the assumption of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.2.1.7 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.2.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.2.1.8

The CHANNEL FUNCTIONAL TEST for the Reactor Mode Switch - Shutdown Position Function is performed by attempting to withdraw any control rod with the reactor mode switch in the shutdown position and verifying a control rod block occurs. A successful test of the required contact(s) of a channel relay may be performed by the verification of the

BASES

REFERENCES

1. FSAR, Section [7.6.1.7.3].

2. FSAR, Section [15.4.2].

3. NEDE-24011-P-A-9-US, "General Electrical Standard Application for Reload Fuel," Supplement for United States, Section S 2.2.3.1, September 1988.

4. "Modifications to the Requirements for Control Rod Drop Accident Mitigating Systems," BWR Owners Group, July 1986.

5. NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.

6. NRC SER, Acceptance of Referencing of Licensing Topical Report NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel, Revision 8, Amendment 17," December 27, 1987.

7. NEDC-30851-P-A, "Technical Specification Improvement Analysis for BWR Control Rod Block Instrumentation," October 1988.

8. GENE-770-06-1, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

9. Reg. Guide 1.105, "Instrument Setpoints for Safety Systems," Rev. 3

B 3.3 INSTRUMENTATION

B 3.3.4.1 End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation

BASES

BACKGROUND

The EOC-RPT instrumentation initiates a recirculation pump trip (RPT) to reduce the peak reactor pressure and power resulting from turbine trip or generator load rejection transients to provide additional margin to core thermal MCPR Safety Limits (SLs).

The need for the additional negative reactivity in excess of that normally inserted on a scram reflects end of cycle reactivity considerations. Flux shapes at the end of cycle are such that the control rods may not be able to ensure that thermal limits are maintained by inserting sufficient negative reactivity during the first few feet of rod travel upon a scram caused by Turbine Control Valve (TCV) Fast Closure, Trip Oil Pressure - Low, or Turbine Stop Valve Closure, Trip Oil Pressure - Low (TSV). The physical phenomenon involved is that the void reactivity feedback due to a pressurization transient can add positive reactivity at a faster rate than the control rods can add negative reactivity.

The protection functions of the EOC-RPT have been designed to ensure safe operation of the reactor during load rejection transients. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the EOC-RPT, as well as LCOs on other system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE ---------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in SR 3.3.4.1.2 or 3.3.4.1.3 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note 2 of the SRs in the SR table. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 7).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel 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.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

The EOC-RPT instrumentation as shown in Reference 1 is comprised of sensors that detect initiation of closure of the TSVs, or fast closure of the TCVs, combined with relays, logic circuits, and fast acting circuit breakers that interrupt the power from the recirculation pump motor generator (MG) set generators to each of the recirculation pump motors. The channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs an EOC-RPT signal to the trip logic. When the RPT breakers trip open, the recirculation pumps coast down under their own inertia. The EOC-RPT has two identical trip systems, either of which can actuate an RPT.

Each EOC-RPT trip system is a two-out-of-two logic for each Function; thus, either two TSV Closure, Trip Oil Pressure - Low or two TCV Fast Closure, Trip Oil Pressure - Low signals are required for a trip system to actuate. If either trip system actuates, both recirculation pumps will trip. There are two EOC-RPT breakers in series per recirculation pump. One trip system trips one of the two EOC-RPT breakers for each recirculation pump and the second trip system trips the other EOC-RPT breaker for each recirculation pump.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The TSV Closure, Trip Oil Pressure - Low and the TCV Fast Closure, Trip Oil Pressure - Low Functions are designed to trip the recirculation pumps in the event of a turbine trip or generator load rejection to mitigate the neutron flux, heat flux and pressurize transients, and to increase the margin to the MCPR SL. The analytical methods and assumptions used in evaluating the turbine trip and generator load rejection, as well as other safety analyses that assume EOC-RPT, are summarized in References 2, 3, and 4.

To mitigate pressurization transient effects, the EOC-RPT must trip the recirculation pumps after initiation of initial closure movement of either the TSVs or the TCVs. The combined effects of this trip and a scram reduce fuel bundle power more rapidly than does a scram alone, resulting in an increased margin to the MCPR SL. Alternatively, MCPR limits for an inoperable EOC-RPT as specified in the COLR are sufficient to mitigate pressurization transient effects. The EOC-RPT function is automatically disabled when turbine first stage pressure is < [40%] RTP.

EOC-RPT instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The OPERABILITY of the EOC-RPT is dependent on the OPERABILITY of the individual instrumentation channel Functions. Each Function must have a required number of OPERABLE channels in each trip system, with their setpoints set within the setting tolerance of the LTSP ~~conservative with respect to the specified LTSP~~ where appropriate.~~of SR 3.3.4.1.3.~~ The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Channel OPERABILITY also includes the associated EOC-RPT breakers. Each channel (including the associated EOC-RPT breakers) must also respond within its assumed response time.

Allowable Values are specified for each EOC-RPT Function specified in the LCO. [Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. A channel is OPERABLE if its actual trip setpoint is conservative with respect to the Allowable Value. The [LTSP]s are selected to ensure that the setpoints remain conservative with respect to Allowable Value between successive CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP]. Each Allowable Value specified is more conservative than the analytical limit assumed in the transient and accident analysis in order to account for instrument uncertainties appropriate to the Function.

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., TSV electrohydraulic control (EHC) pressure), and when the measured output value of the process parameter exceeds the setpoint, the associated channel (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

parameters obtained from the safety analysis. The Allowable Values are derived from the ~~analytic~~analytical limits, corrected for calibration, process, and some of the instrument errors. The ~~trip setpoints~~[Limiting Trip Setpoints] are then determined accounting for the remaining instrument errors (e.g., drift). The ~~trip setpoints~~[LTSPs] derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The specific Applicable Safety Analysis, LCO, and Applicability discussions are listed below on a Function by Function basis.

----------------------------------REVIEWER'S NOTE----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

Alternately, since this instrumentation protects against a MCPR SL violation with the instrumentation inoperable, modifications to the MCPR limits (LCO 3.2.2) may be applied to allow this LCO to be met. The MCPR penalty for the Condition EOC-RPT inoperable is specified in the COLR.

Turbine Stop Valve Closure, Trip Oil Pressure - Low

Closure of the TSVs and a main turbine trip result in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, an RPT is initiated on TSV Closure, Trip Oil Pressure - Low in anticipation of the transients that would result from closure of these valves. EOC-RPT decreases reactor power and aids the reactor scram in ensuring the MCPR SL is not exceeded during the worst case transient.

Closure of the TSVs is determined by measuring the EHC fluid pressure at each stop valve. There is one pressure transmitter associated with each stop valve, and the signal from each transmitter is assigned to a separate trip channel. The logic for the TSV Closure, Trip Oil Pressure - Low Function is such that two or more TSVs must be closed to produce an EOC-RPT. This Function must be enabled at THERMAL POWER

BASES

ACTIONS (continued)

C.1 and C.2

With any Required Action and associated Completion Time not met, THERMAL POWER must be reduced to < 40% RTP within 4 hours. Alternately, the associated recirculation pump may be removed from service since this performs the intended function of the instrumentation. The allowed Completion Time of 4 hours is reasonable, based on operating experience, to reduce THERMAL POWER to < 40% RTP from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in SR 3.3.4.1.2 or 3.3.4.1.3 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes 1 and 2) are only associated with SL-LSSS values.

------------------------------- REVIEWER'S NOTE -----------------------------------

Notes 1 and 2 are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes 1 and 2 are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note 2 requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes 1 and 2 are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes 1 and 2 may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes 1 and 2 being applied to SRs 3.3.4.1.2 or 3.3.4.1.3. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains EOC-RPT trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 5) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the recirculation pumps will trip when necessary.

SR 3.3.4.1.1

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based on reliability analysis (Ref. 5).

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.4.1.2

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the setting is discovered to be less conservative than the Allowable Value specified in SR 3.3.4.1.3. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is ~~not beyond~~conservative with respect to the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on assumptions of the reliability analysis (Ref. 5) and on the methodology included in the determination of the trip setpoint.

SR 3.3.4.1.2 for SL-LSSS functions is modified by two Notes in the SR table. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.4.1.3

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

The Frequency is based upon the assumption of an 18 month calibration interval, in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.4.1.3 for SL-LSSS functions is modified by two Notes in the SR table. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.4.1.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The system functional test of the pump breakers is included as a part of this test, overlapping the LOGIC SYSTEM FUNCTIONAL TEST, to provide complete testing of the associated safety function. Therefore, if a breaker is incapable of operating, the associated instrument channel would also be inoperable.

BASES

SURVEILLANCE REQUIREMENTS (continued)

EOC-RPT SYSTEM RESPONSE TIME tests are conducted on an 18 month STAGGERED TEST BASIS. Response times cannot be determined at power because operation of final actuated devices is required. Therefore, the 18 month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components that cause serious response time degradation, but not channel failure, are infrequent occurrences.

SR 3.3.4.1.7

This SR ensures that the RPT breaker interruption time (arc suppression time plus time to open the contacts) is provided to the EOC-RPT SYSTEM RESPONSE TIME test. The 60 month Frequency of the testing is based on the difficulty of performing the test and the reliability of the circuit breakers.

REFERENCES

1. FSAR, Figure [ ] (EOC-RPT instrumentation logic).

2. FSAR, Section [5.2.2].

3. FSAR, Sections [15.1.1], [15.1.2], and [15.1.3].

4. FSAR, Sections [5.5.16.1] and [7.6.10].

5. GENE-770-06-1, "Bases for Changes To Surveillance Test Intervals And Allowed Out-Of-Service Times For Selected Instrumentation Technical Specifications," February 1991.

6. FSAR, Section [5.5.16.2].

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

B 3.3 INSTRUMENTATION

B 3.3.5.1 Emergency Core Cooling System (ECCS) Instrumentation

BASES

BACKGROUND

The purpose of the ECCS instrumentation is to initiate appropriate responses from the systems to ensure that fuel is adequately cooled in the event of a design basis accident or transient. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the ECCS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------ REVIEWER'S NOTE -----------------------------------

The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.5.1-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note d of Table 3.3.5.1-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-

found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 7).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval.

However, there is also some point beyond which the channel 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.

BASES

BACKGROUND (continued)

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

For most anticipated operational occurrences (AOOs) and Design Basis Accidents (DBAs), a wide range of dependent and independent parameters are monitored.

The ECCS instrumentation actuates low pressure core spray (LPCS), low pressure coolant injection (LPCI), high pressure core spray (HPCS), Automatic Depressurization System (ADS), and the diesel generators (DGs). The equipment involved with each of these systems is described in the Bases for LCO 3.5.1, "ECCS - Operating."

Low Pressure Core Spray System

The LPCS System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of Reactor Vessel Water Level - Low Low Low, Level 1 or Drywell Pressure - High. Each of these diverse variables is monitored by two redundant transmitters, which are, in turn, connected to two trip units. The outputs of the four trip units (two trip units from each of the two variables) are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic. The high drywell pressure initiation signal is a sealed in signal and must be manually reset. The logic can also be initiated by use of a manual push button. Upon receipt of an initiation signal, the LPCS pump is started immediately after power is available.

BASES

BACKGROUND (continued)

room. The DG initiation signal is a sealed in signal and must be manually reset. The DG initiation logic is reset by resetting the associated ECCS initiation logic. Upon receipt of a LOCA initiation signal, each DG is automatically started, is ready to load in approximately 10 seconds, and will run in standby conditions (rated voltage and speed, with the DG output breaker open). The DGs will only energize their respective Engineered Safety Feature (ESF) buses if a loss of offsite power occurs. (Refer to Bases for LCO 3.3.8.1.)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the ECCS are explicitly assumed in the safety analyses of References 1, 2, and 3. The ECCS is initiated to preserve the integrity of the fuel cladding by limiting the post LOCA peak cladding temperature to less than the 10 CFR 50.46 limits.

ECCS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The OPERABILITY of the ECCS instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints set within the ~~specified Allowable Values~~setting tolerance of the [LTSP], where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each ECCS subsystem must also respond within its assumed response time.

Table 3.3.5.1-1 is modified by two footnotes. Footnote (a) is added to clarify that the associated functions are required to be OPERABLE in

MODES 4 and 5 only when their supported ECCS are required to be OPERABLE per LCO 3.5.2, ECCS - Shutdown. Footnote (b) is added to show that certain ECCS instrumentation Functions also perform DG initiation and actuation of other Technical Specifications (TS) equipment.

Allowable Values are specified for each ECCS Function specified in the table. ~~Nominal trip setpoints are specified in the setpoint calculations.~~[Limiting Trip Setpoints] are specified in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The ~~nominal setpoint~~[LTSP]s are selected to ensure that the setpoints ~~do not exceed the Allowable Value~~ remain conservative with respect to the as-found tolerance band between CHANNEL CALIBRATIONS. ~~Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its~~After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

~~Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. Trip setpoints~~required by 10 CFR 50.36 when automatic protection channels do not function as required.

[Limiting Trip Setpoints] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated channel ~~device~~ (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs]~~trip setpoints~~ are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

In general, the individual Functions are required to be OPERABLE in the MODES or other specified conditions that may require ECCS (or DG) initiation to mitigate the consequences of a design basis accident or transient. To ensure reliable ECCS and DG function, a combination of Functions is required to provide primary and secondary initiation signals.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

Low Pressure Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Vessel Water Level - Low Low Low, Level 1

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. The low pressure ECCS and associated DGs are initiated at Level 1 to ensure that core spray and flooding functions are available to prevent or minimize fuel damage. The Reactor Vessel Water Level - Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ECCS during the transients analyzed in References 1 and 3. In addition, the Reactor Vessel Water Level - Low Low Low, Level 1 Function is directly assumed in the analysis of the recirculation line break (Ref. 2). The core cooling function of the ECCS, along with the scram action of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level - Low Low Low, Level 1 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value is chosen to allow time for the low pressure core flooding systems to activate and provide adequate cooling.

BASES

ACTIONS (continued)

H.1

With any Required Action and associated Completion Time not met, the associated feature(s) may be incapable of performing the intended function and the supported feature(s) associated with the inoperable untripped channels must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.5.1-1 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes c and d) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------
Notes c and d are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes c and d are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note d requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes c and d are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes c and d may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes c and d being applied to the Functions shown in TS 3.3.5.1. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

As noted at the beginning of the SRs, the SRs for each ECCS instrument~~ation~~ Function are found in the SRs column of Table 3.3.5.1-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours as follows: (a) for Functions 3.c, 3.f, 3.g, and 3.h; and (b) for Functions other than 3.c, 3.f, 3.g, and 3.h provided the associated Function or redundant Function maintains ECCS initiation capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 4) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the ECCS will initiate when necessary.

SR 3.3.5.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or 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 by the plant 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 instrument has drifted outside its limit.

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

SR 3.3.5.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based on the reliability analyses of Reference 4.

SR 3.3.5.1.3

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be not within its required Allowable Value specified in Table 3.3.5.1-1.

If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analyses. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than the setting accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 4.

SR 3.3.5.1.3 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.1.4 and SR 3.3.5.1.5

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

The Frequency of SR 3.3.5.1.4 is based upon the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of SR 3.3.5.1.5 is based upon the assumption of an [18] month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.5.1.5 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.1.6

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.1, LCO 3.5.2, LCO 3.8.1, and LCO 3.8.2 overlaps this Surveillance to provide complete testing of the assumed safety function.

The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for unplanned transients if the Surveillance were performed with the reactor at power. Operating experience has shown these components

BASES

SURVEILLANCE REQUIREMENTS (continued)

[----------------------------------REVIEWER'S NOTE----------------------------------
The following Bases are applicable for plants adopting NEDO-32291-A.

However, the measurement of instrument loop response times may be excluded if the conditions of Reference 6 are satisfied.]

ECCS RESPONSE TIME tests are conducted on an [18] month STAGGERED TEST BASIS. The [18] month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent.

REFERENCES

1. FSAR, Section [5.2].

2. FSAR, Section [6.3].

3. FSAR, Chapter [15].

4. NEDC-30936-P-A, "BWR Owners' Group Technical Specification Improvement Analyses for ECCS Actuation Instrumentation, Part 2," December 1988.

5. FSAR, Section [6.3], Table [6.3-2].

[6. NEDO-32291-A, "System Analyses for the Elimination of Selected Response Time Testing Requirements," October 1995.]

[7 Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation."]

B 3.3 INSTRUMENTATION

B 3.3.5.2 Reactor Core Isolation Cooling (RCIC) System Instrumentation

BASES

BACKGROUND

The purpose of the RCIC System instrumentation is to initiate actions to ensure adequate core cooling when the reactor vessel is isolated from its primary heat sink (the main condenser) and normal coolant makeup flow from the Reactor Feedwater System is unavailable, such that initiation of the low pressure Emergency Core Cooling Systems (ECCS) pumps does not occur. A more complete discussion of RCIC System operation is provided in the Bases of LCO 3.5.3, "RCIC System." This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RCIC instrumentation, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSSs for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE ---------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not included in Table 3.3.5.2-1 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.5.2-1. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found

and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 2).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval.

BASES

BACKGROUND (continued)

However, there is also some point beyond which the channel 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.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required.

The RCIC System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of reactor vessel Low Low water level. The variable is monitored by four transmitters that are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic arrangement. Once initiated, the RCIC logic seals in and can be reset by the operator only when the reactor vessel water level signals have cleared.

The RCIC test line isolation valve (which is also a primary containment isolation valve) is closed on a RCIC initiation signal to allow full system flow and maintain containment isolated in the event RCIC is not operating.

The RCIC System also monitors the water levels in the condensate storage tank (CST) and the suppression pool, since these are the two sources of water for RCIC operation. Reactor grade water in the CST is the normal source. Upon receipt of a RCIC initiation signal, the CST suction valve is automatically signaled to open (it is normally in the open position) unless the pump suction from the suppression pool valve is open. If the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens and then the CST suction valve automatically closes. Two level transmitters are used to detect low water level in the CST. Either switch can cause the suppression pool suction valve to open and the CST suction valve to close. The suppression pool suction valve also automatically opens and the CST suction valve closes if high water level is detected in the suppression pool (one-out-of-two logic similar to the CST water level logic). To prevent losing suction to the pump, the suction valves are interlocked so that one suction path must be open before the other automatically closes.

BACKGROUND (continued)

The RCIC System provides makeup water to the reactor until the reactor vessel water level reaches the high water level (Level 8) trip (two-out-of-two logic), at which time the RCIC steam supply, steam supply bypass, and cooling water supply valves close (the injection valve also closes due to the closure of the steam supply valves). The RCIC System restarts if vessel level again drops to the low level initiation point (Level 2).

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The function of the RCIC System, to provide makeup coolant to the reactor, is to respond to transient events. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analysis for RCIC System operation. The RCIC System instrumentation satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

The OPERABILITY of the RCIC System instrumentation is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.2-1. Each Function must have a required number of OPERABLE channels with their setpoints set within the setting tolerance of the [LTSPs] where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable Values are specified for each RCIC System instrumentation Function in table 3.3.5.2-1. [Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The nominal setpoints are selected to ensure that the setpoints remain conservative to the as-left tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

~~These uncertainties are described in the setpoint methodology.~~

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the

measured output value of the process parameter exceeds the setpoint, the associated channel (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The individual Functions are required to be OPERABLE in MODE 1, and in MODES 2 and 3 with reactor steam dome pressure > 150 psig, since this is when RCIC is required to be OPERABLE. (Refer to LCO 3.5.3 for Applicability Bases for the RCIC System.)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is set high enough such that for complete loss of feedwater flow, the RCIC System flow with high pressure core spray assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

2. Reactor Vessel Water Level - High, Level 8

High RPV water level indicates that sufficient cooling water inventory exists in the reactor vessel such that there is no danger to the fuel. Therefore, the Level 8 signal is used to close the RCIC steam supply, steam supply bypass, and cooling water supply valves to prevent overflow into the main steam lines (MSLs). (The injection valve also closes due to the closure of the steam supply valve.)

BASES

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.5.2-1 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes a and b) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------

Notes a and b are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes a and b are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note b requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes a and b are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes a and b may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other

than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.5.2. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

As noted in the beginning of the SRs, the SRs for each RCIC System instrument~~ation~~ Function are found in the SRs column of Table 3.3.5.2-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 1) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RCIC will initiate when necessary.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or 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 by the plant 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 instrument has drifted outside its limit.

The Frequency is based upon operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channel status during normal operational use of the displays associated with the channels required by the LCO.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 1.

SR 3.3.5.2.3

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.5.2-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be re-adjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 1.

SR 3.3.5.2.3 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5.2-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.5.2.4

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter with the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

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

SR 3.3.5.2.4 for SL-LSSS functions is modified by two Notes as identified in Table 3.3.5.2-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

.BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.2.5

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.3 overlaps this Surveillance to provide complete testing of the safety function.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

REFERENCES

1. NEDE-770-06-2, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

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

B 3.3 INSTRUMENTATION

B 3.3.6.5 Relief and Low-Low Set (LLS) Instrumentation

BASES

BACKGROUND

The safety/relief valves (S/RVs) prevent overpressurization of the nuclear steam system. Instrumentation is provided to support two modes of S/RV operation - the relief function (all valves) and the LLS function (selected valves). Refer to LCO 3.4.4, "Safety/Relief Valves (S/RVs)," and LCO 3.6.1.6, "Low-Low Set (LLS) Safety/Relief Valves (S/RVs)," for Applicability Bases for additional information of these modes of S/RV operation. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the Safety/Relief valve instrumentation, as well as LCOs on other reactor system parameters, and equipment performance. The subset of LSSS that protect against violating the Reactor Core Safety Limits or the Reactor Coolant System (RCS) Pressure Safety Limit during anticipated operational occurrences (AOOs) are referred to as Safety Limit LSSS (SL-LSSS).

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include LSSS for variables that have significant safety functions. For variables on which a SL has been placed, the LSSS must be chosen to initiate automatic protective action to correct abnormal situations before the SL is exceeded. The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that an SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

------------------------------- REVIEWER'S NOTE ---------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term Limiting Trip Setpoint indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the standard terminology of Nominal Trip Setpoint (NTSP) should be used. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in SR 3.3.6.5.2 and 3.3.6.5.3 for the purpose of compliance with 10 CFR 50.36, the plant-specific location for the Limiting or Nominal Trip Setpoint must be cited in Note 2 of SR 3.3.6.5.2 and 3.3.6.5.3. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint

implemented in the Surveillance procedures to confirm channel performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the t[LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref.4).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." Use of the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around the [LTSP] to account for further drift during the next surveillance interval.

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.

BASES

BACKGROUND (continued)

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE. However, a potential degraded condition has been identified. During the SR performance, the condition of the channel will be evaluated. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and the channel's response evaluated. If the channel is functioning as required and expected to pass the next surveillance, then the channel can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel's as-found condition will be entered into the Corrective Action Program for further evaluation. If any of the above-described evaluations determine that the channel is not performing as expected the channel is degraded because it may not pass its next surveillance test. If the channel setpoint can not be reset to the [LTSP], it is inoperable.

If the actual setting (as-found setpoint) of the channel is found to be non-conservative with respect to the Allowable Value, the channel would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protection channels do not function as required

The relief function of the S/RVs prevents overpressurization of the nuclear steam system. The LLS function of the S/RVs is designed to mitigate the effects of postulated thrust loads on the S/RV discharge lines by preventing subsequent actuations with an elevated water leg in the S/RV discharge line. It also mitigates the effects of postulated pressure loads on the containment by preventing multiple actuations in rapid succession of the S/RVs subsequent to their initial actuation.

Upon any S/RV actuation, the LLS logic assigns preset opening and reclosing setpoints to six preselected S/RVs. These setpoints are selected to override the normal relief setpoints such that the LLS S/RVs will stay open longer, thus releasing more steam (energy) to the suppression pool; hence more energy (and time) is required for repressurization and subsequent S/RV openings. The LLS logic increases the time between (or prevents) subsequent actuations to allow the high water leg created from the initial S/RV opening to return to (or fall below) its normal water level, thus reducing thrust loads from subsequent actuations to within their design limits. In addition, the LLS is designed to limit S/RV subsequent actuations to one valve, so that containment loads will also be reduced.

The relief instrumentation consists of two trip systems, with each trip system actuating one solenoid for each S/RV. There are two solenoids per S/RV, and each solenoid can open its respective S/RV. The relief mode (S/RVs and associated trip systems) is divided into three setpoint groups (the low with one S/RV, the medium with 10 S/RVs, and the high with nine S/RVs). The S/RV relief function is actuated by transmitters that monitor reactor steam dome pressure. The reactor steam dome pressure transmitters send signals to trip units whose outputs are arranged in a two-out-of-two logic for each trip system in each of three separate

BACKGROUND (continued)

setpoint groups (e.g., the medium group of 10 S/RVs opens when at least one of the associated trip systems trips at its assigned setpoint). Once an S/RV has been opened, it will reclose when reactor steam dome pressure decreases below the opening pressure setpoint. This logic arrangement ensures that no single instrument failure can preclude the S/RV relief function.

The LLS logic consists of two trip systems similar to the S/RV relief function. Either trip system can actuate the LLS S/RVs by energizing the associated solenoids on the S/RV pilot valves. Each LLS trip system is enabled and sealed in upon initial S/RV actuation from the existing reactor steam dome pressure sensors of any of the normal relief setpoint groups. The reactor steam dome pressure channels used to arm LLS are arranged in a one-out-of-three taken twice logic. The reactor steam dome pressure channels that control the opening and closing of the LLS S/RVs are arranged in either a one-out-of-one or a two-out-of-two logic depending on which LLS S/RV group is being controlled. This logic arrangement ensures that no single instrument failure can preclude the LLS S/RV function. The channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs a LLS or relief initiation signal, as applicable, to the initiation logic.

APPLICABLE SAFETY ANALYSES

The relief and LLS instrumentation are designed to prevent overpressurization of the nuclear steam system and to ensure that the containment loads remain within the primary containment design basis (Ref. 1).

Relief and LLS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

[Limiting Trip Setpoint]s for Functions which provide automatic trips that are directly credited in the analysis to protect against violating the Reactor Core Safety Limits and the Reactor Coolant System (RCS) Pressure Safety Limits during Anticipated Operational Occurrences (AOOs) are SL-LSSS. Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

LCO

The LCO requires OPERABILITY of sufficient relief and LLS instrumentation channels to provide adequate assurance of successfully accomplishing the relief and LLS function, assuming any single instrumentation channel failure within the LLS logic. Therefore, two trip systems are required to be OPERABLE. The OPERABILITY of each trip system is dependent upon the OPERABILITY of the reactor steam dome pressure channels associated with required relief and LLS S/RVs. Each required channel shall have its setpoint ~~within~~conservative with respect to the specified Allowable Value. ~~A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions.~~

BASES

LCO (continued)

Allowable Values are specified for each channel in SR 3.3.6.5.3. ~~Nominal trip setpoints are specified in the setpoint calculations.~~[[Limiting Trip Setpoints] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure that the actual setpoints remain conservative with respect to the Allowable Value between successive CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated channel (e.g., trip unit) changes state. The Analytical Limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The {LTSPs] derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

For relief, the actuating Allowable Values are based on the transient event of main steam isolation valve (MSIV) closure with an indirect scram (i.e., neutron flux). This analysis is described in Reference 2. For LLS, the actuating and reclosing Allowable Values are based on the transient event of MSIV closure with a direct scram (i.e., MSIV position switches). This analysis is described in Reference 1.

APPLICABILITY

The relief and LLS instrumentation is required to be OPERABLE in MODES 1, 2, and 3, since considerable energy exists in the nuclear steam system and the S/RVs may be needed to provide pressure relief. If the S/RVs are needed, then the relief and LLS functions are required to ensure that the primary containment design basis is maintained. In MODES 4 and 5, the reactor pressure is low enough that the overpressure limit cannot be approached by assumed operational transients or accidents. Thus, pressure relief, associated relief, and LLS instrumentation are not required.

----------------------------------REVIEWER'S NOTE----------------------------------

Where a function does not directly protect a Safety Limit, add the following statement in the function discussion below.

"The setpoint for this function does not provide an automatic trip setpoint that protects against violating the Reactor Core Safety Limit or Reactor Coolant System Pressure Safety Limit during AOOs. This LSSS is not a SL-LSSS."

ACTIONS

----------------------------------REVIEWER'S NOTE----------------------------------

Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

BASES

ACTIONS (continued)

A.1

Because the failure of any reactor steam dome pressure instrument channels [providing relief S/RV opening and LLS opening and closing pressure setpoints] in one trip system will not prevent the associated S/RV from performing its relief and LLS function, 7 days is allowed to restore a trip system to OPERABLE status. In this condition, the remaining OPERABLE trip system is adequate to perform the relief and LLS initiation function. However, the overall reliability is reduced because a single failure in the OPERABLE trip system could result in a loss of relief or LLS function.

The 7 day Completion Time is considered appropriate for the relief and LLS function because of the redundancy of sensors available to provide initiation signals and the redundancy of the relief and LLS design. In addition, the probability of multiple relief or LLS instrumentation channel failures, which renders the remaining trip system inoperable, occurring together with an event requiring the relief or LLS function during the 7 day Completion Time is very low.

B.1 and B.2

If the inoperable trip system is not restored to OPERABLE status within 7 days, per Condition A, or if two trip systems are inoperable, 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 12 hours and to MODE 4 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

----------------------------------REVIEWER'S NOTE----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in SR 3.3.6.5.2 and SR 3.3.6.5.3 that require evaluation of a channels functioning and require reset to a predefined as-left tolerance (Notes 1 and 2) are only associated with SL-LSSS values. Therefore, the Notes are applied to specific SRs for the associated functions in the SR column only. The Notes may be placed at the top of the Allowable Value

column in the Table and applied to all Functions with Allowable Values in the table, but doing so is not required to comply with 10 CFR 50.36.

------------------------------- REVIEWER'S NOTE -----------------------------------

Notes 1 and 2 are applied to the setpoint verification Surveillances for all SL-LSSS Functions unless one or more of the following exclusions apply:

1. Notes 1 and 2 are not applied to SL-LSSS Functions which utilize mechanical components to sense the trip setpoint, or to manual initiation circuits (the latter are not explicitly modeled in the accident analysis). Current Functional Surveillance Requirements, which have no setpoint verifications, adequately demonstrate the OPERABILITY of these functions. Examples of mechanical components are limit switches, float switches, proximity detectors, manual actuation switches, and other such devices that are normally only checked on a "go/no go" basis. Note2 requires a comparison of the periodic Surveillance Requirement results to provide an indication of channel (or individual device) performance. This comparison is not valid for most mechanical components. While it is possible to verify that a limit switch functions at a point of travel, a change in the surveillance result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of Surveillance Requirement results would not provide an indication of the channel or component performance.

2. Notes 1 and 2 are not applied to the Technical Specifications associated with safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.

3. Notes 1 and 2 may not apply to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits, relays, and any other tests using a digital or on/off input, there is no expected change in result between surveillance performances and any test result other than the identified Technical Specification surveillance acceptance criteria would be considered inoperable. Therefore, the Notes would not apply. Where there is a separate as-left and as-found tolerance established for the SR, the Notes may not apply if the NRC staff agrees with a licensee's conclusion that they are not required.

A generic evaluation of SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in TS 3.3.6.5. Each licensee adopting this change must review the list of potential SL-LSSS Functions to identify whether any of the identified functions are not SL-LSSS or meet any of the exclusion criteria based on the plant-specific design and safety analysis (AOOs). It is assumed that each generically identified Function is a plant-specific SL-LSSS unless it can be demonstrated by the licensee that the Function does not meet the definition of a SL-LSSS or it meets one of the exclusion criteria. In addition, each plant adopting

this change must evaluate any plant-specific Functions that do not appear in the ISTS NUREG to determine if the plant-specific Function is a SL-LSSS. Non SL-LSSS functions must be identified as such in the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains relief or LLS initiation capability, as applicable. Upon completion of the

SURVEILLANCE REQUIREMENTS (continued)

Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 3) assumption of the average time required to perform channel surveillance. That analysis demonstrated the 6 hour testing allowance does not significantly reduce the probability that the relief and LLS valves will initiate when necessary.

SR 3.3.6.5.1

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that 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 a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 3.

SR 3.3.6.5.2

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in SR 3.3.6.5.3. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology but is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 3.

SR 3.3.6.5.2 for SL-LSSS functions is modified by two Notes. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.6.5.3

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

The Frequency is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.6.5.3 for SL-LSSS functions is modified by two Notes. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable.

The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR].

SR 3.3.6.5.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required actuation logic for a specific channel. The system functional testing performed for S/RVs in LCO 3.4.4 and LCO 3.6.1.6 overlaps this Surveillance to provide complete testing of the assumed safety function. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 18 month Frequency.

REFERENCES

1. FSAR, Section [5.2.2].

2. FSAR, Appendix 5A.

3. GENE-770-06-1, "Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

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