TSTF

TECHNICAL SPECIFICATIONS TASK FORCE
A JOINT OWNERS GROUP ACTIVITY

April 16, 2007

TSTF-07-14
PROJ0753

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

SUBJECT: TSTF-493, Revision 2, "Clarify Application of Setpoint Methodology for LSSS Functions"

Dear Sir or Madam:

Enclosed for NRC review is Revision 2 of TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions." This revision addresses NRC comments on Revision 1.

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.

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

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Enclosure

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PWROG
PWR Owners Group
BWR OWNERS' GROUP

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Final Resolution: Superceded by Revision Final Resolution Date: 02-Oct-06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

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: Date:

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 or the Reactor Coolant System (RCS) pressure boundary Safety Limits (herein referred to as "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

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.

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 Operation Test (TADOT) Surveillance Requirements that verify trip setpoints.

The two Notes are:

Note 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.

Note 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 [a document controlled under 10 CFR 50.59].

In NUREG-1430, 1432, 1433, and 1434, the Technical Specifications 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 is referred to as the "multiple column" format and 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 Note 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 Note 2 is not required.

Notes 1 and 2 are applied to Functions which are Safety Limit Limiting Safety System Settings (SL-LSSS), considering the definition and exclusion criteria given below.

SL-LSSS are defined as:

> "Trip Setpoints for Functions which provide automatic trips that directly 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). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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.

Notes 1 and 2 are applied to the indicated 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). 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 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. Notes 1 and 2 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. Notes 1 and 2 are not applied to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits and associated relays, there is no expected change in result between surveillance performances other than measurement and test errors (M&TE) and, therefore, comparison of Surveillance results does not provide an indication of channel or component performance.

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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," and to discuss the relationship of the LSSS to other values, such as the Allowable Value, [NTSP], and [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.

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]"). A Reviewer's Note is added to the Bases indicating that 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.

3.0 Background

Plant protective systems initiate reactor trips (scrams) or other protective actions when selected unit parameters exceed Analytical Limits assumed in the safety analysis in order to prevent violation of the reactor core and RCS Safety Limits from postulated Anticipated Operational Occurrences (AOOs). The reactor core and RCS Safety Limits are determined based on protecting reactor core and RCS.

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 plant limits are not exceeded. For AOOs, the event limits include the reactor core and RCS 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 trip setpoint. Therefore, the trip setpoint 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 may be reset at the conclusion of periodic testing to ensure that the Safety Limit (SL) 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. In the intervening period, the industry and the NRC have worked together to develop requirements that will ensure that instrument channels will actuate as assumed in the accident analysis. The complete history is described in Appendix A.

The NRC determined that seven concepts needed to be addressed to ensure that the instrument channels will function as required. These concepts (paraphrased from an NEI to NRC letter dated May 18, 2005, therefore 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 Technical Analysis

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.

Addition of Notes 1 and 2 to the SL-LSSS Functions

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

Note 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. Note 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 Note 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 Note 2, as described below.

The Bases state that 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 the licensee must also perform an independent prompt verification that the instrument is functioning as required.

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 to the Allowable Value but outside the as-found tolerance. In this case the channel is Operable, the setpoint is reset to the [LTSP] (within the as-left 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. A prompt verification of the channel's condition will be performed after 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 functioning as required, the channel is degraded because it may not pass its next surveillance test.

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.

Note 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 [a document controlled under 10 CFR 50.59]."

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 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 Note 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.

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. However, in this case the [LTSP] values must be contained in a document controlled under 10 CFR 50.59, such as the UFSAR, and the title of this document must be identified in Note 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 listed in Note 2.

For TS with a multiple column format which lists the [NTSP] (as shown as an option in NUREG-1431), the last sentence of Note 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 Note 2.

<u>Addition of the Definition of "Limiting Safety System Setting" to the Bases</u>

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.

<u>Addition of the Definition of "Limiting Trip Setpoint" to the Bases</u>

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

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

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 directly protect the Safety Limits for the reactor core and for RCS pressure boundary 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.

5.0 <u>Regulatory Analysis</u>

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-S67.04, 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."

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 [a document controlled under 10 CFR 50.59].

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[db]	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[be],3[be] 4[be],5[be]	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[bd]	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] * T_{out} - [5037.8]) psig
6. Reactor Building High Pressure	1,2,3[fc]	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]

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

(ef) 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[(eb)],3[(be)],4[(be)] 5[(be)]	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]

(be) 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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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 SL-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 ~~Analytic~~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 ~~Analytic~~Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the ~~Analytic~~Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

~~The trip setpoint is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytic Limit and thus ensuring that the SL would not be exceeded. As such, the trip setpoint accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 trip setpoint plays an important role in ensuring that SLs are not exceeded. As such, the trip setpoint meets the definition of an LSSS (Ref. 1) and could be used to meet the requirement that they be contained in the Technical Specifications.~~

------------------------------ 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 term Nominal Trip Setpoint (NTSP) is preferred. 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 term 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an 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)." ~~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 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 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. Therefore, the device would still be OPERABLE because ~~since~~ it would have performed its safety function and the only corrective action required would be to reset the device 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 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 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,~~

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. 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) or CHANNEL CALIBRATION.

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 will still meet the LSSS definition and ensure that an 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 [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 device is found to be non-conservative with respect to 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.

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, these values 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.

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 ~~trip setpoints~~ [LTSPs] is such that adequate protection is provided when all sensor and processing uncertainties ~~and~~ 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 [LTSPs], including their explicit uncertainties, is provided in "[Unit Specific Setpoint Methodology]" (Ref. 5). The actual 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 Frequency. A channel is inoperable if its actual trip setpoint is non-conservative with respect to its required Allowable Value.

[Limiting Trip Setpoints] 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.

BASES

BACKGROUND (continued)

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.

APPLICABLE SAFETY ANALYSES, LCO,

The RPS Functions to maintain the SLs during all AOOs and mitigates the consequences of DBAs. Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 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

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 [LTSP] and the methodologies for calculation of the as-left and as-found tolerances are described in [a document controlled under 10 CFR 50.59]. 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[LTSP], but within conservative with respect to its Allowable Value, is acceptable provided that operation and testing are consistent with the assumptions of the unit specific setpoint calculations. and that the as found setpoint is within the as-found tolerance. 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[LTSP] Allowable Value is to ensures 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.

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 Allowable Values and their associated [LTSPs] are not considered to be 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.

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.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Nuclear Overpower - High Setpoint trip initiates a reactor trip when the neutron power reaches a predefined ~~setpoint~~[LTSP] 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 RCS Flow and Measured AXIAL POWER IMBALANCE trips are analyzed to provide protection against DNB and fuel centerline melt. The Allowable Value does not account for harsh environment induced errors, because the trip will actuate prior to degraded environmental conditions being reached.

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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

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 approximately the same value. Significant deviations between 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.

BASES

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.

SR 3.3.1.3

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.

BASES

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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.

BASES

SURVEILLANCE REQUIREMENTS -(continued)

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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.

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 ESFAS, as well as LCOs on other system parameters and equipment performance. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. 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 term 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 [LTSP] and the methodology for calculating

the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE because since it would have performed its safety function and the only corrective action required would be to reset the device to 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. 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) or CHANNEL CALIBRATION.

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 will ensure that an SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the established [LTSP] 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 device is found to be non-conservative with respect to 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.

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, these values 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,

BASES

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[LTSPs] 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 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 non-conservative with respect to its required Allowable Value.

[Limiting Trip Setpoints], 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.

BASES

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.

-----------------------------------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.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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.

High Pressure Injection

BASES

LCO (continued)

Only the Allowable Value is specified for each ESFAS Function in the LCO. ~~Nominal trip setpoints are specified in the unit specific setpoint calculations.~~The [LTSP] and the methodologies for calculation of the as-left and as-found tolerances are described in [a document controlled under 10 CFR 50.59]. The nominal trip setpoints are selected to ensure the setpoints measured by CHANNEL FUNCTIONAL TESTS do not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the ~~nominal trip setpoint~~[LTSP], but ~~within~~ conservative with respect its Allowable Value, is acceptable provided that operation and testing are consistent with the assumptions of the unit specific setpoint calculations~~.~~ and that the trip setpoint is within the as-found tolerance. 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.

BASES

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 [LTSP] and ~~trip setpoint~~ 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.

BASES

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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

BASES

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

BASES

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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

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(ij) 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(bd),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(bd), 2(ce)	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 32]

(bd) Below the P-10 (Power Range Neutron Flux) interlocks.

(ce) Above the P-6 (Intermediate Range Neutron Flux) interlocks.

--REVIEWER'S NOTE--

(jl) 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(jl) TRIP SETPOINT]
5. Source Range Neutron Flux	2(df)	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 SR 3.3.1.11 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(fh)	[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(eg)	3	K	SR 3.3.1.1 SR 3.3.1.7[(b)(c)] SR 3.3.1.10[(b)(c)]	≤ [93.8]%	[92]%
10. Reactor Coolant Flow - Low	1(fh)	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]

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

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

(fh) Above the P-8 (Power Range Neutron Flux) interlock.

---REVIEWER'S NOTE---

(il) 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(ij) 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--

(~~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 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[il] 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[bd], 4[bd], 5[bd]	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[bd], 4[bd], 5[bd]	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.~~

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

Table 3.3.1-1 (page 6 of 7)
Reactor Trip System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following [Nominal Trip Setpoint] by more than [3.8]% of ΔT span.

$$\Delta T \frac{(1+T_1 S)}{(1+T_2 S)}\left(\frac{1}{1+T_3 S}\right) \le \Delta T_Q \left\{K_1 - K_2 \frac{(1+T_4 S)}{(1+T_5 S)}\left[T \frac{1}{(1+T_6 S)} - T'\right] + K_3 (P - P') - f_1(\Delta I)\right\}$$

Where: ΔT is measured RCS ΔT,°F.
ΔT_Q is the indicated ΔT at RTP,°F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature,°F.
T' is the nominal T_{avg} at RTP, ≤ [*]°F.

P is the measured pressurizer pressure, psig
P' is the nominal RCS operating pressure, ≥ [*] psig

K_1 ≤ [*]	K_2 ≥ [*]/°F	K_3 ≥ [*]/psig
T_1 ≥ [*] sec	T_2 ≤ [*] sec	T_3 ≤ [*] sec
T_4 ≥ [*] sec	T_5 ≤ [*] sec	T_6 ≤ [*] sec

$f_1(\Delta I)$ = [*] {[*] - (q_t - q_b)}	when q_t - q_b ≤ [*]% RTP
0% of RTP	when [*]% RTP < q_t - q_b ≤ [*]% RTP
[*] {(q_t - q_b) - [*]}	when q_t - q_b > [*]% RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and q_t + q_b is the total THERMAL POWER in percent RTP.

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

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

Note 2: Overpower ΔT

The Overpower ΔT Function Allowable Value shall not exceed the following [Nominal Trip Setpoint] by more than [3]% of ΔT span.

$$\Delta T \frac{(1+T_1 S)}{(1+T_2 S)}\left(\frac{1}{1+T_3 S}\right) \leq \Delta T_Q \left\{K_4 - K_5 \frac{T_7 S}{1+T_7 S}\left(\frac{1}{1+T_6 S}\right)T - K_6\left[T\frac{1}{1+T_6 S} - T''\right] - f_2(\Delta I)\right\}$$

Where: ΔT is measured RCS ΔT,°F.
ΔT_Q is the indicated ΔT at RTP,°F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature,°F.
T" is the nominal T_{avg} at RTP, ≤ [*]°F.

K_4 ≤ [*]	K_5 ≥ [*]/°F for increasing T_{avg} [*]/°F for decreasing T_{avg}	K_6 ≥ [*]/°F when T > T" [*]/°F when T ≤ T"
T_1 ≥ [*] sec	T_2 ≤ [*] sec	T_3 ≤ [*] sec
T_6 ≤ [*] sec	T_7 ≥ [*] sec	

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

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

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 $t_1 \geq$ [50] seconds and $t_2 \leq$ [5] seconds.

--REVIEWER'S NOTE--

(jl) 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(~~i~~) 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[j] 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(il) TRIP SETPOINT]
4. Steam Line Isolation						
a. Manual Initiation	1,2 (hj),3 (hj)	2	F	SR 3.3.2.8	NA	NA
b. Automatic Actuation Logic and Actuation Relays	1,2 (hj),3 (hj)	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 (hj), 3 (hj)	[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 (hj), 3 (ack) (hj)	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](bd) psig	[675](bd) psig
(2) Negative Rate - High	3 (fh) (hj)	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](gi) psi	[110](gi) psi

(b) [INSERT 1]

(c) [INSERT 2]
(ac) Above the P-11 (Pressurizer Pressure) interlock.

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

(fh) Below the P-11 (Pressurizer Pressure) interlock.

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

(hj) Except when all MSIVs are closed and [de-activated].

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

------------------------------------REVIEWER'S NOTE------------------------------------
(il) 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 (ij) TRIP SETPOINT]
4. Steam Line Isolation						
e. High Steam Flow in Two Steam Lines	1, 2 (hj), 3 (hj)	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	(df)	(eg)
Coincident with T_{avg} - Low Low	1, 2 (hj), 3 (ce) (hj)	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 (hj), 3 (hj)	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	(df)	(eg)
Coincident with Steam Line Pressure - Low	1,2, (hj) 3 (hj)	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] (bd) psig	[675] (bd) psig
g. High Steam Flow	1,2 (hj), 3 (hj)	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 (hj), 3 (ce) (hj)	[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]

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

(ce) 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(jl) TRIP SETPOINT]
4. Steam Line Isolation						
h. High High Steam Flow	1,2 (hj),3 (hj)	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 (ik), [3](ik)	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 (ik),[3](ik)	[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]

(hj) Except when all MSIVs are closed and [de-activated].

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

--REVIEWER'S NOTE--

(jl) 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---

(jl) 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(jl) 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--

(jl) 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 operational 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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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~~SL-LSSS defined by the regulation as "...settings for automatic protective devices...so chosen that automatic protective action will correct the abnormal situation before a Safety Limit (SL) is exceeded." The ~~Analytic~~Analytical Limit is the limit of the process variable at which a ~~safety~~ 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 ~~Analytic~~Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the ~~Analytic~~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 trip setpoint is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytic Limit and thus ensuring that the SL would not be exceeded. As such, the trip setpoint accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 trip setpoint plays an important role in ensuring that SLs are not exceeded. As such, the trip setpoint meets the definition of an LSSS (Ref. 1) and could be used to meet the requirement that they be contained in the Technical Specifications.~~

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 term for the Limiting or 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 "[a document controlled under 10 CFR 50.59]" 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 "[a document controlled under 10 CFR 50.59]" in the specifications.

The [Nominal Trip Setpoint (NTSP)] is a predetermined setting for a protective 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 [NTSP] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [NTSP] ensures that SLs are not exceeded. As such, the [NTSP] meets the definition of an SL-LSSS (Ref. 1).

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)." ~~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~~[NTSP] 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 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 with a setting that has been found to be different from the ~~trip setpoint~~[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 ~~trip setpoint~~[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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to the ~~trip setpoint~~[NTSP] 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 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 during the CHANNEL OPERATIONAL TEST (COT). As such, the Allowable Value differs from the trip setpoint~~ However, there is also some point beyond which the device 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 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 ~~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 will ~~still meet the LSSS definition and~~ ensure that an SL

BASES

BACKGROUND (continued)

is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. Note that, although the channel is "OPERABLE" under these circumstances, the 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 device is found to have exceeded the be non-conservative with respect to 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: Alternatively, a Technical Specification format incorporating an Allowable Value only column may be proposed by a licensee. 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. 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 [a document controlled under 10 CFR 50.59]. Changes to the actual plant trip setpointsetpoint 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, these values 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 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 ~~trip setpoint~~[NTSP] and Allowable Values. The OPERABILITY of each transmitter or sensor is determined by either "as-found" calibration data evaluated during the CHANNEL CALIBRATION or by qualitative assessment of field transmitter or sensor as related to the channel 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 ~~setpoints~~[NTSPs] established by safety analyses. These ~~setpoints~~[NTSPs] 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.

BASES

BACKGROUND (continued)

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 trip setpoints[NTSPs] 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 trip setpoints[NTSPs], 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 magnitudes of these uncertainties are factored into the determination of each trip setpoint [NTSP] 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 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 exceedis conservative with respect to the Allowable Value, the bistable is considered OPERABLE. Note that, although a channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to within the established as-left criteria and confirmed to be operating within the statistical allowances of the uncertainty terms assigned.

The trip setpoint is the value at which the bistable is set and is the expected value to be achieved during calibration. The [NTSP] value 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] value is within the as-left tolerance band for CHANNEL CALIBRATION uncertainty allowance (i.e., ± rack calibration and comparator setting uncertainties). The [NTSP] 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, 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.

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

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

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 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 that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary safety limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). The RTS interlocks do not function as part of the automatic protection system for accident mitigation. The interlock functions ensure that required manual actions, such as blocking the source range trip prior to entering the intermediate range, are performed in their proper sequence. The interlock functions also ensure that automatic actions occur, such as reinstating the high flux-low trip, if power decreases below the interlock setpoint. 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 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 ~~are~~ 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 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~~

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 is conservative with respect to 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.~~[NTSP]. 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 instrumentation 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

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.

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 ~~LSSS~~[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

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

power level. Above the P-7 setpoint, the reactor trip on loss of flow in two or more RCS loops is automatically enabled. This Function uses the same relays as the ESFAS Function 6.f, "Undervoltage Reactor Coolant Pump (RCP)" start of the auxiliary feedwater (AFW) pumps.

13. Underfrequency Reactor Coolant Pumps

The Underfrequency RCPs reactor trip Function ensures that protection is provided against violating the DNBR limit due to a loss of flow in two or more RCS loops from a major network frequency disturbance. An underfrequency condition will slow down the pumps, thereby reducing their coastdown time following a pump trip. The proper coastdown time is required so that reactor heat can be removed immediately after reactor trip. The frequency of each RCP bus is monitored. Above the P-7 setpoint, a loss of frequency detected on two or more RCP buses will initiate a reactor trip. This trip Function will generate a reactor trip before the Reactor Coolant Flow - Low (Two Loops) Trip Setpoint is reached. Time delays are incorporated into the Underfrequency RCPs channels to prevent reactor trips due to momentary electrical power transients.

The LCO requires three Underfrequency RCPs channels per bus to be OPERABLE.

In MODE 1 above the P-7 setpoint, the Underfrequency RCPs trip must be OPERABLE. Below the P-7 setpoint, all reactor trips on loss [LTSPs] of flow are automatically blocked since no conceivable power distributions could occur that would cause a DNB concern at this low power level. Above the P-7 setpoint, the reactor trip on loss of flow in two or more RCS loops is automatically enabled.

14. Steam Generator Water Level - Low Low

The SG Water Level - Low Low trip Function ensures that protection is provided against a loss of heat sink and actuates the AFW System prior to uncovering the SG tubes. The SGs are the heat sink for the reactor. In order to act as a heat sink, the SGs must contain a minimum amount of water. A narrow range low low level in any SG is indicative of a loss of heat sink for the reactor. The level transmitters provide input to the SG Level Control System. Therefore, the actuation logic must be able to withstand 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. This Function also performs the ESFAS function of starting the AFW pumps on low low SG level.

BASES

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. 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. Notes b and c require 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 test result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of surveillance requirement test 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 are not applied 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, comparison of Surveillance results does not provide an indication of channel or component performance.

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 an 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 an SL-LSSS.

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 ~~within~~ conservative with respect to 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

BASES

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.13

SR 3.3.1.13 is the performance of a COT of RTS interlocks every [18] months. 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 based on the known reliability of the interlocks and the multichannel redundancy available, and has been shown to be acceptable through operating experience.

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 ESFAS, as well as specifying LCOs on other system parameters and equipment performance. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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 SL-LSSS defined by the regulation as "...settings for automatic protective devices...so chosen that automatic protective action will correct the abnormal situation before a Safety Limit (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 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 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 3.3.2-1 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. 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 "[a document controlled under 10 CFR 50.59]" 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 "[a document controlled under 10 CFR 50.59]" in the specifications.

The [Nominal Trip Setpoint (NTSP)] is a predetermined setting for a protective 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 [NTSP] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [NTSP] ensures that SLs are not exceeded. As such, the [NTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to the [NTSP] 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 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 device will ensure that an SL

is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. Note that, although the channel is OPERABLE under these circumstances, the 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 device is found to be non-conservative with respect to the Allowable Value, the device would be considered inoperable. This requires corrective action including those actions required by 10 CFR 50.36 when automatic 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 [a document controlled under 10 CFR 50.59]. 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, these values 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, 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 Values. The OPERABILITY of each transmitter or sensor is determined by either "as-found" calibration data evaluated during the CHANNEL CALIBRATION or by qualitative assessment of field transmitter or sensor, as related to the channel 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~~[NTSP], 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 and ESFAS Setpoints

The trip setpoints used in the bistables are based on the analytical limits stated in Reference 2. The selection of these ~~trip setpoints~~[NTSPs] 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 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 to account for measurement errors detectable by the COT. The Allowable Value serves as the 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~~as-found setpoint ~~does not exceed the~~is conservative with respect to Allowable Value, the bistable is considered OPERABLE. Note that, although a channel is OPERABLE under these circumstances, the ESFAS setpoint must be left adjusted to within the established as-left criteria and confirmed to be operating within the statistical allowances of the uncertainty terms assigned.

The ESFAS setpoints are the values at which the bistables are set and is the expected value to be achieved during calibration. The ESFAS ~~setpoint~~ [NTSP] value, in conjunction with the use of as-found and as-left tolerances, 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.

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

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 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.

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. 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 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 for protection system instrument channels that protect reactor core or RCS pressure boundary Safety Limits. 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)

.

ESFAS Actuation Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary safety limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). The ESFAS interlocks allow ESFAS functions to be blocked for shutdown operations and automatically unblocked for the ESFAS function when the plant is started up. The ESFAS interlocks do not function as part of the automatic actuation system and are not modeled in the safety analysis 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 to be OPERABLE. A channel is OPERABLE with an ~~trip setpoint~~[NTSP] value outside its calibration tolerance band provided the trip setpoint "as-found" value ~~does not exceed~~ is conservative with respect to its associated Allowable Value and provided the ~~trip setpoint~~[NTSP] "as-left" value is adjusted to a value within the calibration tolerance band of the ~~Nominal Trip Setpoint.~~[NTSP]. 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 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:

1. Safety Injection

   Safety Injection (SI) provides two primary functions:

   1. Primary side water addition to ensure maintenance or recovery of reactor vessel water level (coverage of the active fuel for heat removal, clad integrity, and for limiting peak clad temperature to < 2200°F), and

   2. Boration to ensure recovery and maintenance of SDM (k_{eff} < 1.0).

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 Setpoi~~[NTSP]~~nt~~ 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

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. 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. Notes b and c require 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 test result probably indicates that the switch has moved, not that the input/output relationship has changed. Therefore, a comparison of surveillance requirement tests 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 are not applied 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, comparison of Surveillance results does not provide an indication of channel or component performance.

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 an 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 an SL-LSSS.

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 approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

BASES

SURVEILLANCE REQUIREMENTS (continued)

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,

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [NTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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(ac)	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(bd)	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(ce)	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]

(ac) 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.

(bd) 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.

(ce) 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(~~d~~f) (~~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]

(ce) 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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." The ~~Analytic~~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 ~~Analytic~~Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the ~~Analytic~~Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

~~The trip setpoint is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytic Limit and thus ensuring that the SL would not be exceeded. As such, the trip setpoint accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 trip setpoint plays an important role in ensuring that SLs are not exceeded. As such, the trip setpoint meets the definition of an LSSS (Ref. 1) and could be used to meet the requirement that they be contained in the Technical Specifications.~~

------------------------------ 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 term Nominal Trip Setpoint (NTSP) is preferred. 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 term 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an 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)." ~~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 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 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. Therefore, the 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 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.

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. 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 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 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, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and 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 device will ensure that an SL is not exceeded at any given point of time as long as the device has

BASES

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 device is found to be non-conservative with respect to 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.

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, these values 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:

BASES

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:

- <u>Steam Generator Level - Low</u>

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

BASES

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~~ [Limiting 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.

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 as-found setpoint is not withinconservative with respect to its required Allowable Value.

Setpoints 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.

[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 that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 specific safety analyses applicable to each protective Function are identified below:

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.~~[Limiting Trip Setpoints and the methodologies to calculate the as-left and as-found tolerances are specified in [a document controlled under 10 CFR 50.59]. The nominal setpoints are selected to ensure the setpoints measured by CHANNEL FUNCTIONAL TESTS ~~do not exceed the~~ are conservative with respect to the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the ~~nominal trip setpoint,~~ Limiting Trip Setpoint but ~~within~~conservative with respect to its Allowable Value~~,~~ is acceptable, provided that operation and testing are consistent with the assumptions of the plant specific setpoint calculations. 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.

1. <u>Variable High Power Trip (VHPT) - High</u>

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.

To account for these errors, the safety analysis minimum value is 40% RTP. The 10% step is a maximum value assumed in the safety analysis. There is no uncertainty applied to the step.

2. <u>Power Rate of Change - High</u>

This LCO requires four channels of Power Rate of Change - High to be OPERABLE in MODES 1 and 2, as well as in MODES 3, 4, and 5 when the RTCBs are closed and the CEA Drive System is capable of CEA withdrawal.

The high power rate of change trip serves as a backup to the administratively enforced startup rate limit. The Function is not credited in the accident analyses; therefore, the Allowable Value for the trip or bypass Functions is not derived from analytical limits.

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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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..

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.

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 transmitter or the signal processing equipment has drifted outside its limits.

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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

BASES

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 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

The Frequency is based upon the assumption of an 18 month calibration interval for the determination of the magnitude of equipment drift.

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), where they exist, in terms of parameters directly monitored by the ESFAS as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. 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 term 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS.

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. 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 device will ensure that an SL is not exceeded at any given point of time as long as the device has

BACKGROUND (continued)

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 device is found to be non-conservative with respect to 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.

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, these values 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)

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.

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 that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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.F

ESFAS protective Functions are as follows:

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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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----------------------------------

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(c~~a~~)	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(d~~c~~)	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(~~b~~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~~b~~)	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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." The ~~Analytic~~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 ~~Analytic~~Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the ~~Analytic~~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 term Nominal Trip Setpoint (NTSP) is preferred. 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 term 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

The trip setpoint[Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the AnalyticAnalytical Limit and thus ensuring that the SL would not be exceeded. As such, the trip setpoint[LTSP] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 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 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 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 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. Therefore, the 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 to the trip setpoint 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. 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 theUse 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.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 will ~~still meet the LSSS definition and~~ ensure that an SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the

BASES

BACKGROUND (continued)

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). If the actual setting of the device is found to have exceededbe non-conservative with respect to 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, these values 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,

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 "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~~non-conservative with respect to its Allowable Value.

[Limiting Trip 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. FSAR, Section [7.2] (Ref. 9), provides more detail on RPS testing. Processing transmitter calibration is normally performed on a refueling basis.

RPS Logic

The RPS Logic, addressed in LCO 3.3.4, consists of both Matrix and Initiation Logic and employs a scheme that provides a reactor trip 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.

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

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 that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 specific safety analysis applicable to each protective function are identified below:

1. Linear Power Level - High

   The Linear Power Level - High trip provides protection against core damage during the following events:

   - Uncontrolled CEA Withdrawal From Low Power (AOO),

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.~~[Limiting Trip Setpoints and the methodologies to calculate the as-left and as-found tolerances are specified in [a document controlled under 10 CFR 50.59]. The nominal setpoints are selected to ensure the setpoints measured by CHANNEL FUNCTIONAL TESTS ~~do not exceed the~~ are conservative with respect to the Allowable Value if the bistable is performing as required. Operation with a plant trip setpoint less conservative than the ~~nominal trip setpoint~~[LTSP], but ~~within~~conservative with respect to 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~~non-conservative with respect to 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).

The Bases for the individual Function requirements are as follows:

1. Linear Power Level - High

   This LCO requires all four channels of Linear Power Level - High 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 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.

2. Logarithmic Power Level - High

   This LCO requires all four channels of Logarithmic Power Level - High to be OPERABLE in MODE 2, and in MODE 3, 4, or 5 when the

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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

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.

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 transmitter or the signal processing equipment has drifted outside its limits.

The Frequency, about once every shift, is based on operating experience that demonstrates the rarity of channel failure. Since the probability of two random failures in redundant channels in any 12 hour period is

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

[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 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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.

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 ESFAS, as well as LCOs on other system parameters and equipment performance. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. 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 term 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. 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 device will ensure that an SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance

interval. Note that, although the channel is OPERABLE under these circumstances, the 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 device is found to be non-conservative with respect to 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.

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, these values 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:

BASES

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 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. A channel is inoperable if its actual trip setpoint is ~~not within~~conservative with respect to its required Allowable Value.

~~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.

BASES

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 that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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

BASES

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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

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.

BASES

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].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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,

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[(ac)]	[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[(ac)]	[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[(bd)]

(a) [INSERT 1]

(b) [INSERT 2]

(ac) 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[ac]	[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[ac]	[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[ac]	[2]	H	SR 3.3.1.1.10 SR 3.3.1.1.13	NA

(ac) 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(ac)	[2]	H	SR 3.3.1.1.5 SR 3.3.1.1.13	NA

(ac) 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)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP] 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 and the] methodologies used to determine the as-found and the as-left tolerances are specified in [a document controlled under 10 CFR 50.59]. --- [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)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP] 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 and the] methodologies used to	[18] months

	determine the as-found and the as-left tolerances are specified in [a document controlled under 10 CFR 50.59]. -- 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. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." The ~~Analytic~~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~~an SL is not exceeded. Any automatic protection action that occurs on reaching the ~~Analytic~~Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the ~~Analytic~~Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

~~The trip setpoint is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytic Limit and thus ensuring that the SL would not be exceeded. As such, the trip setpoint accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 trip setpoint plays an important role in ensuring that SLs are not exceeded. As such, the trip setpoint 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)

------------------------------- 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in a column in Table 3.3.1.1-1 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 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the 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, use of the 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 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 protective device with a setting that has been found to be different from the 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 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset

~~the device 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.~~

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BACKGROUND (continued)

~~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. 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.~~The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an 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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.1.1-1 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 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. CHANNEL CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this

BASES

BACKGROUND (continued)

manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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.

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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.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 ~~within~~conservative with respect to the ~~specified~~ Allowable Value, where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

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APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

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] are specified in [a document controlled under 10 CFR 50.59]. The ~~nominal setpoints~~[LTSPs] are selected to ensure that the actual setpoints ~~do not exceed the~~ 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~~conservative with respect to its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is ~~not within~~non-conservative with respect to 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 (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.

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 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.1.1-1 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

As noted at the beginning of the SRs, the SRs for each RPS instrumentation 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.

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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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~~ non-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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

BASES

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 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance for the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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.

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 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, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field

setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in a column 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.2 .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 CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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).

BASES

BACKGROUND ~~(continued)~~

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.

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] are specified in [a document controlled under 10 CFR 50.59 such as the UFSAR]. The [LTSPs] are selected to ensure that the actual setpoints are conservative with respect to the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than its [LTSP], but conservative with respect to its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is non-conservative with respect to its required Allowable Value.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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.

[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 power), and when the measured output value of the process parameter exceeds the setpoint, the associated 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] 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, and instrument drift as defined by 10 CFR 50.49) are accounted for.

BASES

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

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

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.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

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~~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 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, and 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).

BASES

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 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

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.

BASES

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

BASES

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. 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.

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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in SR 3.3.4.1.3 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 2 of 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in SR 3.3.4.1.3 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 CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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 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).

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 ~~within~~ conservative with respect to the specified Allowable Value 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] Nominal trip setpoints are specified in [a document controlled under 10 CFR 50.59]the setpoint calculations. A channel is inoperable if its actual trip setpoint is not within conservative with respects to its required Allowable Value. The nominal setpoints are selected to ensure that the setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within conservative with respect to its Allowable Value, is acceptable. 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. [Limiting TTrip sSetpoints] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

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 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 [Limiting Ttrip sSetpoints] 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 specific Applicable Safety Analysis, LCO, and Applicability discussions are listed below on a Function by Function basis.

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 ensuring that the MCPR SL is not exceeded during the worst case transient.

Closure of the TSVs is determined by measuring the position of each valve. There are two separate position switches associated with each stop valve, the signal from each switch being assigned to a separate trip channel. The logic for the TSV - Closure Function is such that two or more TSVs must be closed to produce an EOC-RPT. This Function must be enabled at THERMAL POWER ≥ 30% RTP. This is normally accomplished automatically by pressure transmitters sensing turbine first stage pressure; therefore, to consider this Function OPERABLE, the

BASES

ACTIONS (continued)

C.1 and C.2

With any Required Action and associated Completion Time not met, THERMAL POWER must be reduced to < 30% 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 < 30% RTP from full power conditions in an orderly manner and without challenging plant systems.

Required Action C.1 is modified by a Note which states that the Required Action is only applicable if the inoperable channel is the result of an inoperable RPT breaker. The Note clarifies the situations under which 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 and SR 3.3.4.1.3 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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 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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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~~ 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. The first Note requires evaluation of the TCV 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 TCV instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument channel shall be declared inoperable.

The second Note also requires that TCV [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [a document controlled under 10 CFR 50.59].

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. The first Note requires evaluation of the TCV 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 TCV instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the[LTSP], then the instrument channel shall be declared inoperable.

The second Note also requires that TCV [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [a document controlled under 10 CFR 50.59].

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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in a column in Table 3.3.5.1-1 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 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 [LTSP] and the methodology for calculating

the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.5.1-1 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 CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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 been restored, even if the high drywell pressure condition persists. The logic can also be initiated by use of a manual push button (one push button per subsystem). Upon receipt of an initiation signal, the CS pumps are started immediately after power is available.

The CS test line isolation valve, which is also a primary containment isolation valve (PCIV), is closed on a CS initiation signal to allow full

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.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 conservative with respect to~~within~~ the specified Allowable Values, 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~~ Limiting T~~t~~rip ~~s~~Setpoints] are specified [in a document controlled under 10 CFR 50.59] ~~in the setpoint calculations~~. The nominal setpoints are selected to ensure that the setpoints remain conservative with respect to the~~do not exceed the~~ Allowable Value between CHANNEL CALIBRATIONS.

Operation with a trip setpoint less conservative than the nominal trip setpoint, but conservative with respect to~~within~~ its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not conservative with respect to~~within~~ its required Allowable Value.

[Limiting Trip ~~s~~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 (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.

Core Spray and Low Pressure Coolant Injection Systems

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 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

As noted in the beginning of the SRs, the SRs for each ECCS instrumentation 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in a column in Table 3.3.5.2-1 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 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.5.2-1 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 CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In

this manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 conservative with respect to~~within~~ the specified Allowable Values, where appropriate. A channel is inoperable if its actual trip setpoint is not conservative with respect to~~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. [Limiting Trip Setpoints]Nominal trip setpoints are specified [in a document controlled under 10 CFR 50.59]in the setpoint calculations. The nominal setpoints are selected to ensure that the setpoints do not exceedremain conservative to the Allowable Value between CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but withinconservative with respect to 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.

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.

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 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

As noted in the beginning of the SRs, the SRs for each RCIC System instrumentation 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,

BASES

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 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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.

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]

(ac)_With any control rod withdrawn from a core cell containing one or more fuel assemblies.

[(bd) 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 [(ca)(db)] 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

(ca) [INSERT 1]

(db) [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(ac)	[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(ac)	[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]

(ac)_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)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP] 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 and the] methodologies used to determine the as-found and the as-left tolerances are specified in [a document controlled under 10 CFR 50.59]. -- [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)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP] 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 and the] methodologies used to determine the as-found and the as-left tolerances are specified in [a document controlled under 10 CFR 50.59]. --- 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
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.	

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)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP] 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 and the] methodologies used to determine the as-found and the as-left tolerances are specified in [a document controlled under 10 CFR 50.59]. --- [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)] at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the [LTSP] 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 and the] methodologies used to determine the as-found and the as-left tolerances are specified in [a document	[18] months

	controlled under 10 CFR 50.59]. -- 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. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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 action will correct the abnormal situation before a Safety Limit (SL) is exceeded." The ~~Analytic~~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~~an SL is not exceeded. Any automatic protection action that occurs on reaching the ~~Analytic~~Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the ~~Analytic~~Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

~~The trip setpoint is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytic Limit and thus ensuring that the SL would not be exceeded. As such, the trip setpoint accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 trip setpoint plays an important role in ensuring that SLs are not exceeded. As such, the trip setpoint 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, use of the 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 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 protective device with a setting that has been found to be different from the 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 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to the trip setpoint to account for further drift during the next surveillance interval.

------------------------------ 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in a column in Table 3.3.1.1-1 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 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

~~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. 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~~

BASES

BACKGROUND (continued)

~~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.~~

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.1.1-1 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 CALIBRATION. 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. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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 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

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.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 ~~within the specified~~ conservative with respect to the Allowable Value, 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 Table 3.3.1.1-1. [Limiting Trip Setpoints] are specified in [a document controlled under 10 CFR 50.59 such as the UFSAR]. The [LTSPs] are selected to ensure that the actual setpoints are conservative with respect to the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than its [LTSP], but conservative with respect to its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is non-conservative with respect to its required Allowable Value.

[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 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] 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 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.

~~Allowable Values are specified for each RPS Function specified in the Table. Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the actual setpoints 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. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.~~

~~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 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 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 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 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)

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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

------------------------------- REVIEWER'S NOTE -----------------------------------
The Notes in Table 3.3.1.1-1 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

As noted at the beginning of the SRs, the SRs for each RPS instrumentation 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.

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 agreement criteria includes an expectation of one decade of overlap when transitioning between neutron flux instrumentation. The overlap between SRMs and IRMs must be demonstrated prior to withdrawing SRMs from the fully inserted position since indication is being transitioned from the SRMs to the IRMs. This will ensure that reactor power will not be increased into a neutron flux region without adequate indication. The

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 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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.

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 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, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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 action will correct the abnormal situation before a Safety Limit (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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field

setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in a column in Table 3.3.1.1-1 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.1.1-1 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 CALIBRATION. 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. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures 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 be non-conservative with respect to 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.

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

BASES

BACKGROUND (continued)

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.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 RPS Function specified in Table 3.3.2.1-1. [Limiting Trip Setpoints] are specified in [a document controlled under 10 CFR 50.59 such as the UFSAR]. The [LTSPs] are selected to ensure that the actual setpoints are conservative with respect to the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than its [LTSP], but conservative with respect to its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is non-conservative with respect to its required Allowable Value.

[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 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] 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 specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

BASES

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.

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 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

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 applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. As noted, the SRs are not required to be performed until 1 hour after specified conditions are met (e.g., after any control rod is withdrawn in MODE 2). This allows entry into the appropriate conditions needed to perform the required SRs. The Frequencies are based on reliability analysis (Ref. 7).

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 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.

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 limits. This allows entry into MODES 3 and 4 if the 18 month Frequency

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.

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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in SR 3.3.4.1.3 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 2 of 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.1.1-1 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 CALIBRATION. 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. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures 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 be non-conservative with respect to 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.

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.

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).

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 conservative with respect to~~within~~ the specified Allowable Value 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] are specified in [a document controlled under 10 CFR 50.59].~~Nominal trip setpoints are specified in the setpoint~~

calculations. A channel is inoperable if its actual trip setpoint is not conservative with respect towithin its required Allowable Value. The nominal setpoints are selected to ensure the setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but conservative with respect towithin its Allowable Value, is acceptable. [Limiting Trip Setpoints]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., TSV electrohydraulic control (EHC) pressure), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

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 [Limiting Trip Setpoints]~~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 specific Applicable Safety Analysis, LCO, and Applicability discussions are listed below on a Function by Function basis.

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 ≥ 40% RTP. This is normally accomplished automatically by pressure transmitters sensing turbine first stage pressure; therefore, to consider this Function OPERABLE, the turbine bypass valves must remain shut at THERMAL POWER ≥ 40% RTP. Four channels of TSV Closure, with two channels in each trip system, are available and required to be OPERABLE to ensure that no single instrument failure will preclude an EOC-RPT from this Function on a valid signal. The TSV Closure, Trip Oil Pressure - Low Allowable Value is selected high enough to detect imminent TSV closure.

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 and SR 3.3.4.1.3 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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 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).

BASES

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. 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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. 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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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.

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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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 action will correct the abnormal situation before a Safety Limit (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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in a column in Table 3.3.5.1-1 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 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 [LTSP] and the methodology for calculating

the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an SL-LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.5.1-1 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 CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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.

The LPCS test line isolation valve, which is also a primary containment isolation valve (PCIV), is closed on a LPCS initiation signal to allow full system flow assumed in the accident analysis and maintains containment isolation in the event LPCS is not operating.

The LPCS pump discharge flow is monitored by a flow transmitter. When the pump is running and discharge flow is low enough that pump

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.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 ~~within~~conservative with respect to the specified Allowable Values, 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. [Limiting Trip Setpoints] are specified [in a document controlled under 10 CFR 50.59] Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the setpoints do not exceedremain conservative with respect to the Allowable Value between CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but withinconservative with respect to its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not withinconservative with respect to its required Allowable Value. 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

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

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 ~~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 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.

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

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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 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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.

As noted at the beginning of the SRs, the SRs for each ECCS instrumentation 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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,

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 directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in a column in Table 3.3.5.2-1 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 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in Table 3.3.5.2-1 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 CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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

BASES

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.

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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 withinconservative with respect to the specified Allowable Values, where appropriate. A channel is inoperable if its actual trip setpoint is not withinconservative with respect to 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. [Limiting Trip Setpoints] are specified [in a document controlled under 10 CFR 50.59]. Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the setpoints do not exceedremain conservative to the Allowable Value between CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but

~~within~~conservative with respect to 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.

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.

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 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 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.

As noted in the beginning of the SRs, the SRs for each RCIC System instrumentation 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,

BASES

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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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 Primary Containment Isolation Instrumentation, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that directly protect against violating the reactor core and Reactor Coolant System (RCS) pressure boundary safety limits 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." 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 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 term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint. Where the [LTSP] is not documented in SR 3.3.6.5.3 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 2 of SR 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 [LTSP] and the methodology for calculating the as-left and as-found tolerances, for the phrase "[a document controlled under 10 CFR 50.59]" in the specifications.]

BASES

BACKGROUND (continued)

The [Limiting Trip Setpoint (LTSP)] is a predetermined setting for a protective 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] accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the 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 [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 1).

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 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 protective device 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 protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to 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. The Allowable Value specified in SR 3.3.6.5.3 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 CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the as-left tolerance of the [LTSP] and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the [LTSP] by an amount equal to [or greater than] the as-found tolerance value. In this manner, the actual setting of the device ensures that an 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 be non-conservative with respect to 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.

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

BASES

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).

Trip Setpoints that directly protect against violating the reactor core or Reactor Coolant System (RCS) pressure boundary Safety Limits during anticipated operational occurrences (AOOs) are Safety Limit-Limiting Safety System Settings (SL-LSSS). Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative 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~~conservative with respect to 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. [Limiting Trip Setpoints] are specified [in a document controlled under 10 CFR 50.59]. Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the setpoints do not exceedremain conservative with respect to the Allowable Value between CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but withinconservative with respect to its Allowable Value, is acceptable.

Trip setpoint[Limiting Trip Setpoints]s 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 pressure), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analyticanalytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analyticanalytical 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.

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.

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

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 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.

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

An evaluation of the potential SL-LSSS Functions resulted in Notes 1 and 2 being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the 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 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

BASES

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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 instrument performance will verify that the instrument will continue to behave in accordance with safety analysis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the 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 instrument 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 instrument setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the instrument 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 [a document controlled under 10 CFR 50.59].

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

Appendix A

TSTF-493 History

September 27, 2002

On September 27, 2002, the NRC issued a Request For Additional Information (RAI) Regarding R. E. Ginna Nuclear Power Plant (Ginna) License Amendment Request To Revise The Safety Limits And Instrumentation Setpoints (Tac No. Mb4789) (ADAMS Accession No. ML022200294). This RAI discussed several topics including the following questions relative to the Ginna Setpoint Methodology:

9. Per RG&E Engineering Procedure EP-3-S-0505, Rev. 1, "Instrument Setpoint/Loop Accuracy Calculation Methodology," you indicate that ANSI/ISA-RP67.04-Part II, Figure 6, Method 3 is used to determine the allowable value. The use of Method 3 requires, under certain circumstances, that a check calculation be performed. The check calculation should provide assurance that the purpose of the allowable value is satisfied by providing a large enough margin to account for those uncertainties not measured during the channel operability test as described below.

   Check Calculation Methodology (See RAI original for formulas)

   Per RG&E procedure EP-3-S-0505, the allowable value is calculated using the following arithmetic approach:
   AV = AL – TLU+ COT

   According to ANS/ISA-RP67.04 - Part II, if the arithmetic approach is used to determine the allowable value versus the square root sum of squares (SRSS) approach, then the check calculation as outlined above should be performed. The only exception to this requirement is if your allowable value was calculated using the SRSS approach, i.e.,

   AV= (TLU2 – COT2)1/2 − AL

   which is the setpoint methodology defined by Figure 6, Method 2. These two expressions for the allowable value (AV) are not equivalent and care must be taken whenever terms are removed from the radical sign. Given the information discussed above, please provide justification as to why the check calculation for the safety injection setpoint using Method 3 was not performed in accordance with ANS/ISA-RP67.04-Part II.

10. Did the setpoint calculations use ANSI/ISA-RP67.04-Part II, Figure 6, Method 3 for each of the functions listed in Table 3.3.1-1 and Table 3.3.2-1?

11. Please confirm that your setpoint calculation methodology meets the 95/95 confidence level requirement.

November 20, 2002

As a follow-up to the NRC RAI, representatives of the Rochester Gas and Electric Corporation met with the members of the Nuclear Regulatory Commission (NRC) staff in Rockville, Maryland on November 20, 2002. The purpose of the meeting was to discuss RG& E's proposed response to the NRC's RAI dated September 27, 2002 (ADAMS Accession No. ML022200294). This meeting resulted in the utility confirming that the NRC did not agree with the Ginna application of ISA-S67.04 Part II Method 3 for the calculation of Allowable Values. Talks continued between Ginna and the NRC for the next several months with no agreement on changes to the Ginna submittal that would satisfy the NRC.

June 16, 2003

On June 16, 2003 NRC representatives attended and made a presentation to the ISA S67.04 subcommittee. This presentation stated that the use of Method 3, for the calculation of Allowable Values (identified in 67.04 Part II, a recommended practice document not formally approved or referenced by the NRC) could result in non-conservative Allowable Values for the Technical Specifications.

In response to the June 16 2003 NRC presentation, the ISA 67.04 subcommittee appointed a subcommittee to meet with the NRC and clarify the ISA position on the development of Allowable Values using any of the ISA 67.04 Part II methodologies. In addition, the ISA 67.04 subcommittee also responded with the following letter:

> **"Analytical Limit Issue – Synopsis**
>
> ISA Standard SP67.04.2000 and it's associated recommended practice, RP67.04.2000, endorse a statistical method of combining the uncertainties associated with instrumentation accuracy. The underlying basis for this method involves the low probability of finding a large number of random uncertainty terms all at their greatest value at once.
>
> There are many reasons why 67.04 has determined that these uncertainties may be random. Some include (1) variations in component values, such as random resistance variations in a group of 10% resistors, (2) variations in ambient conditions, such as temperature, voltage, and frequency, (3) variations in the way modules of the same type react to ambient conditions due to component variations, such as differing positive or negative temperature coefficients, (4) variations in the way modules of different types react to ambient conditions, (5) random time related drift, and (6) variations over the range – the actual uncertainty varies depending on the point of measurement between 0 and 100% span.
>
> When a large number of random and independent uncertainties are combined, the standard recommends a Square-Root-Sum-Squares (SRSS) combinational technique. When either randomness or independence are not present, the standard recommends combining the uncertainties using plain addition. This combinational technique – a mix of SRSS and straight addition - has been used to determine both setpoints and allowable values for most plants in the United States. They are firmly based in statistics and neither the NRC or the industry has issue with the general approach.
>
> For setpoint determination, all the uncertainty terms are combined, resulting in a Total Loop Uncertainty (TLU). The trip setpoint is required to be at least one TLU from the Analytical Limit, the value at which the analysis assumes a trip will occur. Neither the industry nor the NRC has any issues with the combinational method using SRSS to determine the setpoint. For example, if the analytical limit was 100 and the TLU was 10, the setpoint would have to be no greater than 90.

For allowable value determination, the most common industry approach is to combine all the uncertainty terms that would be expected to affect the setpoint at the time of the surveillance test – the tested uncertainties. The allowable value is then the setpoint plus the value of the tested uncertainties. To continue the example, if the tested uncertainties were 6, the allowable value would be setpoint + tested uncertainty = 90 + 6 = 96.

It is possible to combine all the terms NOT used to determine the allowable value. This can be thought of as the 'untested uncertainties' – the uncertainties that cannot be observed during the surveillance test. Since the surveillance test is usually done during normal plant conditions and is limited to the instrument cabinet, these terms would include accident effects, radiation effects, and uncertainties associated with field mounted equipment. To continue the example, if all terms were random and independent, the untested uncertainty would be 8, since TLU = SRSS (tested uncertainties, untested uncertainties) = SRSS (6, 8) = 10.

Here is where the NRC takes exception to the industry standard method. They contend that once the loop performance is measured in the surveillance test, it can no longer be treated as random and independent. They contend that simply addition must be used to combine the tested uncertainties and the untested uncertainties. In the example above, the tested uncertainty of 6 and the untested uncertainty of 8 would yield a TLU of 14.

The impact of this approach is that most setpoints in nuclear plant protection systems will be found to be non-conservative. There appear to be three basic alternatives

- Justify smaller uncertainties – reduce the 6 or the 8 so their sum is 10
- Reanalyze to show less conservative analytical limits – increase the 100 to 104 - or
- Move the setpoints – from 90 down to 86.

The subcommittee believes that this is an improper application of the relevant statistics; the surveillance test is only a snapshot, and the uncertainties associated with ambient conditions continue to randomly vary. The subcommittee also believes that trying to separate out the random factors that do not vary will prove an incredibly complex task, with a separate and distinct uncertainty curve over the range of interest for every loop in the plant, a curve that will have to be revised if any module is changed out or significantly altered.**"**

August 13, 2003

On August 13, 2003, a meeting was held between the NRC and the ISA 67.04 subcommittee members regarding application of options 1, 2, and 3 in determination of allowable values. The following is a summary of the meeting from the perspective of the ISA 67.04 subcommittee. The attachments have been removed from the ISA summary but are available in the NRC's public document room attached to the NRC's summary.

ATTENDEES

NRC STAFF	ISA COMMITTEE	OTHER / PUBLIC
Hukam Garg	Jerry Voss	Mike Schoppman
Evangelos C. Marinos	Ron Jarrett	Don Woodland
Dr. William D Beckner	Ted Quinn	Mark Flaherty
Carl Shulton	John Guider	Don Hoffman
Bob Clark	Rick Tuley	Jerry Mauck
Tom Boice	Jim Snelson	
Dan Laurie	Mike Eidson	
Cliff Doutt	Robert Fredricksen	

Refer to the Attendance Sign-In List.

[PDF document removed]

INTRODUCTIONS / PURPOSE

This meeting provided a forum to discuss the applicability of ISA 67.04 recommended practice methods 1, 2, & 3 for determination of allowable values.

NRC STAFF PRESENTATION BY HUKAM GARG

Refer to "NRC's Perspective On Allowable Value."
[PDF document removed]

KEY POINTS & DISCUSSION

10 CFR 50.36 defines the Limiting Safety System Setting (LSSS) as the automatic setting chosen to correct an abnormal condition before safety limit is exceeded.

ITS Bases define Allowable Value (AV) to be equivalent to LSSS.

ITS Bases require the "as left" trip setpoint (TSP) to be within the band for channel calibration uncertainty allowance.

A protection channel is operable if the TSP is found not to exceed the AV.

ISA recommended practice provides three methods to calculate AV.

NRC finds Methods 1 & 2 acceptable because the margin between AV & AL is the same.

NRC is concerned with Method 3 because there may not be sufficient margin between the AV and the AL to account for all other uncertainties not measured during a test.

NRC finds Method 3 unacceptable because the AV calculation method permits an "as found" trip setpoint to be too high before declaring the instrument inoperable.

ISA 67.04 takes issue with the final sentence on the NRC conclusion slide about the technical acceptance of using an SRSS method vs. combination of SRSS and algebraic method to establish the AV.

ISA COMMITTEE PRESENTATION BY JERRY VOSS

Refer to "ISA S67.04 Methods of Determining Trip Setpoints and Allowable Values."
[PDF document removed]

KEY POINTS & DISCUSSION

10 CFR 50.36 defines LSSS; consensus industry standard ISA S67.04 provides methods to determine TSP & AV; RG 1.105 endorses ISA S67.04; and TS list TSP / AV.

Must consider all known uncertainties (i.e., errors) when establishing a TSP.

SRSS method is used to determine Total Loop Uncertainty (TLU) and establish a TSP that protects the respective AL.

Calculated AVs should be based on measurement errors associated with periodic test.

ISA Recommended Practice (RP) 67.04.02 provides three options to determine AV.

For a given instrument channel: Methods 2 & 3 will calculate the same TSP, and the Method 1 setpoint will be more limiting with respect to operating margin.

With respect to the TSP, all three methods meet or exceed the 95% probability limits and are therefore acceptable.

For a given instrument channel: Methods 1 & 2 will calculate the same AV, and the Method 3 calculated AV will be more limiting with respect to the AL.

With respect to AV, Methods 1 & 3 result in an AV that will be satisfied during surveillance with a 95% probability, and Method 2 results in an AV will be satisfied during surveillance with less than a 68% probability.

The algebraic difference between the AV & the AL is not a direct defense of the AL

The TSP protects the AL.

During surveillance testing the AV: validates an error contribution assumption; confirms the TSP, and serves as the LSSS.

As long as the AV is not exceeded, the channel is OPERABLE.

The errors between AV & AL are not part of the LSSS as defined by 10 CFR 50.36.

NRC noted that the Staff has a long internal / external history related to defining the TSP or the AV as the LSSS. The Staff maintains that the AV is the LSSS.

ISA noted that many plants still define the TSP as the LSSS; however, this issue was not discussed further.

NRC is concerned that Method 3 does not have the same conservatisms as Method 2.

ISA indicated that most plants use Method 3 because the error allowances associated with AV derivation are known much better.

NRC stated there is a long debate over TSP vs. AV; i.e., there is a functional or performance issue vs. an OPERABILITY issue.

NRC believes the allowance of Method 3 is based on performance and not from a design point of view.

ISA reviewed Channel Calibration vs. Channel Functional Test and Channel Check, and also the incremental values used to develop the TLU (ref. Fig. 1 Region A).

ISA indicated that data from periodic surveillance tests are used to validate error assumptions such as drift and that such assumptions may be based on design specifications or statistical evaluation of performance data.

ISA noted that plants were required by NRC SE conditions to ensure that actual rack drift was less than setpoint calculation error assumptions when COT frequency was changed from monthly to quarterly.

NRC indicated that there is nothing in the Tech Spec that says you cannot leave the TSP within but close to the Allowable Value.

ISA emphasized that the as-left TSP should be within the channel (or module) calibration tolerance following surveillance and calibration. (This is an explicit requirement for Westinghouse ITS plants via the COT.)

Mr. Hoffman covered the importance of AV with respect to Improved STS Section 3.0 OPERABILITY requirements, and indicated that the channel should not be left near the AV or outside the calibration tolerance (ref. Fig. 1 Region E).

NRC noted that we stated that the setpoint methodology would be reviewed for the plants, but that defining the AV as part of the Tech Specs did not require the NSSS Owners groups to submit the methodologies for review.

Mr. Hoffman noted that both WOG and BWROG submitted their methodologies as part of the overall review and that NRC has generically reviewed the topical reports for Westinghouse and GE.

NRC asked ISA what would be the actual change in TSPs if Method 2 was used (i.e., would this change real numbers or is this an academic argument)?

NRC asked ISA what would be the plant impact in terms of work if Method 2 was used?

ISA indicated that the impacts are real and significant. A change to the method for establishing AV would necessitate revision of all RTS and ESFAS setpoint uncertainty calculations. The revised AVs would require changes to TSPs which would squeeze plant operating and/or safety analyses margins. Any setpoint change would require assessment of safety analyses impacts and performance of new control system analyses. All TSP and AV changes would require revision of supporting scaling calculations and implementation procedures; i.e., all RTS and ESFAS surveillance and calibration procedures would be impacted. Each plant would have to submit licensing amendment requests to change the plant Tech Specs.

CONCLUSION

With regard to the resolution of the NRC Staff concerns with ISA 67.04 recommended practice Method 3, no agreement was reached. The NRC maintains that ISA Method 3 may not provide sufficient margin between the AV and AL. ISA maintains that the Method 3 is technically valid and that the TSP protects the AL. ISA also notes that each licensee is responsible for establishing and maintaining the plant specific TSP & AV used in protection systems and that the NRC has approved all TSP & AV values listed in the current plant Technical Specifications.

MEETING ACTION ITEM

The NRC requested cost estimate information to change from Method 3 to Method 2 or 1 for calculation of Tech Spec AV.

ISA RESPONSE TO MEETING ACTION ITEM

ISA representatives collected information from several representative plants on August 14 & 15, 2003. Based on consideration of the potential impacts on RTS, ESFAS & LOP DG Start instrumentation channels, setpoint uncertainty calculations, scaling calculations, plant calibration & surveillance procedures, TSP & AL values, safety analyses, control system analyses, FSAR, and Technical Specifications, the estimated cost ranged from about $500,000 to $1,000,000 per plant site.

The following is a summary of the August 13 2003 meeting from the perspective of the NRC.

On August 13, 2003, NRC staff met with members of ISA 67.04 Committee and other industry groups in Rockville, Maryland to discuss instrument setpoint methodology recommended in ISA S67.04 standard and used by licensees for determining protection system instrumentation setpoints. Part II of the standard, not endorsed by the staff, includes three methods for calculating allowable values, which represents the limiting safety system settings (LSSS), as required by 10CFR50.36. Methods 1 and 2 determine values that are sufficiently conservative and acceptable to the staff. Method 3, however, used by some licensee does not appear to provide an acceptable degree of conservatism and it is of concern to the staff. ISA and the industry group believe that instrument channel operational testing and plant procedures provide assurance that trip setpoints will be maintained at appropriate levels. Furthermore, ISA maintains that the LSSS is represented by the trip setpoint and protect the analytical limit. The staff maintains that allowable values represent the LSSS and should be used for determining instrument operability as defined in the Standard Technical Specification. No resolution was reached during the meeting. The NRC staff also requested ISA to provide cost estimate information to change from method 3 to method 1 or 2 for calculating allowable value. Following the meeting ISA indicated that the cost estimate based on the information provided by several representative plant site ranges from $5000,000 to $1,000,000 per plant site. A list of the attendees is given in enclosure 1, and the copy of the handout provided by the ISA and by the NRC staff is given in enclosure 2 (ADAMS Accession No. MI032300040).

October 8-9, 2003

On October 8-9, 2003 a series of meetings was held on the subject of ISA-67.04. A pre-meeting was held at Excel Services Corporation offices in Rockville Maryland on the morning of October 8. A public meeting with NRC was held in the afternoon. A post-meeting was held at NEI on the morning of October 9. A summary of all three meetings is below:

I. <u>NEI Pre-Meeting (10/8/03, 9 a.m. - Noon)</u>

- The NRR Electrical and I&C Branch consider Method 3 in ISA-RP67.04 to be non-conservative. This is the method by which (1) a "square root of the sum of the squares" (SRSS) statistical combination of "measured error" and "unmeasured error" is used to determine a setpoint to protect an "analytical limit", and (2) measured error is added to the setpoint to establish a Tech Spec "allowable value" for use in periodic surveillance testing of instrument drift. The NRC believes that Method 3 may, in some cases, leave insufficient margin between the allowable value and the analytical limit. The NRC's concern adversely affects the review of License Amendment Requests (LARs) that are based in whole or in part on Method 3.
- In late September, NRC called NEI to request NEI participation in the resolution of the NRC's concern.
- A public meeting between NRC and NEI was scheduled for 1 p.m. on October 8, 2003.
- A pre-meeting was held on the morning of October 8 so NEI could present its strategy for the NRC meeting and to conduct a dry run of its presentation.

- The pre-meeting established the primary objectives for the afternoon meeting, which were (1) request that NRC provide industry with a precise "problem statement" that documents the bases for their position, (2) request that, in the short term, plant-specific LARs that are consistent with the "current licensing basis" (CLB) be approved, and (3) begin developing an action plan for resolving the long term NRC concern with Method 3.

II. NRC Public Meeting (10/8/03, 1 - 3:30 p.m.)

- The NRR Reactor Operations Branch (Tech Spec section) presented its position on the issue of whether the allowable value or the trip setpoint can be used as the "limiting safety system setting" (LSSS) in accordance with 10 CFR 50.36(c)(1)(ii)(A) - see NRC Handout. NRC considers the LSSS issue to be separate from the technical concern with Method 3. In addition, NRC agrees that the issues are generic and that there are no immediate safety concerns.
- NRC agreed to provide a written description of their concern (including basis) within approximately 30 days.
- Industry's request that NRC accept CLBs and approve pending "Method 3 LARs" was tabled for further discussion at future meetings.
- NEI will be the point-of-contact between NRC and Industry for resolution of the issue. The NEI contact is Mike Schoppman (202-739-8011, mas@nei.org). The NRC contacts are Hukam Garg for technical matters (301-415-2929) and Carl Schulten for Tech Spec matters (301-415-1192).
- A follow-up meeting was scheduled for the morning of November 14th with a pre-meeting hosted by NEI to be held on the afternoon of November 13th.

  ACTION ITEMS:
  - NEI provide NRC with a list of plants that use Method 3 (Schoppman - 11/14/03).
  - NEI provide NRC with a breakdown of estimated costs associated with a change in setpoint methodology (Schoppman - 11/14/03).
  - NEI provide NRC with examples of other issue resolutions that can be used as precedent in drafting a resolution plan for this issue (Schoppman - 11/14/03).
  - NRC provide NEI with a written description of their concern (Marinos/Beckner - 11/7/03; if possible by 10/31/03).
  - NRC/NEI schedule a follow-up public meeting (Schoppman - 11/14/03 - DONE).

III. NEI Post-Meeting (10/9/03, 8 - 11 a.m.)

- The group requested that NEI form a Task Force to address this issue.
- NEI agreed to prepare a special distribution list separate from the ISA-67.04 list-server distribution list. The purpose is to provide a degree of confidentiality as NEI prepares for public NRC meetings
- The group agreed to prepare a "position paper" in preparation for the next meeting with NRC. The paper will include a Licensing/Tech Specs section and a Technical section.

- The definition of Allowable Value in the Improved Tech Specs may be affected by the resolution to this issue.
- NEI will discuss the issue with NRC management.

  ACTION ITEMS:
  - NEI propose Task Force makeup (Schoppman - 10/19/03 - DONE - Setpoint Methods Task Force (SMTF)).
  - NEI prepare special distribution list (Schoppman - 10/19/03 - DONE.
  - Prepare a position paper. Inputs are due to NEI by 10/31/03 if possible. Inputs received between 10/31 and 11/14 will be used to prepare for the 11/14/03 NRC meeting. Inputs received after 11/14/03 will be factored into future drafts of the position paper. (Bob Fredricksen provided a first-draft technical input by e-mail dated 10/14/03; licensing/Tech Spec input is being prepared by Don Hoffman, Rick Tuley, and Jack Stringfellow.)
  - NEI/NRC management discussions (Alex Marion - 11/13/03).

The NRC provided the following summary of the October 8, 2003 Meeting:

> On October 8 2003, members of the U. S. Nuclear Regulatory Commission (NRC) met with representatives of industry and the Nuclear Energy Institute (NEI) to discuss staff concerns that margins for instrument setpoints were potentially being reduced because of the use of a non-conservative methodology. A list of those attending the meeting is in Attachment 1, NRC presentation material is in Attachment 2 (ADAMS Accession No. ML032820399), and presentation material used by NEI is in Attachment 3 (ADAMS Accession No. ML032820184). The staff' s Statement of Concern for Method 3 of independent safety analysis (ISA) Standard 67. 04 Part II, provided after the meeting, is in Attachment 4 (ADAMS Accession No. ML032960002).
>
> Mr. William Beckner, of the NRC, began the meeting by presenting an overview of the concern and stated that the staff was seeking NEI and industry assistance in evaluating the concern before embarking on a regulatory course of action. He said the concern was not directly related to the issue of whether the Allowable Value or the Trip Setpoint is used to represent the Limiting Safety System Settings required to be in technical specifications. That issue had been extensively discussed with industry. He indicated that the current concern involves the adequacy of the setpoint methodology used to determine the values and that the use of a particular methodology could introduce non-conservatism that would be of concern in issues such as amendment requests for large power uprates.
>
> Mr. Alex Marion, of NEI, responded that industry understood that the staff had a concern and that industry wanted to know clearly what the staff's concern with Method 3 in ISA-RP67 was. He noted that the attendance of industry at this meeting was an indication of the level of interest of industry. He expressed that industry believed it would be inappropriate for the NRC to hold up approval of license amendment requests that used approved methodologies while the NRC sought a generic resolution of this concern. He said industry hoped to agree with the staff on a resolution strategy that was fair to industry.

Mr. Evangelos Marinos, of the NRC, clarified that the recent license amendment request the staff had concerns with was not using an NRC approved methodology. While the staff had prepared an evaluation of its concerns for that request, the evaluation was not issued because the licensee had withdrawn its request. He said that Method 3 is not considered conservative by the staff and that power uprates take away some of the margin in the determination of setpoints.

Mr. Michael Schoppman, of NEI, then presented the information in Attachment 3. He stated that the goal of industry for this meeting was to identify the issue and to establish a resolution process. He discussed the history of technical specifications for instrumentation and the role ISA-S67. 04 and Regulatory Guide 1.105 had in the development of those technical specifications. He said industry needed a precise statement of the technical issue that was the NRC' s concern. The NRC stated that the issue had been described at the recent meeting of the NRC with the Instrumentation, Systems, and Automation Society but agreed that the NRC should provide industry with a written statement of the issue. The staff said it would provide a written statement to industry in a month or less.

Jerry Burford, of Entergy, observed that the staff had, in the past, approved license amendment requests, that were consistent with the plant's licensing basis, while a resolution of a concern was developed noting that the resolution of the concern could require a change to the license amendment.

The NRC asked industry for examples and industry agreed to provide examples in about two weeks. The NRC also asked that industry provide an outline of the potential impacts of the staff's concern. Industry stated that it was working towards developing this. In summary, industry said it needed a clear statement of the technical issue and NRC agreed to provide a write-up of the issue to industry. Industry agreed to provide NRC examples of license amendment requests where the request was not held up pending resolution of a potential generic concern. Industry and the NRC agreed that it would be most effective to work together to achieve a resolution of the issue.

The following written summary was provided after the 10/8/2003 NRC Public Meeting to satisfy an ACTION ITEM to provide a written problem statement. This was the first actual written problem statement provided to the utilities by the NRC.

"Staffs Statement of Concern on Method 3 of ISA Standard 67.04 Part II

The industry position is that technical specification (TS) Allowable Values (AVs) are used during periodic surveillances to demonstrate channel operability by validating the respective trip setpoint (TSP). In addition, the TSP protects the Analytical Limit, and therefore the Safety Limits in plant safety analyses. The TS periodic tests used to validate instrument channel uncertainties are the Channel Operational Test (COT) and Channel Calibration (non-COT) tests. These tests are used to establish operability of different components of an instrument channel. The staff concern is that the industry position on the relationship of the TSP to the AV does not address underlying assumptions of TS operability and setpoint methodologies to validate non-COT uncertainties.

Specifically, the underlying assumption for the non-COT uncertainty is that there will be a 95/95 confidence that instrument readings are conservative with respect to the Analytical Limits. The non-COT uncertainty must be accounted for in the safety margin at all times. Method 3 invalidates the non-COT uncertainty assumptions by setting the AV closer to the Analytical Limit and thereby the Safety Limit. Thus it does not preserve the safety margin by accounting for the total non-COT uncertainties. This is because AVs calculated using Method 3 set the AV at a value which assumes that all of the COT uncertainties are accounted for verifying the operability of the TSP, independent of the non-COT uncertainty, even though the two uncertainties were previously combined to establish the total channel uncertainty used to establish the TSP. Therefore, the staff does not believe that AVs calculated using Method 3 establish instrument channel operability limits that preserve the 95/95 confidence that structures, systems and components will be actuated to perform their intended safety function(s)."

The NRC notified NEI on 11/07/03 that the 11/14/03 meeting to discuss instrument setpoint methodology would have to be postponed. The NRC was unsuccessful in developing a consensus position within the NRC staff. An alternative date was not identified.

November 13-14, 2003

The Setpoint Methods Task Force (SMTF) met on November 13-14, 2003. Below are the highlights from the meeting.

<u>Meeting Highlights:</u>

- NRR managers plan to meet internally in November to sort through diverging staff opinions on this issue. NEI expects NRR to request a public meeting in December 2003 or January 2004.
- NEI/SMTF is preparing a letter and a White Paper for submittal to NRC. The letter will request that this issue be resolved as a Generic Issue, with a corresponding task action plan and schedule. Pending generic resolution, open License Amendment Requests (LARs) should be reviewed against the plant-specific licensing basis. In other words, if the plant-specific Licensing Basis is Method 3, it remains acceptable unless and until a generic resolution finds to the contrary.
- The October ISA meeting in Houston noted that (1) it is the responsibility of each licensee to use Method 3 as intended for it to remain statistically valid, (2) the type of plant-specific Tech Spec contributes to the NRC concern, (3) the ISA is not prepared to concede that Method 3 is invalid, and (4) the ISA might consider, at most, clarifying language in the 67.04 "recommended practice" document.
- The SMTF provided comments on Technical Paper Draft E and prepared an outline of a Licensing Paper.
- Final drafts of each paper are due to NEI by 11/30.

- NEI will merge inputs and forward a final draft paper to the SMTF, the NSSS Owners Groups, and the NEI Licensing Action Task Force (LATF).
- NEI will prepare a final paper, including a final round SMTF review/telecon, and submit to NRC by 12/31. This date may need to be moved up if NRC wants a meeting in mid-December. An important objective is to have an NEI letter/paper to NRC before the NRC/NEI public meeting.
- NRC/NEI communications about the public meeting date will be the subject of separate e-mail correspondence.
- NEI is advising NSSS Owners Group chairmen of this issue by copy of this meeting summary.

The meeting also resulted in discussion about a TS revision, submitted by EXELON, to add channel checks for some new instrumentation in the temperature leak detection world. Previously these channel checks could not be submitted under a Tech Spec revision, but can be now. Summary of discussion on the use of ISA Method 3 as it relates to the EXELON amendment request is listed below.

The NRC stated that it is not accepting new license amendments using ISA Method 3. Since the instrument change involves a license amendment, the NRC stated it is unwilling to accept the change when it knows that Method 3 was used to confirm the AV of the new instruments. The NRC believes that Method 3 does not provide adequate margin for drift that could result in exceeding the analytical limit. Thus, they would be remiss in approving an amendment in which the analytical limit would not be protected, even if the amendment doesn't specifically involve the setpoints.

EXELON stated that this amendment does not involve changing the AV, and thus Method 3 should not be an issue. EXELON also stated that our approved setpoint methodology would allow us to change instruments and AVs under 50.59, as long as a license amendment is not required. Also, use of another method could potentially be beyond the scope of the EXELON setpoint methodology approved by the NRC. EXELON asked if the NRC had considered the impact on the use of Method 3 under 50.59. The NRC personnel present stated they had not specifically considered this, but expected that this would covered under whatever formal document the NRC issues on this topic. The Project Manager stated that they are considering various options, including a Generic Letter.

The NRC stated that Method 3 allows for a check calculation using another method to confirm that the Method 3 result is adequate. They asked if we had performed this confirmatory calculation. The EXELON person present could not confirm this, although based on previous conversations it is doubtful that this was performed.

Finally, the NRC stated that the agency position against Method 3 is now fairly firm and will not change, including the application to cases in which Method 3 is not specifically involved in the amendment. The technical reviewers also stated that we can expect a similar question on the HPCS AV amendment request.

November 14, 2003

There was an NRC/NEI (Holden/Marion) Telecom on 11/14/03 discussing the Method 3 topic outside the NEI SMTF meeting. The following summary is provided for this telecom:

> The NRR management team will be meeting on this issue next week. Mr. Holden said NRC will be sending NEI a letter documenting their concern. He was not aware of Enclosure 4 (Statement of Concern) contained in the NRC summary of the October 8 meeting between NRC and NEI. That summary is dated October 28, 2003 (ADAMS Accession Number ML033030193).
>
> After the NRC management meeting, Mr. Holden will advise NEI of a prospective meeting date at NRC. It is possible that NRC may wish to have the meeting during the first week of December. If so, it accelerates our schedule for preparing an NEI White Paper. Alex or I will advise you as soon as we learn more about the prospective NRC/NEI meeting date.

December 5, 2003

NEI submitted a letter to NRC transmitting the NEI task force document (Technical White Paper) with the following discussion:

> "The purpose of this letter is twofold. First, it addresses licensing-process issues associated with NRC review of License Amendment Requests (LARs) pertaining to trip setpoints and allowable values for safety related instrumentation. Second, it addresses technical issues pertaining to the determination of trip setpoints and allowable values using ISA-S67.04-1994, "Setpoints for Nuclear Safety-Related Instrumentation," and allowable values using Method 3 of ISA-RP67.04-1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation." Regulatory endorsement of ISA-S67.04-1994 is contained in Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation."
>
> With respect to license amendments, a number of licensees have been informed by their NRC project managers that the staff does not plan to review LARs based on ISA-RP67.04 Method 3, even if that method is the current licensing basis for protection system instrumentation setpoints and allowable values (which is the case for approximately 75 domestic nuclear units). This licensing approach is having a significant effect on licensee plans and schedules for implementing operational and safety improvements. We believe that changing from one setpoint methodology to another will impact plant operating and/or safety margins at an average estimated cost of $1,000,000 per site. Consistent with NRC regulations and regulatory guidance, NEI requests that the staff process setpoint-related LARs in accordance with plant-specific licensing bases pending generic resolution of NRC concerns with Method 3.
>
> With respect to technical issues, NEI, through its Setpoint Methods Task Force (SMTF), is prepared to work with NRC to resolve generic concerns with ISA-RP67.04 Method 3. During a public meeting held on October 8th, we requested

that NRC provide a "problem statement" to support the issue-resolution process. Subsequently, the SMTF has prepared the enclosed Technical White Paper to provide the industry perspective on the regulatory requirements and technical bases associated with the trip setpoint and allowable value determination process for protection system instrumentation. The paper finds that the setpoint and allowable value determination requirements defined by ISA-S67.04-1994 are acceptable and that the allowable value Method 3 guidance provided by ISA-RP67.04-1994 is acceptable. The paper concludes that licensee use of setpoints and allowable values established using these requirements and guidance does not raise any safety issues. NRC comments on the Technical White Paper are requested as soon as practicable."

The white paper justified the use of ISA 67.04 Part II Method 3 for the development of Allowable Values.

January 21, 2004

The NRC gave a status report on the setpoints issue at the January 21, 2004 Licensing Action Task Force meeting. The following summarizes that status report:

- An NRC response to the 12/5/03 NEI/SMTF letter and white paper is ready to be signed this week, next week for sure. The letter maps out a two-part process for going forward. NRC management characterized the use of industry white papers as very helpful in focusing people on the various aspects of an issue (in this case - statistics, Tech Specs, regulations, margin, etc.).

- Part 1 --- There were 18 license amendment requests (LARs) on hold due to ISA-RP67.04 Method 3 implications. NRC tech staff reviews have either restarted or will restart for all these LARs. Licensees should see SEs within 3 to 6 weeks. The use of Method 3 is no longer considered a disqualifier. The first SE that is issued will be sent to NEI so we can distribute it to industry. Until we see the first SE, it is best not to speculate on how it will be worded.

- Part 2 --- The SEs will contain language about a new generic safety issue (GSI) that will be opened to define, evaluate, and resolve NRC tech-staff concerns, because these concerns have not gone away. In the long term this could lead to further Tech Spec changes, Reg. Guide changes, margin changes, or rule changes (50.36). NRC agreed that a licensing white paper would be a good vehicle for a "back & forth" exchange between the NRC tech staff and industry on how to resolve the generic issue. Again, until we see the GSI, I don't want to speculate about its wording.

February 2, 2004

NEI provided an update on February 2, 2004 in response to the NRC status report given at the January 21, 2004 Licensing Action Task Force meeting as follows:

The NRC letter in response to the NEI/SMTF 12/05/03 Technical White Paper (TWP) is ready to be signed by Eric Leeds, Assistant Director, NRR Division of Licensing Project Management (DLPM). Other issues have distracted Mr. Leeds, so as of this morning it had not been signed. As soon as it is signed, the NRC lead Project Manager (Chris Grattan) will put a copy in ADAMS and fax a copy to me. NRC still wants a meeting on February 26, 2004, so I think the SMTF should plan for a pre-meeting on the afternoon of February 25 at NEI. I expect the 2/26 meeting to be free form and probing; i.e., Q&A about the language in the TWP and the NRC letter response, status at NRC of the 18 stalled LARS, what the GSI might look like, and when the GSI might be issued. We on our end need to strategize the Licensing White Paper (LWP) scope and schedule. We need to craft the LWP carefully, so it won't be ready by 2/25. Also, we need to discuss whether it is better to send it before NRC drafts a GSI, or after.

February 4, 2004

NEI provided additional updates on February 4, 2004 in response to the NRC status report given at the January 21, 2004 Licensing Action Task Force meeting as follows:

Chris Gratton, the Lead NRR PM for the setpoints issue, is scheduling a public meeting with the SMTF for the morning of February 26, 2004. The purpose is to re-engage on this issue by establishing a "current situation," how we got here, and where we go next. The focus documents are our 12/5/03 white paper and NRC's response, which as of today is still on NRC management's desk (Eric Leeds) waiting for signature. The number of "on hold" amendments has been reduced from 18 to about 6. Several of the 18 were rationalized by NRC as not really about Method 3, so the reviews have been re-started. Some others were re-started because the licensees agreed to use Method 2 for the applications in question. NRR Projects is working with the I&C Branch to get the others re-started. Of course, these numbers do not include those licensees that may be holding up submittals because of the uncertainty surrounding this issue.

February 20, 2004

The NRC issued a letter on February 20, 2004 to NEI (ML040500688) stating that the NRC would consider the views in the NEI technical report (in the December 5, 2003 NEI to NRC letter). The NRC letter also stated that the NRC staff concluded that the use of Method 3, as described in ISA 67.04 Part II, "Setpoints for Nuclear Safety Related Instrumentation Used in Nuclear Power Plants", does not raise significant generic concerns that would prevent the issuance of the amendments currently under review by the staff. … While the NRC staff proceeds with the review of the current licensing actions, longer-term actions to resolve its programmatic and technical concerns with Method 3 will be addressed in an action plan. The NRC staff plans to address this issue with the Nuclear Energy Institute, Instrument Society of America and other interested stakeholders to develop a long-term resolution.

February 26, 2004

Listed below is a summary of NRC/NEI Meeting on Safety-Related Instrument Setpoints and Allowable Values held on February 26, 2004.

<u>NRC Agenda:</u>

- Introductions
- Discussion of NEI White Paper "ISA S67.04 Methods for Determining Trip Setpoints and Allowable Values for Safety-Related Instrumentation"
- Opportunity for public comment
- Future activities/adjournment

Meeting Highlights:

- Representatives from the NEI Setpoint Methods Task Force (SMTF) gave a detailed presentation (attached) on the basis and conclusions of the NEI White Paper. Mike Eidson (Southern Nuclear) and Bob Fredricksen (Exelon) were the primary presenters.
- NRC staff agrees that its concerns about ISA-RP67.04 Method 3 do not represent a safety or compliance issue.
- NRC staff will pursue generic resolution of its concerns, probably by using the internal NRC guidelines in NRR Operating Instruction LIC-400, "Procedures for Controlling the Development of New and Revised Generic Requirements for Power Reactor Licensees."
- The NRR Division of Licensing Project Management will work with the NRR Electrical and I&C Branch to develop standardized wording for Safety Evaluations that approve license amendments related to the use of Method 3. Such standardized wording is needed until resolution of the generic issue is documented and implemented.
- NEI is considering additional white papers.

Follow-up Topics:

- Standard language in NRC Safety Evaluations (pending generic issue resolution).
- Generic issue resolution via NRR Operating Instruction LIC-400 (including a technical problem statement).
- Safety analysis methods and the derivation of "safety limit" and "analytical limit."
- Basis of the ISA RP67.04 Method 3 check calculation and when a check calculation is needed.
- Process by which a licensee may change a trip setpoint without changing the allowable value via a license amendment (for Method 1, 2, or 3 plants with single column technical specifications that list the allowable value as a limiting safety system setting).

March 4, 2004

On March 4, 2004 LaSalle station received an SER for an Allowable Value change. The following is an excerpt from the NRC's technical evaluation in the SER.

3.0 TECHNICAL EVALUATION (Excerpt)

...

During recent reviews of proposed license amendments associated with changes to the LSSSs, the staff has identified a concern regarding Method 3. The concern relates to the manner in which uncertainties not addressed in periodic testing are accounted for in the establishment of the Allowable Values. Of particular concern are uncertainties associated with instruments excluded from channel operational testing, such as instruments located inside the containment building and tested only during outages. Failure to properly account for these uncertainties could result in Allowable Values that do not provide adequate assurance that associated SLs will not be violated. The NRC staff is currently working toward resolution of this generic concern.

The licensee's proposed change to TS Table 3.3 .5.1-1, Function 3.e for LSCS is based on use of Method 3. However, the staff has concluded that the generic concern does not apply to the proposed changes because the instruments involved are process-actuated switches and so there are no instruments excluded from channel operational tests. Therefore, the staff finds that there is reasonable assurance that the proposed change will not result in violation of any SL, and that the proposed change is acceptable.

Based on the review of licensee's regulatory and technical analyses in support of the proposed license amendment, the staff concludes that the proposed TS change is in accordance with the current licensing basis and is, therefore, acceptable. The staff's conclusion does not signify that the generic concern discussed above is resolved for LSCS. The licensee may be subject to further actions in the future as this generic concern is resolved.

March 23, 2004

On March 23, 2004, the NRC staff issued the following internal memo for short-term actions on the use of Method 3:

TO: Brian W. Sheron,
FROM: Ledyard B. Marsh, Director ***/RA/***
Richard J. Barrett, Director
Bruce A. Boger, Director ***/RA/***

SUBJECT: DECISION ON SHORT-TERM ACTIONS REGARDING THE USE OF ISA-RP67.04-1994, PART II SETPOINT METHOD 3

The purpose of this memorandum is to document the staff's decision on the appropriate
short-term actions necessary to continue the review of licensing actions that involve the

modification of instrumentation setpoints. The specific decision discussed herein is consistent with the discussion of the status of the setpoint methodology review described in the memorandum to you, dated February 5, 2004, from Eric J. Leeds, Deputy Director, Division of Licensing Project Management.

On January 9 and January 22, 2004, the NRC staff briefed the Leadership Team (LT) on the proposed short-term actions regarding the industry's proposed use of one of the methods used by licensees in determining instrument loop allowable values (AVs) as described in ISA-RP67.04-1994, Part II, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation." Specifically, the staff has raised concerns regarding whether Method 3 (M3) in ISA-RP67.04 provides an adequate methodology for establishing the operability limit for the instrument loop. The NRC staff is currently reviewing several license amendments that requested changes to values in the technical specifications (TS) that were determined using M3. Review of the M3 portion of these amendments had been suspended pending a decision on the use of M3.

On December 19, 2003, a meeting of Office of Nuclear Reactor Regulation senior managers and staff members was held to determine the course of action necessary to restart the review of the licensing actions with M3 issues. Based on that meeting, the staff was directed to develop a position paper that would justify the interim use of M3 and to develop longer-term plans to address the underlying issues associated with determining Limiting Safety System Settings (LSSS) as required by Title 10 of the *Code of Federal Regulations*, Section 50.36, "Technical Specifications."

Previous to the December 19, 2003, meeting, the staff had determined that the M3 issue did not raise immediate safety concerns that would prevent the issuance of an amendment if the proposed TS changes were found to be otherwise acceptable. Upon completion of the position paper, the LT was to reconvene and review the staff's plan to proceed with the review of the M3 licensing actions.

On January 9, 2004, the LT and cognizant staff members met to discuss the position paper. Based on those discussions, the staff generally agreed that, with minor modification, the position paper outlined an acceptable safety basis for the use of M3 until a long-term solution to the issue could be developed and implemented. At the conclusion of this meeting, the technical staff was tasked with selecting a lead plant from those with M3-based changes and developing the draft safety evaluation (SE) using the basis outlined in the position paper.

On January 22, 2004, the staff briefed the LT on the status of the M3 short-term action plan. The staff reported that it was unable to develop a generic SE to address the M3 concern that could be applied (i.e., could be used as a template) to many of the plants with M3-based changes due to the plant-specific nature of the issue. The staff proposed and the LT agreed that for plants requesting setpoint and allowable value changes to their TS that are derived using M3, the following three bases should be cited as reasons why the staff does not have an immediate safety concern with the proposed methodology. The LT also agreed that the SE should acknowledge the NRC staff's concern that LSSSs (AVs) calculated using M3 may not establish a TS operability limit that ensures the AL would not be exceeded and state that the NRC staff has the issue under review.

• since the total loop uncertainty accounts for all uncertainties associated with the instrument loop, there is reasonable assurance that the trip setpoint will provide protective action prior to a safety limit (SL) being exceeded.
• there is conservatism in the analyses used to determine the analytical limit (AL), as well as the SL.
• the staff is not aware of any event where instrument loops have exceeded the SL based on periodic surveillance testing.

The LT concluded, for the reason specified above, that there is sufficient conservatism in the analyses used to determine the AL such that as-found instrument setpoints that fall within the AVs determined by M3 would not result in an SL being exceeded, and therefore, the method used to determine the trip setpoints meets the 10 CFR 50.36 requirements. The LT also concluded that licensees could continue to calculate AVs using M3 until a long-term resolution is implemented. The NRC staff's expectation for setting the AV is given in Regulatory Guide 1.105, "Setpoints for Safety-Related Instrumentation," Regulatory Position C.4, which states:

"The allowable value is the limiting value that the trip setpoint can have when tested periodically, beyond which the instrument channel is considered inoperable and the corrective action must be taken in accordance with the technical specifications." During the development of the draft SE, Division of System Safety and Analysis (DSSA) staff developed a more comprehensive discussion of the basis for the second bullet above. The meeting participants reviewed the expanded DSSA basis and decided that the following discussion did not need to be included in each SE issued for an M3 setpoint change, but that it should be documented in this memorandum:

"These analyses are approved by the staff against the criteria of Title 10 of the *Code of Federal Regulations*, Section 50.46, which requires that they be conservative or account for uncertainties in the evaluation method. The result provides significant margin when establishing setpoints for safety system actuation. The AL is established as a conservative value below the SL in order to ensure margin in the trip setpoint."

At the conclusion of the meeting, the participants agreed that the short-term actions described above regarding the use of M3 in the determination of LSSS AVs was an acceptable method to address the staff's concerns with the use of M3 in the short term. The meeting participants also agreed that staff members from DSSA and the Division of Regulatory Improvement Programs would concur on any SEs where the staff uses these short-term actions to address M3 issues until the issuance of this memorandum documenting the decision to use this basis. The long-term actions to address issues with the use of M3 in the determination of LSSS AVs will be addressed separately. The staff has been directed to use the Director's Quarterly Status Report to develop and track those long-term actions.

April 21, 2004

A meeting was held on April 21, 2004 in which the NRC staff summarized the setpoints issue with the Licensing Action Task Force. The summary is listed below:

1. In the near term, NRC intends to use a pending Ginna safety evaluation (SE) to provide "standard wording" for SEs addressing Method 3 (open item).
2. The NRC technical branch has not yet obtained consensus on a long-term "problem statement" (open item).
3. The NRC has not provided NEI with any plan for follow-up via a long-term "generic safety issue" (open item).
4. The NRC wants a public meeting in June to discuss industry safety analysis practices and their relationship to safety limits and analytical limits. The SMTF does not wish to support a meeting without having received a problem statement from NRC and without having had sufficient time to prepare (about 6 weeks). NEI is in contact with NRC on this matter (open item).

June 17, 2004

On June 17 2004, the NRC issued "Problem Statement on the Use of Instrumentation, Systems and Automation Society (ISA) Standard ISA 67.04 Part II. "METHODOLOGY FOR THE DETERMINATION OF SETPOINTS FOR NUCLEAR SAFETY-RELATED INSTRUMENTATION.' METHOD 3.

The NRC staff was concerned that there may be instances where an instrument channel is believed to be operable following a periodic surveillance (e.g., CFT, COT), even though the channel may not meet the definition of operability because the process parameter being measured may exceed the AL assumed in the plant's safety analysis should an accident occur without initiating the required action. This is probable because Method 3, the calculation method used by some licensees to determine the value by which those licensees determine the operability of instrument loops, does not fully account for the uncertainties that are not addressed during periodic surveillances. Under the conditions described above, if the instrument channel is not declared inoperable, the NRC is concerned that licensees may not take appropriate actions to correct the problem, as discussed in 10 CFR 50.36. For these reasons, Method 3 should not be used to calculate AVs where the AV is used as an LSSS.

The problem statement was issued in advance of a June 23, 2004 meeting between NEI and NRC. As far as NEI was concerned, the meeting with NRC was restricted to a general discussion of safety analysis techniques and their relationship to safety limits. There was to be no discussion on the part of NEI/vendor attendees on the region of ISA interest below the analytical limit. There will be no formal presentation by NEI.

June 23, 2004

Meeting with NRC (9am - noon, 6/23/04)

The NRC staff (Garg & Rebstock) made a presentation during the meeting. This presentation supplements the NRC problem statement that was published last on the use of Method 3. The presentation defined new terms and discussed the unacceptability of using Method 3 to develop Allowable Values. The presentation was unexpected and the NEI audience was not prepared to understand the impacts of the presentation.

Following the NRC staff presentation, the Westinghouse attendees described typical conservatisms and margins inherent in their non-LOCA methodology. A copy of the Westinghouse talking points is attached. These were not handed out at the meeting. The Westinghouse presentation was made in seminar fashion using the whiteboard in the NRC meeting room to talk the staff through safety analysis techniques used by Westinghouse to establish safety limits and derive analytical limits (i.e., the region above the analytical limit). The processes by which licensees establish trip setpoints and allowable values (i.e., the region below the analytical limit) were not discussed.

The following is an NRC EEIB provided summary from the June 23, 2004 meeting:

The presentation by NRC/NRR/DE/EEIB-I&C was based upon the slides contained in the PowerPointXP presentation file AVPresentation-40621.ppt. Copies of the slides were distributed to attendees, to the extent available. The slides have been converted to Adobe Acrobat format (with minor formatting adjustments) and have been posted in ADAMS as ML041810346 (AVPresentation-40624.pdf). The slides detailing the content and interpretation of 10CFR50.36 were omitted from the presentation in the interest of saving time. After the title, introduction, and setpoint graphic slides (#s 1-3), the presenter jumped directly to the 10CFR50.36 summary slide (#9). The audience, in particular, the NEI and Westinghouse representatives, indicated that they accepted the points on the summary slide and that detailing their development was not necessary. Also in the interest of saving time some explanatory points on slides prior to the "The Math" section (that is, prior to #25) were not addressed explicitly but rather left for the audience to read for themselves. No objection or dissent was raised regarding this practice.

A question was raised from the floor requesting further clarification of Epilogue 1 (#41 & 42). This relates to a non-intuitive situation in which a channel that is behaving as expected should nevertheless be declared inoperable because the Analytical Limit is in jeopardy. It was reiterated, as indicated on the slides, that the need to protect the AL supersedes the fact that the channel is behaving as expected, and that the cause of this situation is rooted in the use of Square Root of the Sum of the Squares to combine the COT and nCOT uncertainties in the derivation of the limiting setpoint. SRSS is clearly acceptable from a statistical point of view for combining COT and nCOT in the absence of *a priori* information, but it does not leave enough margin between SP and AL to accommodate nCOT when the conditional probability of failure is to be assessed following the determination of an As-Found setpoint in excess of the Method 2 Allowable Value even though that As-Found setpoint may be within the expected deviation from As-Left.

Representatives from Westinghouse made a brief presentation concerning plant safety analyses and the application of Analytical Limits. They did not provide any notes or handouts. In the course of the presentation and repeatedly in subsequent discussions, they stated explicitly that although there is margin both in the Analytical Limits assumed in the analyses and in the designated Safety Limits, which the analyses show to be protected, they have never attempted themselves nor have they ever encountered any attempt to quantify and use this margin. They indicated that they would consider it inappropriate to permit violation of the AL without a rigorous analysis that demonstrated that such violation would in fact be tolerable. They said that it is their practice to assume that the AL is a hard and inviolate limit.

July 26, 2004

An NRC/SMTF Meeting was held at NRC on July 26, 2004. The following is a summary of the meeting and additional actions by the SMTF.

Paul Rebstock repeated the presentation he gave at the 6/23/04 NRC/NEI meeting. Mike Schoppman followed with a discussion of the points in the NEI handout. The floor was then opened for Q&A. This part of the meeting helped improve the NRC staff's understanding of typical setpoint practices at an operating plant.

At approximately 3 p.m., Rich Barrett (Director, NRR Division of Engineering) requested time for the NRC staff to caucus privately. They returned in about 20 minutes, and Rich made the following summary remarks:

- NRC "has heard our concerns" re what the SMTF considers to be a flawed assumption in the second paragraph on page two of the NRC's 6/17/04 Problem Statement (" … that once a COT/CFT is performed, the instrument uncertainties are a measured value and cannot be treated as a random variable of instrument uncertainty. Licensees should consider the results of the COT/CFT as a bias and should add the results to uncertainties not measured by COT/CFT.").
- It was very useful for NRC staff to hear from so many licensees about how they handle Trip Setpoints (TSPs) and Allowable Values (AVs).
- NRC considers plants that use Method 3 to be safe.
- <u>But</u> there remains a challenge with respect to what constitutes compliance with the definition of LSSS in 10 CFR 50.36. If, as the SMTF claims, the TSP (and not the AV) is the real LSSS and the AV is a "representation" of the TSP for Tech Spec surveillance purposes, then that position needs to be reconciled within the context of the standard tech specs.
- At this point, the NRC has not determined the next phase of this issue. It could become a GSI, or a TSTF Traveler, or even a 50.36 rulemaking.

July 27, 2004

NEI contracted MPR Associates to performing an independent evaluation of the primary references on this issue, which are: (1) the NEI/SMTF Technical White Paper dated December 5, 2003, (2) the NRC Problem Statement dated June 17, 2004, and (3) the NRC Presentation first given on June 23, 2004. MPR was requested to perform modeling of the channel calibration process considering the assumptions and discussion in the references.

August 30, 2004

Based on discussions with NRC representatives during the July 26, 2004 meeting, Ginna submitted a revised LAR (based on NRC comments) to resolve the Method 3 issue as it applied to Ginna for a major submittal. This revised LAR replaced the Allowable Value column with an LSSS column and added note a to the LSSS column stating:

a) A channel is OPERABLE when both of the following conditions are met:

1. The absolute difference between the as-found Trip Setpoint (TSP) and the previous
as-left TSP is within the COT Acceptance Criteria. The COT Acceptance Criteria
is defined as:

|as-found TSP - previous as-left TSP| =< COT uncertainty
The COT uncertainty shall not include the calibration tolerance.

2. The as-left TSP is within the established calibration tolerance band about the nominal
TSP. The nominal TSP is the desired setting and shall not exceed the Limiting Safety
System Setting (LSSS). The LSSS and the established calibration tolerance band are
defined in accordance with the Ginna Instrument Setpoint Methodology. The channel
is considered operable even if the as-left TSP is non-conservative with respect to
the LSSS provided that the as-left TSP is within the established calibration tolerance
band.

August 30, 2004

MPR completed the independent review of the NEI and NRC positions discussed in the associated reference documents. Monti-Carlo simulations were run to verify the acceptably of Allowable Values generated using either Method 2 or 3. The following is excerpted from the MPR report:

"At the request of NEI, MPR independently reviewed ISA-RP67. 04 instrument channel setpoint methods to address NRC concerns with one of the methods (Method 3) currently used by many nuclear utilities. The NRC position is that Method 3 of the ISA Recommended Practices does not ensure that plant Safety Limits are protected at a high level of assurance. Based on reviews of both the NRC and industry positions in this matter and on independent calculations we performed, we conclude that ISA Method 3 provides adequate protection. The bases of our conclusion are provided in the enclosure and attached calculation."

January 27, 2005

The Setpoints issue was discussed briefly at the NRC/NEI Licensing Action Task Force (LATF) meeting at NRC headquarters on January 27, 2005. Ed Hackett (NRC Division of Licensing Project Management) made the following points:

- NRC senior management (Brian Sheron) has directed staff to have a firm resolution plan no later than March 31, 2005.
- John Nakoski has the NRC lead for coordinating the resolution plan.
- NRC will set up a management meeting with NRC in March.
- The MPR independent review was very helpful in clarifying industry practices and margins.
- NRC sees long-term resolution by means of Tech Specs.
- NRC is not asking industry to change its setpoint methodology.

March 11, 2005

The NRC staff hosted a public meeting with the NEI Setpoint Methods Task Force (SMTF) on March 11, 2005, to discuss the status of NRC's review of issues pertaining to the use of the Instrumentation, Systems, and Automation Society (ISA) Recommended Practice, ISA RP67.04, Part II, Method 3. Although consensus on the acceptability of Method 3 for determining Technical Specification allowable values was not achieved during the meeting, both the NRC and SMTF representatives expressed the opinion that a generic, method-independent resolution is feasible.

The NEI SMTF proposed the following approach:

1. We will support development of a Tech Spec Task Force (TSTF) Traveler that (a) specifically addresses resetting automatic trip setpoints for limited safety system settings (i.e., the LSSS defined in 10 CFR 50.36) to within the calibration tolerance, and (b) describes how setpoint methodologies are applied in practice to verify component operability. For PWRs, this includes the reactor trip system (RTS) and engineered safety feature actuation system (ESFAS) trip setpoints. For BWRs, this includes the Reactor Protection System (RPS) and emergency core cooling system (ECCS) trip setpoints. The details will be provided in a TSTF submittal to NRC, currently scheduled for June 2005.
2. The TSTF Traveler will be based on current methods and terminology. We continue to maintain that all methods currently in use are acceptable. A supplement to my letter to you (same subject) dated December 17, 2004, is enclosed.
3. The final resolution should be implemented by means of the consolidated line item improvement process (CLIIP).
4. Pending generic resolution, we respectfully request that NRC withdraw all Requests for Additional Information (RAIs) on licensing amendment requests (LARs) that involve allowable values based on ISA Method 3. In

the interim, NRC safety evaluations should be performed in accordance with the plant-specific licensing bases. License amendments can be issued conditional on implementation of the final generic resolution.

March 31, 2005

On March 31 2005, the NRC provided a response to the three outstanding SMTF letters (11/29/04, 12/17/04, 3/18/05). The following are excerpted NRC letter highlights:

NRC agrees that a TSTF Traveler can be used to address the issue. A June 2005 submittal date is acceptable. NRC supports the use of CLIIP to implement the final TSTF.

The scope of the TSTF should be "plant-specific systems that could be included within the scope of systems covered by 10 CFR 50.36(c)(1)(II)(A)." It seems they don't want to explicitly limit the scope of systems covered by a generic solution because to do so might not bound all plant-specific licensing bases.

NRC will not hold up any reviews of setpoint LARs based on Method 3; however, the RAIs will not go away. Any RAI conditioned on modifying Method 3 will be replaced with a RAI focused on compliance with 50.36. The replacement RAI will ask for two commitments and one Tech Spec:

- commitment to adopt the final TSTF
- commitment to assess operability
- a reset footnote in TS for the setpoint(s) in question

NRC intends to issue a RIS to document the staff's position on how 50.36 relates to LSSS and periodic testing/calibration. NRC may issue additional generic correspondence as the issue resolution proceeds.

This NRC letter confirmed that the main focus of the NRC was not on compliance to 10 CFR 50.36. Additionally, since this was a compliance issue, a backfit evaluation was not required.

May 18, 2005

Based on the NRC position and additional discussions with specific NRC personnel, a concepts document was developed. This document proposed specific actions and notes to respond the NRCs compliance concerns and to define operability for instrument channels in TS.

NEI letter to NRC (Marion to Lyons). This letter documented what NEI believed to be NRC's position on setpoints, based on dialogue between the Tech Spec Task Force and NRC's Tech Spec Section. NRC continues to mischaracterize this letter as an "NEI proposal."

May 18, 2005

Mr. James E. Lyons
Deputy Director, Division of Licensing Project Management
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Instrumentation, Systems, and Automation Society S67.04 Methods for Determining Trip Setpoints and Allowable Values for Safety-Related Instrumentation

The enclosed information is provided in response to your letter to me (same subject) dated March 31, 2005. It was developed by the NEI Setpoint Methods Task Force (SMTF) and represents what we believe to be a reasonable and responsive approach to resolution of the setpoints issue.

We request that NRC confirm that the concepts discussed in the enclosure provide a satisfactory basis for issue resolution. We further request an NRC/SMTF working meeting on either June 2nd or 3rd, 2005, to discuss the concepts and their translation to the Technical Specifications.

Industry has spent considerable time and effort working with NRC staff to develop a generic resolution of the setpoints issue that addresses NRC concerns. The SMTF is coordinating this generic resolution to ensure that all plants are aware of the generic issue and its potential impact. It is essential that the generic issue resolution process be applied to this TSTF and its implementation. Therefore, we request that NRC withdraw all requests for additional information (RAIs) that require operability determinations based on previous as-left conditions. It is important that NRC permit licensees with open LARs, and licensees that plan to submit LARs prior to the implementation of the generic resolution, to commit to evaluating the TSTF for plant-specific implementation after it has been approved and published by NRC.

If you have questions or require additional information, please contact me at 202.739.8080 (am@nei.org) or Mike Schoppman at 202.739.8011 (mas@nei.org).

Sincerely,
Alexander Marion

Enclosure
c: Dr. B. W. Sheron, NRC
Mr. M. E. Mayfield, NRC
Mr. C. I. Grimes, NRC
Mr. L. B. Marsh, NRC
Dr. E. M. Hackett, NRC
Mr. J. A. Nakoski, NRC
Mr. W. D. Reckley, NRC
Licensing Action Task Force Steering Group, NEI
Setpoint Methods Task Force, NEI

Enclosure

Introduction

The NEI Setpoint Methods Task Force (SMTF) has developed a set of concepts that will be used to prepare a Technical Specification Task Force (TSTF) Traveler for submittal to NRC. The SMTF believes that the concepts are responsive to the NRC letter dated March 31, 2005 (J. Lyons to A. Marion), on the subject of safety-related instrument setpoints and allowable values. These concepts represent a pathway toward resolution of NRC concerns about the calculation methodologies specified in ISA RP67.04. The concepts will be applied to limiting safety system setting (LSSS) values linked to safety limits as defined in 10 CFR 50.36 (typically a subset of
RPS/ECCS or RTS/ESFAS).

Background

The NRC concern about the use of ANSI/ISA RP67.04 Method 3 for the calculation of allowable values has transitioned into a discussion about compliance with 10 CFR 50.36. It is our understanding that NRC plans to issue a corresponding Regulatory Issue Summary (RIS) in approximately three weeks. The RIS is expected to inform addressees of the NRC position on the requirements of Title 10 of the Code of Federal Regulations, Section 50.36, "Technical Specifications." We understand that the RIS will require no action or written response, and that any licensee action in direct response to the RIS will be strictly voluntary. The NRC staff has indicated that final resolution of the setpoints issue can be achieved without its being considered a backfit under 10 CFR 50.109. Once the RIS has been issued, the NRC has indicated that a follow-up Generic Letter may be issued to request that licensees provide information on their methods of assuring compliance with 10 CFR 50.36. During discussions with NRR staff and with NRC supervisors at the section chief level, several concepts have been identified that are of critical importance to NRC reviewers. The NRC believes that these concepts must be addressed to comply with 10 CFR 50.36.

The concepts described below address two basic NRC issues to facilitate compliance to 10 CFR 50.36. The first issue is ensuring that the Safety Limit is protected by an appropriately determined calculated trip setpoint that has an appropriate reset requirement. Following a surveillance that demonstrates that the instrument is operable, the NRC staff expects that the as-left instrument setting will be returned to the trip setpoint established to protect the Safety Limit (i.e., returned to either the Limiting Trip Setpoint, or a Nominal Trip Setpoint that is more conservative than the Limiting Trip Setpoint).

The second issue is ensuring that operability and expected performance are confirmed during performance of the surveillance tests. Using the rules of Technical Specifications (TS), OPERABILITY is confirmed at the time of surveillance performance. In the current NUREGS for Standard Technical Specifications, this OPERABILITY verification is based on a single value (i.e., the Allowable Value) for single-column TS. Demonstration that a channel actually performs its intended safety function conservatively with respect to this value indicates that the channel is operable at the time of the test. Satisfactory performance of the surveillance requirement confirms that if an actual demand had required the channel to actuate it would have actuated to prevent the Analytical Limit and Safety Limit from being exceeded. The NRC's major concern is performance outside the expected range, in which case satisfactory completion of the surveillance requirement does not necessarily provide confidence that an instrument channel will continue to perform its intended safety function. The verification of expected instrument performance provides a level of confidence that the channel will continue to perform correctly during actual demand situations.

The following concepts will be applied in the proposed TSTF to address the NRC concerns:

1. TS Note and Bases – The Limiting Trip Setpoint shall be calculated consistent with the plant-specific methodology. The Limiting Trip Setpoint is the expected value for the trip. The as-left and as-found values may be less conservative than the Limiting Trip Setpoint by predefined tolerances (which were factored into the TSP calculation). This concept will be contained in the revised Bases discussion, and a note will be added to the TS to allow for as-found and as-left values less conservative than the Limiting Trip Setpoint, if identified in the TS. This concept is related to the NRC's Trip Setpoint/Limiting Safety System Setting concern.

2. TS Note and Bases – The as-found trip setpoint must be verified within predefined limits (double-sided limits) based on the actual expected errors between calibrations. Exceeding the as-found limit may warrant additional evaluation and potential corrective action as necessary to ensure continued performance of the specified safety function. Normally the as-found predefined acceptance criteria will be equivalent to the errors verified during the surveillance (e.g. setting tolerance, drift, and M&TE). The methodology for calculating as-found predefined limits will be contained in the revised Bases discussion. The requirement to find the trip setpoint (during required surveillance testing) within the predefined limits will be added in a note to the TS. This concept is related to the NRC's operability concern.

3. TS Note – Reset or leave the Nominal Trip Setpoint within the reference accuracy or setting 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 requirement to reset to the as-left tolerance will be added in a note to the TS. This concept is related to the NRC's Trip Setpoint/Limiting Safety System Setting concern.

4. TS Note and Bases – The Nominal Trip Setpoint may be set more conservative than the Limiting Trip Setpoint. If the Nominal Trip Setpoint is set more conservative than the Limiting Trip Setpoint, the predefined limits for as-found and as-left values will be maintained around the more conservative Nominal

Trip Setpoint. This clarification will be added in a note to the TS and a discussion in the Bases. This concept recognizes TS requirements, operational flexibility, and current plant practices.

5. Bases – While the predefined as-found tolerance band provides one definition of operability, the Allowable Value (defined as the least conservative as-found surveillance value) still 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 is determined at the time of performance, the fact that the tested trip point occurred conservative to the Allowable Value ensures that at that point in time the instrument would have functioned to protect the Analytical Limit. With the implementation of these concepts, calculation of the Allowable Value using any of the ISA S67.04 methods is acceptable. The Allowable Value will be documented in the TS. This concept is related to the NRC's operability concern, but minimizes licensing changes. It is in accordance with the normal rules of the improved Standard Technical Specifications and is consistent with current practices.

6. Bases – Utilities may choose to maintain multiple column TS. However, the Trip Setpoint identified in the TS is expected to be the Limiting Trip Setpoint for the channel. The Limiting Trip Setpoint, if used, will be documented in the TS. This concept, which minimizes licensing changes, is in accordance with the normal rules of the improved Standard Technical Specifications and is consistent with current practices. The Bases will be clarified to provide these options.

7. Concept – not in Bases (may be a part of the TSTF traveler) –

    a. When a channel's as-found value is outside the predefined tolerance range, the channel is declared inoperable. In this case the channel does not conform to the design-basis calculation. Since the results of the surveillance do not confirm operation within the assumed design limits, there shall be an immediate determination utilizing available information to ensure confidence of performance before the channel is declared operable. For example, this determination may include an evaluation of previous history, magnitude of change per unit time, response of instrument for reset, etc., to provide confidence that the channel is functional. The determination must conclude that the channel will perform its specified safety function. This determination, combined with resetting the trip setpoint, permits the channel to be declared operable and returned to service (i.e., declared OPERABLE). Although the specifics of the "immediate determination" process as described above will not be included in the TS or the Bases, we anticipate that NRC will expect licensees to include a commitment in setpoint-related License Amendment Requests (LARs) to implement a corresponding process. This concept is related to the NRC's operability determination concern.

    b. Any degraded instrument must be entered into the licensee's "corrective action program" (or equivalent). A prompt determination is expected to validate the immediate determination (normally conducted within about 24 hours). The overall operability determination process continues to be updated as additional information becomes available.

The prompt determination may consider factors such as:

i. Is this a single out-of-tolerance condition for this instrument, or are there previous historical occurrences;
ii. Is the instrument's response repeatable;
iii. Are there any reasonable explanations for the out-of-tolerance condition, such as:

- Extreme or seasonal ambient environmental changes (temperature, pressure, etc.)
- Human Performance or M&TE errors during the current calibration (or previous calibrations)
- First-time implementation of calibration with better M&TE
- First-time pressure set or deformation on a diaphragm (for a newly installed instrument)
- Induced errors due to response time variations of the calibration input (for example, a thermal dispersion level measurement has a faster response time going from dry to wet than from wet to dry)
- Known physical characteristic changes due to environment (for example, a JFET transistor junction getting smaller due to continuous high temperatures)
- A 5% statistical outlier
- The uncertainty calculation has not modeled the instrument correctly, and there is usage margin that can be used to protect the AL

Although the specifics of the "prompt determination" process as described above will not be included in the TS or the Bases, we anticipate that NRC will expect licensees to include a commitment in setpoint-related License Amendment Requests (LARs) to implement a corresponding process. This concept is related to the NRC's operability determination concern.

c. The licensee's "corrective action program" (or equivalent) is used to track degraded but OPERABLE instruments. It will define the need and threshold for trending. The plant must have confidence that abnormal conditions will be identified, tracked, and appropriate action taken. The trending process will not be included in the TS, but will be used to support corrective actions associated with inoperability based on as-found values outside of tolerance. Although the specifics of the trending process as described above will not be included in the TS or the Bases, we anticipate that NRC will expect licensees to include a commitment in setpoint-related License Amendment Requests (LARs) to implement a corresponding process. This concept is related to the NRC's operability determination concern.

June 2, 2005

During the June 02 2005 NRC/SMTF meeting, SMTF presented its position on the setpoints issue. The presentation was conducted as a working meeting, with free interchange of comments between NRC and the SMTF during the presentation.

The presentation explained seven concepts that NEI and the SMTF are prepared to sponsor in a TSTF Traveler for NRC review:

1. Limiting Trip Setpoint
2. As-found Trip Setpoint
3. Reset Setpoint
4. Limiting vs. Nominal
5. Allowable Value
6. Single-column vs. Multiple-column TS
7. Operability

The first six concepts are identical to those described in NEI's letter to NRC (Marion to Lyons) dated May 18, 2005. Concept seven was modified from what appears in the letter (see SMTF presentation for the June 2 meeting).

SMTF Concerns

At the beginning of the meeting, the SMTF highlighted two main concerns:

1. Operability framework (Concept 7 in the presentation)
2. NRC Requests for Additional Information (RAIs) filed against plant-specific License Amendment Requests (LARs)

OPERABILITY FRAMEWORK – The issue is the timing of the operability determination when the results of a surveillance test are outside a predefined tolerance range. NRC felt that the instrument must be declared inoperable and the LCO entered, <u>even after reset</u>, until an "immediate determination" is completed to confirm that the instrument is either "operable" or "degraded but operable." The SMTF explained the detailed field procedure that is followed by the technician (i.e., communicate suspect results to control room, troubleshoot the problem, take action to verify loop functionality, reset the instrument, and enter the condition in the "corrective action program"). NRC attendees seemed to accept this as an acceptable "immediate determination" process to verify instrument functionality such that reset would be sufficient and the LCO would not have to be entered.

PLANT-SPECIFIC RAIs – The SMTF reiterated its preference for handling this issue via the generic-issue resolution process and not the plant-specific RAI process. NRC attendees seemed willing to limit the RAIs to (1) calling for an interim TS note to require reset of the instrument(s) in the scope of the LAR if they are found outside a predefined tolerance range, and (2) calling for a commitment to consider the final TSTF after it is approved by NRC. The SMTF would not object if the RAIs are limited to these two items.

A resolution path was outlined for these concerns during the meeting.

NRC Caucus

NRC offered four options for a TSTF Traveler:

1. Single-column Allowable Value (AV) designated as the Limiting Safety System Setting (LSSS). Only ISA Method 1 or 2 can be used in this option.

2. Single-column calculated (limiting) Trip Setpoint (LTSP) designated as the LSSS. Adding margin is acceptable, but the number must be in Tech Specs (TS). Including a second AV column is acceptable. Licensees must commit to the "Ginna deviation limit" TS, or equivalent.

3. Single-column AV, but NOT designated as LSSS. The LSSS would be the LTSP and would be maintained outside TS (incorporated by reference). This option would require OGC concurrence.

4. Status quo. Single-column AV based on Method 3. NRC has safety concern with this option (thus, it is not really an option).

NOTE: On June 3 2005, NRC sent an e-mail to NEI containing a variant of Option 3:

3. (Variant) Single-column AV, derived by any Method, designated the "as-found LSSS." When necessary, reset to the nominal trip setpoint (NTSP), which may also be the limiting trip setpoint (LTSP). Put LTSP (or a description of how to calculate the LTSP) in a TS footnote. Assess operability at each test (put a commitment to do so in a TS footnote, with details in Bases or other licensee controlled document).

Final Remarks by NEI

- NRC staff has accepted Method 3 for the last 10-15 years. This has been documented in SERs, ACRS minutes, and reaffirmed to disposition an earlier DPO/DPV. NRC has the right to change regulatory position, but there has to be a demonstrated basis with a nexus to safety or compliance. This has not been shown.

- Several utilities are giving serious consideration to submitting backfit appeals.
- Industry is frustrated that efforts to be responsive to NRC concerns have not moved this issue closer toward resolution because we always regress to a discussion of the acceptability of ISA Method 3.
- Industry provided a technical paper and an independent statistical analysis demonstrating the acceptability of Method 3, but we keep coming back to the NRC staff's little-documented opinion that Method 3 is unacceptable.
- NRC not yet demonstrated to our satisfaction a basis for a safety case or a compliance issue.

June 30, 2005

NEI letter to NRC (Coyle to Dyer). This letter clarifies NEI's proposal as "reset only."

June 30, 2005

Mr. James E. Dyer
Director, Office of Nuclear Reactor Regulations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Dyer:

Following up on our recent discussion concerning instrument setpoint methodologies, the industry has agreed to include a provision in each plant's Technical Specifications for resetting an instrument when the "as found" setting is outside a predetermined tolerance band. This would be applicable to plants that currently use Method 3 as described in Instrumentation, Systems and Automation Society (ISA) Recommended Practice, S67.04. For Pressurized Water Reactor (PWR) plants, this includes the reactor trip system (RTS) and engineered safety features actuation System (ESFAS) trip setpoints. For Boiling Water Reactor (BWR) plants, this includes the Reactor Protection System (RPS) and the emergency core cooling system (ECCS) trip setpoints. From discussions with your staff the industry's current understanding is that Method 3, with this reset provision, addresses NRC's concerns with continued use of ISA Method 3.

A Technical Specification Task Force (TSTF) Traveler is under development with the Nuclear Steam Supply System (NSSS) Owners Groups. We anticipate the traveler will be submitted to NRC for review and approval in mid-August. Since this is a straightforward change, we envision final resolution to be documented via the consolidated line item improvement process (CLIIP) by the end of this year.

If you have any questions, please contact me at 202.739.8112; mtc@nei.org or Alex Marion at 202.739.8080; am@nei.org.

Sincerely,
Michael T. Coyle

c: Dr. Brian W. Sheron

August 23, 2005

NRC letter to NEI (Boger to Marion). This letter describes concepts acceptable to the NRC to ensure compliance with 10 CFR 50.36. It goes well beyond NEI's June 30 proposal.

August 23, 2005

Mr. Alexander Marion
Senior Director, Engineering
Nuclear Generation Division
Nuclear Energy Institute
1776 I Street, Suite 400
Washington, DC 20006-3708

SUBJECT: INSTRUMENTATION, SYSTEMS, AND AUTOMATION SOCIETY (ISA) S67.04 METHODS FOR DETERMINING TRIP SETPOINTS AND ALLOWABLE VALUES FOR SAFETY-RELATED INSTRUMENTATION

Dear Mr. Marion:

The purpose of this letter is to respond to the information provided to the U.S. Nuclear Regulatory Commission (NRC) staff in your letter of May 18, 2005, during a public meeting on June 2, 2005, with the Nuclear Energy Institute (NEI) Setpoint Methods Task Force (SMTF), and in Mr. Michael Coyle's letter of June 30, 2005. This information discusses instrument settings and the technical specifications (TSs) required for limiting safety system settings (LSSSs) related to plant safety limits (SLs). In the letter dated May 18, 2005, the NEI SMTF proposed seven concepts that could be used in the development of a Technical Specification Task Force (TSTF) change traveler that would address these issues generically. These concepts were clarified during the public meeting on June 2, 2005, and are further clarified in this letter.

The NRC staff believes that implementation of these concepts as described in this letter will satisfactorily address both the staff's and industry's concerns with instrument settings, and ensure compliance with Part 50 of Title 10 of the Code of Federal Regulations (10 CFR) section 50.36, "Technical Specifications." The staff does not anticipate further changes to these concepts, and intends to follow them in its current reviews of plant-specific license amendment requests. The staff believes that the NEI SMTF should incorporate these concepts into the TSTF that is planned to be submitted to NRC in late September 2005.

During the June 2, 2005, public meeting, the NRC staff and the NEI SMTF reached agreement on five of the seven concepts discussed in the letter of May 18, 2005. Specifically, agreement was reached on concept 1 ([limiting] trip setpoint (TSP)); concept 2 (as-found trip setpoint), with a minor change that exceeding the predefined test acceptance criteria band "must" (vice "may") require additional evaluation; concept 3 (reset setpoint), and concept 6 (single-column vs. multiple-column TS). The staff and industry reached tentative agreement on concept 4 (limiting TSP vs. nominal TSP), but adjourned the meeting in disagreement on concept 5 (allowable value). Following the meeting, the staff developed an additional option for concept 5 that is acceptable to satisfy the requirements of 10 CFR 50.36. These agreements are discussed in more detail in Enclosure 1.

Subsequently, Mr. Coyle's letter of June 30, 2005, to Mr. James Dyer (NRC) appeared to limit the scope of the concepts to be incorporated into the TSTF to only "resetting an instrument when the 'as found' setting is outside a predetermined tolerance band," and to tie the resolution to Method 3 as described in ISA-RP67.04-1994, Part II, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation." Mr. Coyle's letter stated that this was industry's current understanding based on discussions with the NRC staff. We agree that Mr. Coyle's statement resolves many of the staff's concerns. However, it does not capture all of the concepts discussed in your May 18, 2005, letter, as clarified in the June 2 public meeting and the subsequent discussions that are documented in Enclosure 1. For example Mr. Coyle's statement does not address concept 2 (as-found trip setpoint), which states that, if the as-found TSP exceeds the predefined test acceptance criteria band during periodic surveillances, additional evaluation and potential corrective action is warranted as necessary to ensure continued performance of the specified safety function. The NRC staff believes that implementation of all of the concepts is required to address the requirements of 10 CFR 50.36(c)(1)(ii)(A), and to address staff and industry concerns with instrument settings, including allowing continued use of Method 3 by licensees.

During the June 2 meeting, the NEI SMTF requested that the NRC staff provide additional information regarding its concerns with the analysis on Method 3 conducted by MPR Associates, which was provided to the staff in your letter of December 17, 2004. This additional information is in Enclosure 2.

The NRC staff intends to issue a generic communication in the near future to document and facilitate implementation of the concepts in this letter. The staff intends to reference the TSTF in the generic communication, provided it is submitted in a timely manner and accurately implements the concepts. In the interim, the staff intends to continue to process plant specific licensing amendment requests (LARs) consistent with the concepts. In the letter of May 18, NEI requested that the staff withdraw all requests for additional information for LARs associated with operability of instrument settings. As stated above, the staff believes that implementation of all of the concepts is required to address the requirements of 10 CFR 50.36. The staff believes that licensee responses to the RAIs that include TS requirements, which implement the concepts, described in the Enclosure to your May 18, 2005, letter (as discussed in Enclosure 1 of this letter) will be acceptable. A discussion related to NRC staff requests for additional information is provided in Enclosure 3.

The NRC staff points of contact for this issue are Mr. Tom Boyce and Mr. Christopher Gratton. Mr. Boyce may be reached at 301-415-0184 or email at thb@nrc.gov; Mr. Gratton may be reached at 301-415-1055 or email at cxg1@nrc.gov.

Sincerely,

Bruce A. Boger, Director
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

Enclosures: As stated
cc: James Dyer, NRR
Brian Sheron, ADPT
Michael Mayfield, DE
Dave Matthews, DRIP
Tad Marsh, DLPM
Jim Lyons, DSSA
Mike Schoppman, NEI

Enclosure 1

Agreements on Concepts
in the NEI Letter of May 18, 2005

In a letter to Mr. James Lyons (NRC) of May 18, 2005, the Nuclear Energy Institute (NEI), based upon information developed by the Setpoint Methods Task Force (SMTF), proposed seven concepts that could be used in the development of a Technical Specification Task Force (TSTF) change traveler that would address issues regarding instrument setpoint and plant Technical Specifications (TS) generically.

During the June 2, 2005, public meeting, the NRC staff and the NEI SMTF reached agreement on five of the seven concepts discussed in the letter of May 18, 2005. Specifically, agreement was reached on concept 1 ([limiting] trip setpoint (TSP)); concept 2 (as-found trip setpoint), with a minor change that exceeding the predefined test acceptance criteria band "must" (vice "may") require additional evaluation; concept 3 (reset setpoint), and concept 6 (single-column vs. multiple-column TS).

For concept 4 (limiting TSP vs. nominal TSP), the NRC staff agreed that a nominal TSP may be established that is more conservative than the limiting TSP. When a nominal TSP is used, the NRC staff agreed that the as-left TSP must be set to within the setting tolerance of the nominal TSP consistent with its agreement on concept 3. However, the NRC staff questioned the idea that the predefined test acceptance criteria band for as-found values be maintained around the nominal TSP versus the previous as-left TSP. As expressed during the meeting, the NRC staff's view was that these predefined test acceptance criteria bands should be based on the as-left TSP from the most recently completed surveillance. Basing the predefined test acceptance criteria band on the previous as-left TSP ensures that the assumptions in the uncertainty analysis used to determine the limiting TSP remain unchanged.

During the meeting, the SMTF indicated that because of the small setting tolerance used when setting the TSP for the instrument channel, there would be little effect on the predefined test acceptance criteria band by using the nominal TSP versus the previous as-left TSP. The SMTF indicated that it would provide the NRC staff with information supporting this position. The NRC staff acknowledged that the use of the nominal TSP was acceptable provided detection of performance problems would be as effective as if the previous as-left TSP were used.

For concept 5 (allowable value), there was disagreement and extended discussions regarding the methodology used to calculate the allowable value designated as the limiting safety system setting (LSSS) in TS. The NRC staff proposed several options for follow-on discussion to resolve the issue, but the SMTF did not agree that any of these were an appropriate resolution. The staff agreed to reconsider the NEI SMTF proposal to retain a single column TS format that uses allowable values (AVs) determined using any of the three methods described in ISA-RP67.04, Part II-1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation."

Subsequently, the NRC staff developed an additional option for concept 5 that it found acceptable to satisfy the requirements of Part 50 of Title 10 of the Code of Federal Regulations (10 CFR) section 50.36. The option retained the concept of the AV based in a single column TS format, and the AV could be determined based on any of the methodologies in ISA-RP67.04, Part II-1994. Under this option, the instrument channel must be reset to within the setting tolerance of the nominal TSP, which may also be the limiting TSP, but is usually more conservative, and the capability of the instrument channel to function as required within the predefined test acceptance criteria band (consistent with concept 4) must be assessed. Further, the AV is an operability limit for the channel, and would not be designated as the LSSS. The LSSS would be the limiting TSP which accounts for the credible uncertainties associated with the instrument channel.

The specifics on how to designate the LSSS in TSs should be developed as part of a TSTF implementing these concepts. The concepts call for the limiting TSP to be the LSSS, vice the AV. Since 10 CFR 50.36 requires that the LSSS be included in the TS, either the limiting TSP value or a reference to the method for determining the limiting TSP value needs to be specified in the TS. The value or the description of the factors used to determine the value would be determined consistent with a licensee's current setpoint methodology. The method of determining the limiting TSP, the as-found instrument channel setpoint acceptance criteria band, and the as-left instrument channel setpoint tolerance band would be specified in the Updated Final Safety Analysis Report (UFSAR) or a document incorporated into the UFSAR such as the technical requirements manual.

Significant discussions were held during the June 2 meeting regarding concept 7 (operability). As clarified below, the NRC staff and the NEI SMTF agreed on concept 7:

1. If the as-found TSP is found to be non-conservative with respect the the AV specified in the TSs, the channel is required to be declared inoperable and the associated TS action statement must be followed.

2. If the as-found TSP is found to be conservative with respect to the AV, and outside the predefined test acceptance criteria band, but the licensee is able to determine that the instrument channel is functioning as required and the licensee can reset the channel to within the setting tolerance of the limiting TSP, or a value more conservative than the limiting TSP, then the licensee may consider the channel to be operable. If the licensee cannot determine that the instrument channel is functioning as required, the channel is required to be declared inoperable and the associated TS actions must be followed.

3. If the as-found TSP is outside the predefined test acceptance criteria band, the condition must be entered into the licensee's corrective action program for further evaluation.

Enclosure 2

NRC Staff comments on MPR Associates Analysis on Method 3

An area of discussion between the NRC staff and the Setpoint Methods Task Force (SMTF) relates to the analysis on Method 3 conducted by MPR Associates provided in the NEI letter of December 17, 2004. In that letter, it is stated "[t]he independent review (enclosed) concludes that ISA Method 3 provides adequate protection." The overall conclusion of the MPR Associates analysis is best summed up by the last paragraph of the paper:

> Safety channel operability is monitored and maintained both through periodic, measurement based surveillance testing and recalibration. The Analytical Limit [AL] is protected by the trip setpoint, not the Allowable Value, and the setpoint drift is, in practice, kept small by a tight recalibration tolerance band. Because of this and our Monte Carlo simulation results, we have no concern that the use of ISA Method 3 for establishing the Allowable Value for surveillance tests leads to a generic safety concern.

The NRC staff agrees with the conclusion that the AL is protected by resetting the instrument trip setpoint (TSP) at, or more conservative than, the limiting setpoint (LSP) during surveillance testing and recalibration. The MPR report mathematically supports the staff and industry agreement that a properly-derived LSP ensures adequate protection of the AL if the channel setpoint is returned to the LSP at the beginning of each test interval. Note that each Monte Carlo simulation trial in the report begins with the channel setpoint equal to the LSP. This is based on the fact that the LSP accounts for the credible uncertainties associated with the instrument channel (e.g., total loop uncertainty).

However, the NRC staff notes that licensees with allowable value (AV) based technical specifications (TSs) do not currently have a regulatory requirement for the licensee to reset the instrument to the LSP (within a specified tolerance). Since licensees are not required to control the instrument setting based on the LSP, they could potentially leave an instrument setpoint set at the AV after periodic operational testing or calibration. This would not be consistent with the assumption of the MPR Associates analysis (in which the instrument was reset to the LSP that accounts for the credible uncertainties at the beginning of each monte carlo simulation). The staff understands from your input that resetting is consistent with typical industry practices. However, without a clear regulatory requirement to reset the instrument to the LSP, the NRC staff assumes in its regulatory decision making process that the AV becomes the de facto worst-case setpoint and therefore, the total loop uncertainty must be added to the AV when assessing whether the instrument is capable of protecting the SL.

Stated in more analytical terms, since the report assumes instruments are reset to a nominal setpoint, it does not analyze the influence of instruments where as-left setpoints can vary up to the AV. Therefore, it does not yield a quantitative assessment of the effectiveness of AVs determined either using Method 2 (AV2) or Method 3 (AV3) by themselves as a limiting value for the protection of the AL. Because the as-found setpoint is permitted to vary stochastically around a nominal setpoint, rather than being fixed at the AV being investigated, many trials are deemed successful in support of the AV when, in fact, the as-found value is unrelated to the AV. This artificially inflates the fraction of trials that appear to be successful, and, therefore, dilutes the assessment of the fraction that fail. Trials having as-found values that are not equal to the AV do not test the AV and should not be counted at all. The resulting statistics therefore apply to the efficacy of the combination of LSP and AV together in the protection of the AL, rather than to the efficacy of the AV itself. Those statistics relate to the overall probability that the channel will protect the AL (absent hardware failures). Applying the 95/95 criterion to this overall effectiveness statistic, rather than just to the AV effectiveness statistic, would constitute acceptance of a significant increase in the overall likelihood of failure to protect the AL.

The report confirms that an AV based on AV2 provides more certain protection of the AL than does AV3, and therefore that AV2 is more conservative than AV; however, it does not demonstrate the effectiveness of either AV2 or AV3 in protecting the AL.

Enclosure 3

License Amendment Requests
for changes to TS Setpoint Allowable Values

In the NEI letter of May 18, 2005, the NRC staff was requested to withdraw all requests for additional information (RAIs) for licensing action requests (LARs) associated with operability of instrument settings. The staff believes that demonstration of the operability of instruments is required to ensure compliance with the requirements of Part 50 of Title 10 of the Code of Federal Regulations (10 CFR) section 50.36(c)(3) which requires that TS surveillances demonstrate that the plant is operating within its safety limits. Verification that the instrument is functioning as required is an integral part of this periodic testing. In addition, Section 50.36(c)(1)(ii)(A), which discusses the requirements for limiting safety system settings (LSSS), states that "If, during operation, it is determined that the automatic safety system equipment does not function as required (emphasis added), the licensee shall take appropriate action, which may include shutting down the reactor." This latter requirement is unique to automatic safety system equipment.

The staff's position is that simply resetting an instrument whose setpoint is found outside the predefined test acceptance criteria band back to its nominal setpoint and entering the data into a corrective action program, without a prompt evaluation of the condition, is not sufficient to determine the operability of the instrument that is being placed back into service. This is because an instrument may be degraded or fail due to conditions other than statistical variations in uncertainties, including drift. The staff and the NEI SMTF reached agreement on this issue during the June 2 meeting as part of Concept 2 (as-found trip setpoint) of the May 18, 2005, letter. This letter states that, if the as-found TSP exceeds a predefined test acceptance criteria band during periodic surveillances, additional evaluation and potential corrective action "is" (emphasis added) warranted (a change from "may be warranted" was agreed to during the meeting) as necessary to ensure continued performance of the specified safety function. Incorporating this requirement into TS provides reasonable assurance that at the next surveillance the as-found value of the TSP will continue to protect plant safety limits.

Concept 7 (Operability) discusses factors that could be considered in this evaluation. It should be noted that, although the TS would contain a note to verify that the as-found TSP was within the predefined test acceptance criteria band and that exceeding the limits would warrant additional evaluation, the detailed discussion of the evaluation process and the factors to be considered would not be required in either the TS or the Bases, and that the process for evaluation is consistent with the guidance that has recently been developed by the staff and the NEI Operability Determination Process Task Force as part of the effort to revise the operability guidance in Generic Letter 91-18.

More broadly, the staff will continue to issue RAIs similar to those in the enclosure to its letter to NEI from James Lyons (NRC) dated March 31, 2005, (Agencywide Documents Access and Management Systems, Accession No. ML050870008) for LARs that change LSSSs, but do not include the TS requirements described above for the LSSSs. This information is necessary in order for the NRC staff to determine whether the LAR complies with NRC rules and regulations, a finding needed to support the issuance of the LAR. The staff believes that licensee responses to the RAIs that include TS requirements which implement the concepts described in the Enclosure to the May 18, 2005, letter (as discussed in Enclosure 1 of this letter) will be acceptable. One of the RAIs requested that the licensee provide a brief description of the methodology used to determine its setpoints. The purpose of this request was to solicit information from the licensee to determine whether TSPs were calculated in a manner that accounted for credible uncertainties associated with the instrument channel. This could be accomplished by referring to Regulatory Guide 1.105, "Setpoints for Safety-Related Instrumentation," or an NRC approved plant-specific setpoint methodology. In addition, a predefined test acceptance criteria band should be developed consistent with the assumptions and uncertainties associated with the tested portion of the instrument channel and the determination of the TSP calculated to protect the safety limits. This information is necessary for the NRC staff to conclude that the TSP provides reasonable assurance that the safety limits will be protected, a finding necessary to support issuance of the LAR.

September 7, 2005

NRC letter to NEI (Heiland to Schoppman). The letter contains a standard position on TS footnotes and Bases pertaining to setpoint LARs. It is guidance to reviewers and PMs and is intended to stabilize the NRC response to setpoint LARs in the near term.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555-0001

September 7, 2005

NEI Setpoint Methods Task Force
c/o Mr. Michael A. Schoppman
Nuclear Energy Institute
1776 I Street, N. W.
Suite 400
Washington, DC 20006-3708

Dear Mr. Schoppman:

SUBJECT: TECHNICAL SPECIFICATION FOR ADDRESSING ISSUES RELATED TO SETPOINT ALLOWABLE VALUES

Reference: Bruce A. Boger (NRC) letter to A. Marion (NEI), "INSTRUMENTATION SYSTEMS, AND AUTOMATION SOCIETY (ISA) S67.04 METHODS FOR DETERMINING TRIP SETPOINTS AND ALLOWABLE VALUES FOR SAFETY-RELATED INSTRUMENTATION " dated August 23 2005

In the reference letter, the Nuclear Regulatory Commission (NRC) staff responded to the Nuclear Energy Institute (NEI) Setpoint Methods Task Force (SMTF) issues on instrument settings and the technical specifications (TSs) required for limiting safety system settings related to plant safety limits. The letter also clarified the staff positions on the seven concepts proposed by the NEI SMTF that could be used in the development of a Technical Specification Task Force (TSTF) change traveler for addressing these issues generically. Enclosed are draft changes to plant TSs that are acceptable to the NRC staff for implementing the concepts in the reference letter related to setpoint allowable values for safety related instrumentation. The staff intends to use these TSs in its reviews of plant-specific license amendment requests and in its review of the TSTF.

Specifically, Part A provides two notes that apply to setpoint verification surveillances needed to address instrument trip setpoint allowable value issues, and Part B is a check list that provides the TS Bases content for the two notes in Part A. We believe that the TS Notes and the discussion of the content for the related TS Bases will satisfactorily address both the NRC staffs and industry s concerns with instrument settings, and ensure compliance with Title 10 of the Code of Federal Regulations (10 CFR) Section 50.36, "Technical Specifications.

Please contact Carl Schulten at (301) 415- 1192 or e-mail css1@nrc.gov if you have any questions or need further information.

Sincerely,

Patrick L. Hiland, Chief
Reactor Operations Branch
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

Enclosure: As stated

cc w/encl: D, Hoffman, EXCEL
J. Voss, EXCEL

TECHNICAL SPECIFICATIONS
FOR LICENSE AMENDMENT REQUESTS
RELATED TO SETPOINT ALLOWABLE VALUES
FOR SAFETY-RELATED INSTRUMENTATION

A. Technical Specification (TS) Notes for SMTF Agreement Concepts

Note 1: If the as-found channel setpoint is conservative with respect to the Allowable Value but outside its predefined as-found acceptance criteria band, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. If the as-found instrument channel setpoint is not conservative with respect to the Allowable Value, the channel shall be declared inoperable.

Note 2: The instrument channel setpoint shall be reset to a value that is within the as-left tolerance of the (Limiting Trip Setpoint*, or a value that is more conservative than the Limiting Trip Setpoint); otherwise , the channel shall be declared inoperable. The (Limiting Trip Setpoint) and the methodology** used to determine the (Limiting Trip Setpoint), the predefined as-found acceptance criteria band , and the as-left setpoint tolerance band are specified in the UFSAR (or Bases) (or a document incorporated into the UFSAR such as the technical requirements manual).

* Reviewers Note: the words "Limiting Trip Setpoint" are generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in the UFSAR, or Bases, or a document incorporated into the UFSAR such as the technical requirements manual. The nominal Trip Setpoint (field setting) may use a setting value that is more conservative than the Limiting Trip Setpoint, but for the purpose of TS compliance with 10 CFR 50. , the plant-specific setpoint term for the Limiting Trip Setpoint must be cited in Note 2. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC staff.

** The NRC staff will review and approve the methodology supporting the requested changes in the LAR.

B. Check List for Development of TS Using SMTF Agreement Concepts

The items that follow are intended for the review of plant-specific license amendment requests for changes to TS setpoint Allowable Values. The TS Bases shall be included with the license amendment application and will be reviewed by the NRC staff, to ensure consistency with the TS and design bases for the plant.

1. Note 1 and Note 2 above pertain to setpoint verification surveillances for instrument functions on which a safety limit has been placed. In accordance with 10 CFR 50.36 these functions are limiting safety system settings (LSSS). Note and 2 can be incorporated into LCO surveillances or the notes can be used as footnotes to surveillances listed in the instrumentation tables for specific functions.

2. The TS Bases shall contain a statement that the Limiting Trip Setpoint is based on the calculated total loop uncertainty per the plant-specific methodology documented in the UFSAR (or a document incorporated into the UFSAR such as the technical requirements manual). Regulatory Guide 1.105, " Setpoints for Safety-Related Instrumentation" provides an acceptable methodology.

3. The TS Bases shall include a statement that the Limiting Trip Setpoint is the LSSS required by 10 CFR 50.36. The TS Bases for Note 1 and Note 2 shall explain the basis for the notes including why the notes are applicable to specific instrument functions. The revised Bases shall include a discussion about entering degraded instrument channels into the plant-specific corrective action program. Degraded instruments are those that are not functioning as required.

4. As an alternative to a license commitment (reference: NRC

letter dated March 31, 2005 from J. Lyons to A. Marion (NEI)) to assess the operability of tested instrumentation for meeting Note 1, the TS Bases may include discussion regarding the evaluation of a channel to verify that it is functioning as required before returning the channel to service when the channel's as-found channel setpoint is found to be conservative with respect to the Allowable Value, but outside its as-found predefined acceptance criteria band. This establishes a TS Bases presentation that is consistent with agreement concept 7 of NEI letter dated May 18, 2005 from A. Marion to J. Lyons (NRC). In general, operability of instruments is treated as outlined below:

1) If the as-found TSP is found to be non-conservative with respect to the AV specified in TSs, the channel is declared inoperable and the associated TS action statement must be followed.

2) If the as-found TSP is found to be conservative with respect to the AV, and outside the as-found predefined acceptance criteria band, but the licensee is able to determine that the instrument channel is functioning as required and the licensee can reset the channel to within the setting tolerance of the limiting TSP or a value more conservative than the limiting TSP, then the licensee may consider the channel to be operable. If the licensee cannot determine that the instrument channel is functioning as required, the channel is declared inoperable and the associated TS actions must be followed.

3) If the as-found TSP is outside the as-found predefined acceptance criteria band the condition must be entered into the licensee's corrective action program for further evaluation.

September 8, 2005

Summary of SMTF telecom on September 8, 2005.

Telecon Participants:

Ed Weinkam (NMC), Bill Sotos (STP/ISA), Bob Fredricksen (Exelon), Don Woodlan (STARS), Don Hoffman (Excel/TSTF), Jerry Voss (Excel/ISA), Chris Kerr (Exelon), Patrick Simpson (Exelon), Ron Jarrett (TVA), Tony Langley (TVA), Tim Byam (Exelon), Mike Eidson (SNC), Pete Kokolakis (Entergy North), Jim Andrachek (Westinghouse), Dave Willis (APS), Alex Marion (NEI), Mike Schoppman (NE), three representatives at Diablo Canyon, and one representative at Monticello.

Telecon Objectives:

(1) Discuss NRC's 8/23/05 Boger letter (attached)
(2) Discuss NRC's 9/8/05 Hiland letter (attached)
(3) Discuss near-term and long-term options
(4) Schedule next telecon

Highlights:

- NRC is determined to increase its enforcement authority with respect to reset and operability of LSSS instrumentation. This appears to be a Branch position that NRC management and OGC are willing to accept, i.e., it is bottom-up rather than top-down.

- The SMTF has concerns in three areas: technical, process, and Tech Specs. For technical issues, SMTF is supporting ISA; for process issues, SMTF is supporting the LATF's Generic Issues Management (GIM) team; for Tech Spec issues, SMTF is supporting the Tech Spec Task Force (TSTF).

- Potential hard spots with the NRC position are (a) as-found/as-left acceptance criteria, (b) post-test treatment of instrument operability, (c) can't use AV as LSSS, and (d) scope of applicability beyond LSSS instruments. We do not have a concern with reset.

- Few if any licensees are in a position to resist new TS footnotes on reset and operability, especially when they pertain to important License Amendment Requests (LARs) such as uprates or extending cycle length. This increases the need for a near-term NRC/SMTF consensus to stabilize NRC reviewer treatment of setpoint LARS. The TSTF has developed separate Traveler options for the current SMTF position of "reset only" and for the NRC staff's position described in their two most recent letters (attached).

- With respect to hard spot (a), NRC has not taken its "deviation limit" concept off the table. ISA (Fredricksen) is preparing a position paper and will likely need a meeting with NRC to discuss scope and as-found tolerance band.

- A revised ISA standard is at least nine (9) months from publication. It has been approved by subcommittee. Additional steps before publication are 67.04 committee approval, ISA board approval, and public comment.

- The TSTF has recovered the history describing which LSSS are linked to safety limits.

- The SMTF needs to absorb the most recent NRC letter received 9/8/05 before the next telecon.

- The SMTF will remain an active task force for the following reasons: (a) participate in TSTF Traveler comments, (b) avoid sending a capitulation message to NRC, (c) act as coordinating point of contact with ISA, Owners Groups, TSTF, and NRC, and (d) prepare response to anticipated NRC generic communications on setpoints.

- The <u>next telecon</u> to discuss follow-up options (see below) is scheduled for September 15 at 11 am Eastern. Call 719-955-1361, passcode 261971.

<u>Options:</u>

- Technical Options
  - ➢ SMTF prepare a formal technical position
  - ➢ SMTF rely on ISA standard and position paper as its technical position

- Process Options
- ➢ SMTF prepare a generic backfit claim (NRC is using a new/different compliance position/interpretation)
- ➢ Refer process concerns to the LATF GIM Team for follow-up

- TSTF Traveler Options
- ➢ No Traveler
- ➢ Reset footnote only (current position)
- ➢ Reset footnote + operability footnote (stop short of Hiland letter)
- ➢ Reset footnote + operability footnote (conform to Hiland letter)

September 15, 2005

Summary of SMTF telecom on September 15, 2005.

<u>Participants:</u>

Willis, Fredricksen, Kerr, Woodlan, Hoffman, Voss, Rogers, Eidson, Stringfellow, Sotos, Jarrett, Schoppman, Marion

References:
1. Summary of SMTF Telecon on 9/8/05
2. NRC letter (Hiland) to SMTF dated 9/7/05

<u>Discussion of Technical Options:</u>

Option 1 – SMTF prepare a formal technical position
Option 2 – SMTF rely on ISA standard and position paper as its technical position

Consensus – Do both.

- Schoppman prepare a draft letter to NRC (technical and process position statement). Distribute it in September for SMTF review.
- ISA revise the Standard and Recommended Practice documents. The Standard revision is ~8-9 months away. The companion RP revision has just begun.
- Fredricksen prepare a position paper (setpoint performance testing). Distribute it in September for SMTF review. It will be a program document

to address the technique of performing a surveillance test. It will provide details on how to develop acceptable performance criteria. It will describe how test results are to be treated by the licensee's organization (I&C technicians, engineering department, operations department, licensing department). It is not intended for Tech Specs or Bases.

Discussion of Process Options:

Option 1 – SMTF prepare a generic position statement or backfit claim
Option 2 – SMTF refer process concerns to the NEI LATF Generic Issues Management (GIM) Team for follow-up

Consensus – Do both.

- SMTF stay involved in the short term discussions with NRC on the setpoints issue.
- Defer to NEI for long-term strategy within the broader context of GIM.

Discussion of Traveler Options:

Option 1 – No Traveler
Option 2 – Reset footnote (per NEI 6/30/05 letter to NRC)
Option 3 – Reset footnote + operability footnote that stops short of the 9/7/05 NRC letter, i.e., develop a new approach consistent with ISA but not tied to NRC letter
Option 4 – Reset footnote + operability footnote that is consistent with the SMTF's understanding of the 9/7/05 NRC letter

Consensus – Option 4. Develop a forward-looking TSTF Traveler. The second footnote should use the terminology "performance test" rather than "operability." Performance testing guidance should be placed in a licensing basis document, not the Tech Specs.

- Submit Traveler to NRC by the end of November 2005.

1. draft to SMTF and TSTF chairpersons
2. draft to WOG and BWROG
3. finalize Traveler
4. submit to NRC

Additional Notes:

- The SMTF consensus is to try to work with NRC within the framework of the NRC's 9/7/05 letter.
- There is a difference between (i) a permanent, resilient revision to the improved STS (i.e., "doing the right thing"), and (ii) a compromise revision to the iSTS that frees the LAR hostages (i.e., "doing the practical thing"). We have chosen (b) in the near term.
- The TSTF believes that the scope issue (i.e., which LSSS instruments should be subject to the new TS footnotes) can be resolved generically during review of the Traveler.
- NEI will advise the BWROG of issue status and request their input.

- NEI will work with the NEI General Counsel to determine NRC OGC's role in the staff's [new] position on compliance with 10 CFR 50.36(c)(1)(ii)(A).
- Further dialogue will be needed with NRC to document agreements on definitions and implementation details.

Follow-up NRC/NEI Telecon @ 2:30 p.m. on 9/15/05:

Participants: Coyle, Marion, & Schoppman for NEI. Boger, Hiland, & Schulten for NRC.

NEI advised NRC that the SMTF supports submittal of a TSTF Traveler that is consistent with the intent of NEI's 5/18/05 letter to NRC and the SMTF's reading of the intent of NRC's 9/7/05 letter to the SMTF. In addition, NEI advised NRC of the SMTF position on the following four points:

1. *The scope of 10 CFR 50.36(c)(1)(ii)(A)*

10 CFR 50.36(c)(1)(ii)(A) states, in part, "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." The SMTF interpretation strictly limits the scope to LSSS instruments documented in the plant-specific design basis as protecting safety limits.

2. *The meaning of the double-asterisk footnote[1] in the NRC 9/7/05 letter*

NRC-approved methods documented in the plant-specific licensing basis should not be subject to re-review at the sole discretion of the technical reviewer(s). The SMTF would consider such treatment a backfit under 10 CFR 50.109.

3. *The role of the ISA Position Paper*

The paper will represent the ISA/SMTF position with respect to setpoint performance testing. The SMTF intends to treat the paper as explanatory programmatic information, not as a requirement or criteria document.

4. *The need for another public meeting*

The SMTF supports additional meetings if they will help end the setpoint disagreements between licensees and the NRC staff to our mutual satisfaction.

[1] The NRC staff will review and approve the methodology supporting the requested changes in the LAR.