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October 2, 2013
GO2-13-138

10 CFR 50.90

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

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397 LICENSE AMENDMENT REQUEST FOR ADOPTION OF TSTF-493, REVISION 4, OPTION A**

Dear Sir or Madam:

In accordance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.90, Energy Northwest is submitting a request for an amendment to the Technical Specifications (TS) for Columbia Generating Station (Columbia).

The proposed amendment incorporates Technical Specification Task Force (TSTF) Traveler TSTF-493-A, Revision 4, "Clarify Application of Setpoint Methodology for LSSS Functions," Option A. The proposed amendment would revise the TS by adding requirements to assess channel performance during testing that verifies instrument channel setting values established by the plant-specific setpoint methodologies. The availability of this TS improvement was announced in the Federal Register on May 11, 2010 (75 FR 26294) as part of the consolidated line item improvement process (CLIIP).

Attachment 1 provides a description and analysis of the proposed changes including the requested confirmation of applicability and plant-specific verifications; technical analyses; regulatory analyses; and environmental considerations. No changes to any setpoint values are proposed. Attachment 2 provides the plant-specific evaluation identifying the list of instrument Functions to be annotated with the TSTF-493 Surveillance Notes. Attachments 3 and 4 provide markup pages of existing TS and TS Bases, respectively, to show the proposed change in accordance with TSTF-493, Revision 4, Option A. Attachment 5 provides revised (clean) TS pages.

Energy Northwest requests approval of the proposed license amendment within one year of the date of this submittal, with the amendment being implemented within 180 days of approval.

This letter and its enclosure contain no regulatory commitments.

A001
NRR

In accordance with 10 CFR 50.91 (a)(1), "Notice for public comment," the analysis about the issue of no significant hazards consideration using the standards in 10 CFR 50.92 is being provided to the Commission in accordance with the distribution requirements in 10 CFR 50.4.

In accordance with 10 CFR 50.91 (b)(1), "State consultation," a copy of this application and its reasoned analysis about no significant hazards considerations is being provided to the designated Washington State Official.

If you should have any questions regarding this submittal, please contact Ms. L. L. Williams, Licensing Supervisor, at (509) 377-8148.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the date of this letter.

Respectfully,

For

A. L. Javorik
Vice President, Engineering

Attachments: As stated

cc: NRC Region IV Administrator
NRC NRR Project Manager
NRC Senior Resident Inspector/988C
AJ Rapacz BPA/1 399 (email)
WA Horin Winston & Strawn (email)
JO Luce – EFSEC (email)
RR Cowley – WDOH (email)

EVALUATION OF PROPOSED CHANGES

1.0 DESCRIPTION

The proposed amendment would revise the Technical Specifications (TS) by applying additional testing requirements to applicable instrument Functions, listed in Technical Specifications Task Force (TSTF) Improved Standard Technical Specifications (STS) Change Traveler TSTF-493, Revision 4, "Clarify Application of Setpoint Methodology for LSSS [Limiting Safety System Settings] Functions," Attachment A, "Identification of Instrument Functions to be Annotated with the TSTF-493 Footnotes." Attachment A contains Functions related to those variables that have a significant safety function, as defined in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(c)(1)(ii)(A), thereby ensuring instrumentation will function as required to initiate protective systems or actuate mitigating systems at values equal to or more conservative than the point assumed in applicable safety analyses. These TS changes are made by the addition of individual surveillance Note requirements to applicable instrument Functions in accordance with Option A of TSTF-493, Revision 4.

This change is consistent with Option A of NRC-approved Revision 4 to TSTF-493. The availability of this TS improvement was announced in the *Federal Register* on May 11, 2010 (75 FR 26294).

2.0 PROPOSED CHANGE

Energy Northwest proposes to add TSTF-493, Revision 4, Option A TS surveillance Notes with no changes to setpoint values to Columbia Generating Station (Columbia) instrumentation Functions.

Energy Northwest has reviewed the model safety evaluation (SE) referenced in the *Federal Register* Notice of Availability published on May 11, 2010 (75 FR 26294). As described herein, Energy Northwest has concluded that the justifications presented in TSTF-493, Revision 4, Option A, and the model SE prepared by the NRC staff for Option A are applicable to Columbia and support these changes to the Columbia TS.

Energy Northwest is not proposing variations or deviations from the TS changes described in TSTF-493, Revision 4 or the NRC staff's model SE referenced in the Notice of Availability. However, it should be noted that Columbia is based on the General Electric BWR/5 design. Some Columbia instrumentation TS requirements are similar to those provided in NUREG-1433, "Standard Technical Specifications General Electric Plants, BWR/4," and other Columbia instrumentation TS are similar to those provided in NUREG-1434, "Standard Technical Specifications General Electric Plants, BWR/6." Therefore, the Columbia incorporation of TSTF-493, Revision 4, Option A, reflects changes based on the TSTF-493, Revision 4, Option A TS page markups provided for either NUREG-1433 or NUREG-1434, as appropriate. The plant-specific evaluation identifying the list of instrument Functions to be annotated with the TSTF-493

surveillance Notes provided in Attachment 2 identifies which STS was used in the evaluation.

3.0 BACKGROUND

The background for this application is adequately addressed by the NRC Notice of Availability published in the *Federal Register* on May 11, 2010 (75 FR 26294).

4.0 TECHNICAL ANALYSIS

The Technical Analysis for this application is described in TSTF-493 as referenced in the NRC Notice of Availability published in the *Federal Register* on May 11, 2010 (75 FR 26294). Plant-specific information related to the Technical Analysis is described below to document that the content of TSTF-493, Revision 4, Option A, is applicable to Columbia.

4.1 Use of the Term of "Limiting Trip Setpoint"

The term "Limiting Trip Setpoint" (LTSP) is used for the setpoint value calculated by means of the plant-specific setpoint methodology documented in the Final Safety Analyses Report (FSAR) or a document incorporated by reference into the FSAR. The actual trip setpoint may be more conservative than the LTSP. The LTSP is the LSSS[1] which is required to be in the TS by 10 CFR 50.36.

The LTSP is the least conservative value to which the instrument channel is adjusted to actuate. The Allowable Value[2] (AV) is derived from the LTSP. The LTSP is the limiting setting for an operable channel trip setpoint considering all credible instrument errors associated with the instrument channel. The LTSP is the least conservative value (with an as-left tolerance (ALT)) to which the channel must be reset at the conclusion of periodic testing to ensure that the analytical limit (AL) will not be exceeded during an anticipated operational occurrence or accident before the next periodic surveillance or calibration. It is impossible to set a physical instrument channel to an exact value, so a calibration tolerance is established around the LTSP. Therefore, an instrument adjustment is considered successful if the LTSP as-left instrument setting is within the setting tolerance (i.e., a range of values around the LTSP). The Nominal Trip Setpoint (NTSP) is the LTSP with margin added. The NTSP is as conservative as or more conservative than the LTSP.

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1 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."
2 The instrument setting "Allowable Value" is a limiting value of an instrument's as-found trip (AFT) setting used during surveillances. The AV is more conservative than the Analytical Limit (AL) 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 AV, the channel is declared inoperable and actions must be taken consistent with the TS requirements.

4.2 Addition of Channel Performance Surveillance Notes to TS Instrumentation Functions

The determination to include surveillance Notes for specific Functions in the TS is based on these Functions being automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A). There are two surveillance Notes added to the TS regarding the use of TS AVs for operability determinations and for assessing channel performance. Evaluation of Exclusion Criterion (Section 4.3 below) discusses the principles applied to determine which Functions are to be annotated with the two surveillance Notes. The list of affected Functions is provided in Attachment 2 of this amendment request.

Surveillance 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."

Surveillance 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) 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 (Nominal Trip Setpoint) to confirm channel performance. The Limiting Trip Setpoint and the methodologies used to determine the as-found and as-left tolerances are specified in the Licensee Controlled Specifications.

Setpoint calculations establish an LTSP based on the AL of the safety analysis to ensure that trips or protective actions will occur prior to exceeding the process parameter value assumed by the safety analysis calculations. These setpoint calculations also calculate an allowed limit of expected change (i.e., the AFT) between performances of the surveillance test for assessing the value of the setpoint setting. The least conservative as-found instrument setting value that a channel can have during calibration without requiring performing a TS remedial action is the setpoint AV. Discovering an instrument setting to be less conservative than the setting AV indicates that there may not be sufficient margin between the setting and the AL. TS channel calibrations are performed to verify channels are operating within the assumptions of the setpoint methodology calculated LTSP and that channel settings have not exceeded the TS AVs. When the measured as-found setpoint is non-conservative with respect to the AV, the channel is inoperable and the actions identified in the TS must be taken.

The first surveillance Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its AFT but conservative with respect to the AV. Evaluation of channel performance will verify that the channel will continue to perform in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service.

Verifying that a trip setting is conservative with respect to the AV when a surveillance test is performed does not by itself verify the instrument channel will operate properly in the future. Although the channel was operable during the previous surveillance interval, if it is discovered that channel performance is outside the performance predicted by the plant setpoint calculations for the test interval, then the design basis for the channel may not be met, and proper operation of the channel for a future demand cannot be assured. Surveillance Note 1 formalizes the establishment of the appropriate AFT for each channel. This AFT is applied about the LTSP or about any other more conservative setpoint. The AFT ensures that channel operation is consistent with the assumptions or design inputs used in the setpoint calculations and establishes a high confidence of acceptable channel performance in the future. Because the AFT allows for both conservative and non-conservative deviation from the LTSP, changes in channel performance that are conservative with respect to the LTSP will also be detected and evaluated for possible effects on expected performance.

To implement surveillance Note 2 the ALT for some instrumentation Function channels is established to ensure that realistic values are used that do not mask instrument performance. Setpoint calculations assume that the instrument setpoint is left at the LTSP within a specific ALT (e.g., 25 psig ± 2 psig). A tolerance band is necessary because 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 ALT is normally as small as possible considering the tools and the objective to meet an as low as reasonably achievable calibration setting of the instruments. The ALT is 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 ALT, would invalidate the assumptions in the setpoint calculation because any subsequent instrument drift would not start from the expected as-left setpoint.

4.3 Evaluation of Exclusion Criterion

Exclusion criteria are used to determine which Functions do not need to receive the proposed footnotes, as discussed in TSTF-493, Revision 4. Instruments are excluded from the additional requirements when their functional purpose can be described as (1) a manual actuation circuit, (2) an automatic actuation logic circuit, or (3) an instrument function that derives input from contacts which have no associated sensor or adjustable device. Many permissives or interlocks are excluded if they derive input from a sensor or adjustable device that is tested as part of another TS function. The list of affected

Functions identified in Attachment 2 of this amendment request was developed on the principle that all Functions in the affected TS are included unless one or more of the exclusion criterion apply. If the excluded functions differ from the list of excluded functions in TSTF-493, Revision 4, a justification for that deviation is provided in Attachment 2.

4.4 Relationship to Previously Submitted License Amendment Requests

Due to a previously submitted license amendment request, this submittal does not contain surveillance Notes for instrument Functions: Average Power Range Monitors (APRM), Oscillation Power Range Monitor (OPRM), and Rod Block Monitors (RBM). In letter GO2-12-017 dated January 17, 2012, from BJ Sawatzke (Energy Northwest) to NRC, "License Amendment Request to Change Technical Specifications in support of PRNM / ARTS / MELLLA Implementation," Energy Northwest proposed changes to the TS to reflect the installation of the General Electric Hitachi (GEH) Nuclear Measurement Analysis and Control (NUMAC) Power Range Neutron Monitor (PRNM) system and expansion of the operating domain resulting from the implementation of APRM/RBM Technical Specifications (ARTS) / Maximum Extended Load Line Limit Analysis (MELLLA). This amendment request proposed changes to the APRM Functions in TS Table 3.3.1.1-1 (Function 2) and the RBM Functions in TS Table 3.3.2.1-1 (Function 1) to reflect the new PRNM system.

In GO2-12-017, the following instrumentation Functions <u>were annotated with</u> the two TSTF-493 surveillance Notes:

- TS Table 3.3.1.1-1 Function 2, Average Power Range Monitors
  a. Neutron Flux – High (Setdown)
  b. Simulated Thermal Power – High
  c. Neutron Flux – High
  f. OPRM Upscale

- TS Table 3.3.2.1-1 Function 1, Rod Block Monitor
  a. Low Power Range – Upscale
  b. Intermediate Power Range – Upscale
  c. High Power Range - Upscale

The following instrumentation Functions <u>were excluded from</u> the two TSTF-493 surveillance Notes:

- TS Table 3.3.1.1-1 Function 2, Average Power Range Monitors
  d. Inop (Interlock excluded from surveillance Notes)
  e. 2-Out-of-4 Voter (Automatic actuation logic circuit, which is excluded from surveillance notes)

- TS Table 3.3.2.1-1 Function 1, Rod Block Monitor

d. Inop (Interlock excluded from surveillance Notes)
[The PRNM system does not contain a Rod Block Monitor, Downscale Function]

In letter GO2-13-075 dated May 9, 2013, from BJ Sawatzke (Energy Northwest) to NRC, "Response to Request for Additional Information Regarding License Amendment Request to Implement PRNM/ARTS/MELLLA," Energy Northwest submitted revisions to these proposed TS to accommodate the delayed installation schedule for this modification. The proposed revision retained the current Specifications with a revised Applicability of "prior to implementation of Power Range Neutron Monitor (PRNM) upgrade" and revised the Specifications proposed in GO2-12-017 with a revised applicability of "after implementation of Power Range Neutron Monitor (PRNM) upgrade." Energy Northwest does not propose to add TSTF-493 surveillance Notes to the Functions associated with the current Neutron Monitor System (NMS) APRM and RBM instrumentation or the current OPRM instrumentation since these instruments will be replaced by the PRNM system in Refueling Outage 22 (R22), which is scheduled for spring 2015. The Functions associated with the new instruments will have the surveillance Notes applied as described above.

No other instrument Functions in this TSTF-493 submittal are associated with the PRNM modification.

5.0 REGULATORY SAFETY ANALYSIS

5.1 NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Energy Northwest has evaluated the proposed changes to the TS using the criteria in 10 CFR 50.92, "Application for amendment of license, construction permit, or early site permit," and has determined that the proposed changes do not involve a significant hazards consideration.

Basis for proposed no significant hazards consideration: As required by 10 CFR 50.91(a), "Notice for public comment," the Energy Northwest analysis of the issue of no significant hazards consideration is presented 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 adds test requirements to TS instrument Functions related to those variables that have a significant safety function to ensure that instruments will function as required to initiate protective systems or actuate mitigating systems at the point assumed in the applicable safety analysis. Surveillance tests are not an initiator to any accident previously evaluated. As a result, the probability of any accident previously evaluated is not significantly

increased. The systems and components required by the TS for which surveillance Notes are added are still required to be operable, meet the acceptance criteria for the surveillance requirements, and be capable of performing any mitigation function assumed in the accident analysis. 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. The change does not alter assumptions made in the safety analysis but ensures that the instruments perform 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 previously evaluated.

3: Does the Proposed Change Involve a Significant Reduction in a Margin of Safety?

   Response: No

   The proposed change adds test requirements that will assure that TS instrumentation AVs (1) will be limiting settings for assessing instrument channel operability and (2) will be conservatively determined so that evaluation of instrument performance history and the ALT requirements of the calibration procedures will not have an adverse effect on equipment operability. The testing methods and acceptance criteria for systems, structures, and components specified in applicable codes and standards (or alternatives approved for use by the NRC) will continue to be met as described in the plant licensing basis including the updated FSAR. There is no impact to safety analysis acceptance criteria as described in the plant licensing basis because no change is made to the accident analysis assumptions. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

5.2 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA

A description of the proposed TS change and its relationship to applicable regulatory requirements were published in the *Federal Register* Notice of Availability on May 11, 2010 (75 FR 26294). Energy Northwest has reviewed the NRC staff's model SE published as part of the Notice of Availability and concluded that the regulatory evaluation section is applicable to Columbia.

6.0 ENVIRONMENTAL CONSIDERATION

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 Part 20, and 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. Owners Group Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler TSTF-493-A, Revision 4 "Clarify Application of Setpoint Methodology for LSSS Functions"

2. 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 13, "Instrumentation and Control"

3. 10 CFR Part 50, Appendix A GDC 20, "Protection System Functions"

4. 10 CFR 50.36, "Technical Specifications"

5. NUREG 1433/1434, Standard Technical Specifications for BWR 4/6

6. 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review"

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

8. ISA-S67-04-1994, "Setpoints for Nuclear Safety-Related Instrumentation"

9. GO2-12-017 dated January 17, 2012, from BJ Sawatzke (Energy Northwest) to NRC, "License Amendment Request to Change Technical Specifications in support of PRNM / ARTS / MELLLA Implementation"

10. GO2-13-075 dated May 9, 2013, from BJ Sawatzke (Energy Northwest) to NRC, "Response to Request for Additional Information Regarding License Amendment Request to Implement PRNM/ARTS/MELLLA"

IDENTIFICATION OF INSTRUMENT FUNCTIONS TO BE ANNOTATED WITH OR EXCLUDED FROM SURVEILLANCE NOTES FOR APPLICATION OF TSTF-493, REVISION 4, OPTION A

Instrumentation Functions Annotated with Surveillance Notes

NUREG-1433 (except as noted below)	**Columbia TS**
Table 3.3.1.1-1, "Reactor Protection System Instrumentation" Functions	**Table 3.3.1.1-1, "Reactor Protection System Instrumentation" Functions**
1. Intermediate Range Monitors a. Neutron Flux – High	1. Intermediate Range Monitors a. Neutron Flux – High
2. Average Power Range Monitors a. Neutron Flux - High, Setdown b. Flow Biased Simulated Thermal Power - High c. Fixed Neutron Flux - High d. Downscale	2. Average Power Range Monitors - See Attachment 1 Section 4.4 [Average Power Range Monitors, Downscale is not in the Columbia TS]
3. Reactor Vessel Steam Dome Pressure – High	3. Reactor Vessel Steam Dome Pressure – High
4. Reactor Vessel Water Level – Low, Level 3	4. Reactor Vessel Water Level - Low, Level 3
6. Drywell Pressure – High	6. Primary Containment Pressure – High
NUREG-1434 8. Scram Discharge Volume Water Level - High a. Transmitter/Trip Unit	7. Scram Discharge Volume Water Level - High a. Transmitter/Trip Unit
9. Turbine Control Valve Fast Closure, Trip Oil Pressure – Low	9. Turbine Governor Valve Fast Closure, Trip Oil Pressure – Low
	TS 3.3.1.3, "Oscillation Power Range Monitor Instrumentation" Functions
	Oscillation Power Range Monitors – See Attachment 1 Section 4.4
Table 3.3.2.1-1, "Control Rod Block Instrumentation" Functions	**Table 3.3.2.1-1, "Control Rod Block Instrumentation" Functions**
1. Rod Block Monitor a. Low Power Range - Upscale b. Intermediate Power Range - Upscale c. High Power Range - Upscale	1. Rod Block Monitor - See Attachment 1 Section 4.4
TS 3.3.4.1, "EOC-RPT Instrumentation" Functions	**TS 3.3.4.1, "EOC-RPT Instrumentation" Functions**
Trip Units	[Trip Units are not part of the Columbia design for this function]
Turbine Control Valve - Fast Closure, Trip Oil Pressure – Low	Turbine Governor Valve Fast Closure, Trip oil Pressure – Low
NUREG-1434 **Table 3.3.5.1-1, "Emergency Core Cooling System Instrumentation" Functions**	**Table 3.3.5.1-1, "Emergency Core Cooling System Instrumentation" Functions**
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems a. Reactor Vessel Water Level – Low Low Low, Level 1 b. Drywell Pressure – High c. LPCI Pump A Start - Time Delay Relay	1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems a. Reactor Vessel Water Level — Low Low Low, Level 1 b. Drywell Pressure — High c. LPCS Pump Start - LOCA Time Delay Relay d. LPCI Pump A Start - LOCA Time Delay Relay

NUREG-1433 (except as noted below)	Columbia TS
2. LPCI B and LPCI C Subsystems a. Reactor Vessel Water Level - Low Low Low, Level 1 b. Drywell Pressure – High c. LPCI Pump B Start - Time Delay Relay	2. LPCI B and LPCI C Subsystems a. Reactor Vessel Water Level — Low Low Low, Level 1 b. Drywell Pressure — High c. LPCI Pump B Start - LOCA Time Delay Relay d. LPCI Pump C Start - LOCA Time Delay Relay
3. High Pressure Core Spray (HPCS) System a. Reactor Vessel Water Level - Low Low, Level 2 b. Drywell Pressure - High c. Reactor Vessel Water Level - High, Level 8 (Optional to include surveillance Notes or not) f. HPCS Pump Discharge Pressure - High (Bypass) (If mechanical device, excluded from surveillance Notes) (If valve locked open, Function can be removed from TS) g. HPCS System Flow Rate - Low (Bypass) (If mechanical device, excluded from surveillance Notes) (If valve locked open, Function can be removed from TS)	3. High Pressure Core Spray (HPCS) System a. Reactor Vessel Water Level — Low Low, Level 2 b. Drywell Pressure — High c. Reactor Vessel Water Level — High, Level 8 [HPCS Pump Discharge Pressure – High (Bypass) is not part of the Columbia design for this function] f. HPCS System Flow Rate — Low (Minimum Flow)
4. Automatic Depressurization System (ADS) Trip System A a. Reactor Vessel Water Level - Low Low Low, Level 1 b. Drywell Pressure - High d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	4. Automatic Depressurization System (ADS) Trip System A a. Reactor Vessel Water Level — Low Low Low, Level 1 [Drywell Pressure – High is not part of the Columbia design for this Function] c. Reactor Vessel Water Level — Low, Level 3 (Permissive) f. Accumulator Backup Compressed Gas System Pressure — Low
5. ADS Trip System B a. Reactor Vessel Water Level - Low Low Low, Level 1 b. Drywell Pressure - High d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	5. ADS Trip System B a. Reactor Vessel Water Level — Low Low Low, Level 1 [Drywell Pressure – High is not part of the Columbia design for this function] c. Reactor Vessel Water Level — Low, Level 3 (Permissive) e. Accumulator Backup Compressed Gas System Pressure — Low
Table 3.3.5.2-1, "Reactor Core Isolation Cooling System Instrumentation" Functions	**Table 3.3.5.2-1, "Reactor Core Isolation Cooling System Instrumentation" Functions**
1. Reactor Vessel Water Level - Low Low, Level 2	1. Reactor Vessel Water Level - Low Low, Level 2
2. Reactor Vessel Water Level - High, Level 8 - (Optional to include surveillance Notes or not)	2. Reactor Vessel Water Level — High, Level 8
4. Suppression Pool Water Level - High (If mechanical device, excluded from surveillance Notes)	[Suppression Pool Water Level – High is not part of the Columbia design for this function]

Instrumentation Functions Excluded From Surveillance Notes

NUREG-1433 (except as noted below)	Columbia TS
Table 3.3.1.1-1, "Reactor Protection System Instrumentation" Functions	**Table 3.3.1.1-1, "Reactor Protection System Instrumentation" Functions**
1. Intermediate Range Monitors b. Inop (Interlock excluded from surveillance Notes)	1. Intermediate Range Monitors b. Inop (Interlock excluded from surveillance Notes)
2. Average Power Range Monitors e. Inop (Interlock excluded from surveillance Notes)	2. Average Power Range Monitors - See Attachment 1 Section 4.4
5. Main Steam Isolation Valve - Closure (Mechanical device excluded from surveillance Notes)	5. Main Steam Isolation Valve — Closure (Mechanical device excluded from surveillance Notes)
NUREG-1434 7. Scram Discharge Volume Water Level - High b. Float Switch (Mechanical device excluded from surveillance Notes)	7. Scram Discharge Volume Water Level - High b. Float Switch (Mechanical device excluded from surveillance Notes)
8. Turbine Stop Valve - Closure (Mechanical device excluded from surveillance Notes)	8. Turbine Throttle Valve - Closure (Mechanical device excluded from surveillance Notes)
10. Reactor Mode Switch - Shutdown Position (Manual actuation excluded from surveillance Notes)	10. Reactor Mode Switch — Shutdown Position (Manual actuation excluded from surveillance Notes)
11. Manual Scram (Manual actuation excluded from surveillance Notes)	11. Manual Scram (Manual actuation excluded from surveillance Notes)
Table 3.3.2.1-1, "Control Rod Block Instrumentation" Functions	**Table 3.3.2.1-1, "Control Rod Block Instrumentation" Functions**
1. Rod Block Monitor d. Inop (Interlock excluded from surveillance Notes) e. Downscale (Not part of RPS or ECCS excluded from surveillance Notes) f. Bypass Time Delay (Permissive or interlock excluded from surveillance Notes if it derives input from a sensor or adjustable device that is tested as part of another TS function.)	1. Rod Block Monitor - See Attachment 1 Section 4.4 [Bypass Time Delay is not part of the Columbia design for this function]
2. Rod Worth Minimizer (Not part of RPS or ECCS excluded from surveillance Notes)	2. Rod Worth Minimizer (Not part of RPS or ECCS excluded from surveillance Notes)
3. Reactor Mode Switch - Shutdown Position (Manual actuation excluded from surveillance Notes)	3. Reactor Mode Switch - Shutdown Position (Manual actuation excluded from surveillance Notes)
TS 3.3.4.1, "EOC-RPT Instrumentation" Functions	**TS 3.3.4.1, "EOC-RPT Instrumentation" Functions**
Turbine Stop Valve - Closure (Mechanical component excluded from surveillance Notes)	Turbine Trip Valve – Closure (Mechanical component excluded from surveillance Notes)
NUREG-1434 **Table 3.3.5.1-1, "Emergency Core Cooling System Instrumentation" Functions**	**Table 3.3.5.1-1, "Emergency Core Cooling System Instrumentation" Functions**
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems c. LPCI Pump A Start - Time Delay Relay (Permissive or interlock excluded from surveillance Notes.) d. Reactor Steam Dome Pressure - Low (Injection Permissive) (Actuation logic excluded from	1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems e. LPCI Pump A Start - LOCA/LOOP Time Delay Relay (Permissive or interlock excluded from surveillance Notes since it derives input from a sensor or adjustable device that is tested as part of another TS function) f. Reactor Vessel Pressure - Low (Injection Permissive) (Actuation logic excluded from

NUREG-1433 (except as noted below)	Columbia TS
surveillance Notes) e. LPCS Pump Discharge Flow - Low (Bypass) (Actuation logic excluded from surveillance Notes) f. LPCI Pump A Discharge Flow - Low (Bypass) (Actuation logic excluded from surveillance Notes) g. Manual Initiation (Manual actuation excluded from surveillance Notes)	surveillance Notes) g. LPCS Pump Discharge Flow - Low (Minimum Flow) (Actuation logic excluded from surveillance Notes) h. LPCI Pump A Discharge Flow - Low (Minimum Flow) (Actuation logic excluded from surveillance Notes) i. Manual Initiation (Manual actuation excluded from surveillance Notes)
2. LPCI B and LPCI C Subsystems c. LPCI Pump B Start - Time Delay Relay (Permissive or interlock excluded from surveillance Notes) d. Reactor Steam Dome Pressure - Low (Injection Permissive) (Actuation logic excluded from surveillance Notes) e. LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass) (Actuation logic excluded from surveillance Notes) f. Manual Initiation (Manual actuation excluded from surveillance Notes)	2. LPCI B and LPCI C Subsystems e. LPCI Pump B Start - LOCA/LOOP Time Delay Relay (Permissive or interlock excluded from surveillance Notes since it derives input from a sensor or adjustable device that is tested as part of another TS function) f. Reactor Vessel Pressure - Low (Injection Permissive) (Actuation logic excluded from surveillance Notes) g. LPCI Pumps B & C Discharge Flow - Low (Minimum Flow) (Actuation logic excluded from surveillance Notes) h. Manual Initiation (Manual actuation excluded from surveillance Notes)
3. High Pressure Core Spray (HPCS) System d. Condensate Storage Tank Level – Low (If mechanical device, excluded from surveillance Notes) e. Suppression Pool Water Level – High (If mechanical device, excluded from surveillance Notes) h. Manual Initiation (Manual actuation excluded from surveillance Notes)	3. High Pressure Core Spray (HPCS) System d. Condensate Storage Tank Level — Low (Mechanical device excluded from surveillance Notes) e. Suppression Pool Water Level — High (Mechanical device excluded from surveillance Notes) g. Manual Initiation (Manual actuation excluded from surveillance Notes)
4. Automatic Depressurization System (ADS) Trip System A c. ADS Initiation Timer (Actuation logic excluded from surveillance Notes) e. LPCS Pump Discharge Pressure – High (Actuation logic excluded from surveillance Notes) f. LPCI Pump A Discharge Pressure – High (Actuation logic excluded from surveillance Notes) g. ADS Bypass Timer (High Drywell Pressure) (Actuation logic excluded from surveillance Notes) h. Manual Initiation (Manual actuation excluded from surveillance Notes)	4. Automatic Depressurization System (ADS) Trip System A b. ADS Initiation Timer (Actuation logic excluded from surveillance Notes) d. LPCS Pump Discharge Pressure — High (Actuation logic excluded from surveillance Notes) e. LPCI Pump A Discharge Pressure — High (Actuation logic excluded from surveillance Notes) [ADS Bypass Timer (High Drywell Pressure) is not part of the Columbia design for this function] g. Manual Initiation (Manual actuation excluded from surveillance Notes)
5. ADS Trip System B c. ADS Initiation Timer (Actuation logic excluded from surveillance Notes) e. LPCI Pumps B & C Discharge Pressure – High (Actuation logic excluded from surveillance Notes) f. ADS Bypass Timer (High Drywell Pressure) (Actuation logic excluded from surveillance Notes) g. Manual Initiation (Manual actuation excluded from	5. ADS Trip System B b. ADS Initiation Timer (Actuation logic excluded from surveillance Notes) d. LPCI Pumps B & C Discharge Pressure — High (Actuation logic excluded from surveillance Notes) [ADS Bypass Timer (High Drywell Pressure) is not part of the Columbia design for this function] f. Manual Initiation (Manual actuation excluded from

NUREG-1433 (except as noted below)	**Columbia TS**
surveillance Notes)	surveillance Notes)
Table 3.3.5.2-1, "Reactor Core Isolation Cooling System Instrumentation" Functions	**Table 3.3.5.2-1, "Reactor Core Isolation Cooling System Instrumentation" Functions**
3. Condensate Storage Tank Level - Low (If mechanical device, excluded from surveillance Notes)	3. Condensate Storage Tank Level — Low (Mechanical device excluded from surveillance Notes)
5. Manual Initiation (Manual actuation excluded from surveillance Notes)	4. Manual Initiation (Manual actuation excluded from surveillance Notes)

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Table 3.3.1.1-1 (page 1 of ~~3~~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 3.3.1.1.3 SR 3.3.1.1.5 SR 3.3.1.1.6 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 122/125 divisions of full scale
	5[a]	3	H	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 122/125 divisions of full scale
b. Inop	2	3	G	SR 3.3.1.1.3 SR 3.3.1.1.14	NA
	5[a]	3	H	SR 3.3.1.1.4 SR 3.3.1.1.14	NA
2. Average Power Range Monitors					
a. Neutron Flux - High, Setdown	2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.3 SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.9 SR 3.3.1.1.14	≤ 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 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.11 SR 3.3.1.1.14	≤ 0.58 W + 62% RTP and ≤ 114.9% RTP

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

(b) Reserved

(c) Reserved

(d) 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.

(e) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.1.1-1 (page 2 of ~~3~~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 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 120% RTP
d. Inop	1,2	2	G	SR 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.14	NA
3. Reactor Vessel Steam Dome Pressure - High	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 1079 psig
4. Reactor Vessel Water Level - Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14 SR 3.3.1.1.15	≥ 9.5 inches
5. Main Steam Isolation Valve - Closure	1	8	F	SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 12.5% closed
6. Primary Containment Pressure - High	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 1.88 psig

(d) 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.

(e) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.1.1-1 (page 3 of ~~3~~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. Transmitter/Trip Unit	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 529 ft 9 inches elevation
	5[a]	2	H	SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 529 ft 9 inches elevation
b. Float Switch	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.14	≤ 529 ft 9 inches elevation
	5[a]	2	H	SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.14	≤ 529 ft 9 inches elevation
8. Turbine Throttle Valve - Closure	≥ 30% RTP	4	E	SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.12 SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 7% closed
9. Turbine Governor Valve Fast Closure, Trip Oil Pressure - Low	≥ 30% RTP	2	E	SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.12 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ 1000 psig

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

(d) 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.

(e) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.1.1-1 (page 43 of 34)
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
10. Reactor Mode Switch - Shutdown Position	1,2	2	G	SR 3.3.1.1.13 SR 3.3.1.1.14	NA
	5[a]	2	H	SR 3.3.1.1.13 SR 3.3.1.1.14	NA
11. Manual Scram	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.14	NA
	5[a]	2	H	SR 3.3.1.1.4 SR 3.3.1.1.14	NA

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.4.1.2.a	Perform CHANNEL CALIBRATION. The Allowable Value shall be: TTV - Closure: ≤ 7% closed.	24 months
SR 3.3.4.1.2.b	----------NOTE---------- 1. For the TGV 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 TGV 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications. ---------- Perform CHANNEL CALIBRATION. The Allowable Value shall be: TGV Fast Closure, Trip Oil Pressure - Low: ≥ 1000 psig.	18 months
SR 3.3.4.1.3	Verify TTV – Closure and TGV Fast Closure, Trip Oil Pressure – Low Functions are not bypassed when THERMAL POWER is ≥ 30% RTP.	18 months

Table 3.3.5.1-1 (page 1 of 65)
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
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3, 4[a], 5[a]	2[b]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -142.3 inches
b. Drywell Pressure - High	1, 2, 3	2[b]	B	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≤ 1.88 psig
c. LPCS Pump Start - LOCA Time Delay Relay	1, 2, 3, 4[a], 5[a]	1[e]	C	SR 3.3.5.1.5[f][g] SR 3.3.5.1.6	≥ 8.53 seconds and ≤ 10.64 seconds
d. LPCI Pump A Start - LOCA Time Delay Relay	1, 2, 3, 4[a], 5[a]	1[e]	C	SR 3.3.5.1.5[f][g] SR 3.3.5.1.6	≥ 17.24 seconds and ≤ 21.53 seconds
e. LPCI Pump A Start - LOCA/LOOP Time Delay Relay	1, 2, 3, 4[a], 5[a]	1	C	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.6	≥ 3.04 seconds and ≤ 6.00 seconds
f. Reactor Vessel Pressure - Low (Injection Permissive)	1, 2, 3	1 per valve	C	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 psig and ≤ 492 psig
	4[a], 5[a]	1 per valve	B	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 psig and ≤ 492 psig

(a) When associated subsystem(s) are required to be OPERABLE.

(b) Also required to initiate the associated diesel generator (DG).

(e) Also supports OPERABILITY of 230 kV offsite power circuit pursuant to LCO 3.8.1 and LCO 3.8.2.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.5.1-1 (page 2 of 6~~5~~)
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
1. LPCI and LPCS Subsystems					
g. LPCS Pump Discharge Flow - Low (Minimum Flow)	1, 2, 3, 4[a], 5[a]	1	E	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 668 gpm and ≤ 1067 gpm
h. LPCI Pump A Discharge Flow - Low (Minimum Flow)	1, 2, 3, 4[a], 5[a]	1	E	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 605 gpm and ≤ 984 gpm
i. Manual Initiation	1, 2, 3, 4[a], 5[a]	2	C	SR 3.3.5.1.6	NA
2. LPCI B and LPCI C Subsystems					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3, 4[a], 5[a]	2[b]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -142.3 inches
b. Drywell Pressure - High	1, 2, 3	2[b]	B	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≤ 1.88 psig
c. LPCI Pump B Start - LOCA Time Delay Relay	1, 2, 3, 4[a], 5[a]	1[e]	C	SR 3.3.5.1.5[f][g] SR 3.3.5.1.6	≥ 17.24 seconds and ≤ 21.53 seconds
d. LPCI Pump C Start - LOCA Time Delay Relay	1, 2, 3, 4[a], 5[a]	1[e]	C	SR 3.3.5.1.5[f][g] SR 3.3.5.1.6	≥ 8.53 seconds and ≤ 10.64 seconds

(a) When associated subsystem(s) are required to be OPERABLE.

(b) Also required to initiate the associated DG.

(e) Also supports OPERABILITY of 230 kV offsite power circuit pursuant to LCO 3.8.1 and LCO 3.8.2.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.5.1-1 (page 3 of 65)
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 Start - LOCA/LOOP Time Delay Relay	1, 2, 3, 4[a], 5[a]	1	C	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.6	≥ 3.04 seconds and ≤ 6.00 seconds
f. Reactor Vessel Pressure - Low (Injection Permissive)	1, 2, 3,	1 per valve	C	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 psig and ≤ 492 psig
	4[a], 5[a]	1 per valve	B	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 psig and ≤ 492 psig
g. LPCI Pumps B & C Discharge Flow - Low (Minimum flow)	1, 2, 3, 4[a], 5[a]	1 per pump	E	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 605 gpm and ≤ 984 gpm
h. Manual Initiation	1, 2, 3, 4[a], 5[a]	2	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 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -58 inches
b. Drywell Pressure - High	1, 2, 3	4[b]	B	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≤ 1.88 psig

(a) When associated subsystem(s) are required to be OPERABLE.

(b) Also required to initiate the associated DG.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.5.1-1 (page 4 of 65)
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					
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 3.3.5.1.4[f][g] SR 3.3.5.1.6	≤ 56.0 inches
d. Condensate Storage Tank Level - Low	1, 2, 3, 4[c], 5[c]	2	D	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 ft 1 inch elevation
e. Suppression Pool Water Level - High	1, 2, 3	2	D	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≤ 466 ft 11 inches elevation
f. HPCS System Flow Rate - Low (Minimum Flow)	1, 2, 3, 4[a], 5[a]	1	E	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 1200 gpm and ≤ 1512 gpm
g. Manual Initiation	1, 2, 3, 4[a], 5[a]	2	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], 3[d]	2	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -142.3 inches
b. ADS Initiation Timer	1, 2[d], 3[d]	1	G	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.6	≤ 115.0 seconds

(a) When associated subsystem(s) are required to be OPERABLE.

(c) 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.

(d) With reactor steam dome pressure > 150 psig.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.5.1-1 (page 5 of 6~~5~~)
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					
c. Reactor Vessel Water Level - Low, Level 3 (Permissive)	1, 2[d], 3[d]	1	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 9.5 inches
d. LPCS Pump Discharge Pressure - High	1, 2[d], 3[d]	2	G	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 119 psig and ≤ 171 psig
e. LPCI Pump A Discharge Pressure - High	1, 2[d], 3[d]	2	G	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 116 psig and ≤ 134 psig
f. Accumulator Backup Compressed Gas System Pressure - Low	1, 2[d], 3[d]	3	F	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 151.4 psig
g. Manual Initiation	1, 2[d], 3[d]	4	G	SR 3.3.5.1.6	NA

(d) With reactor steam dome pressure > 150 psig.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.5.1-1 (page 65 of 56)
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					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2[d], 3[d]	2	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -142.3 inches
b. ADS Initiation Timer	1, 2[d], 3[d]	1	G	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.6	≤ 115.0 seconds
c. Reactor Vessel Water Level - Low, Level 3 (Permissive)	1, 2[d], 3[d]	1	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 9.5 inches
d. LPCI Pumps B & C Discharge Pressure - High	1, 2[d], 3[d]	2 per pump	G	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 116 psig and ≤ 134 psig
e. Accumulator Backup Compressed Gas System Pressure - Low	1, 2[d], 3[d]	3	F	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 151.4 psig
f. Manual Initiation	1, 2[d], 3[d]	4	G	SR 3.3.5.1.6	NA

(d) With reactor steam dome pressure > 150 psig.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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	≥ -58 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[(a)(b)] SR 3.3.5.2.4	≤ 56 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	≥ 447 ft 7 inches elevation
4. Manual Initiation	2	C	SR 3.3.5.2.4	NA

(a) 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.

(b) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Columbia Generating Station

Technical Specification Bases Markup Pages

(for reference only)

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 pressure boundary (RCPB) 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 LSSS are defined in this Specification as the Allowable Values, which, in conjunction with the LCOs, establish the threshold for protective system action to prevent exceeding acceptable limits, including Safety Limits (SLs), during Design Basis Accidents (DBAs).~~

Technical Specifications are required by 10 CFR 50.36 to include LSSS for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so 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 protective action is initiated, as established by the safety analysis, to ensure that a safety limit (SL) is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The Limiting Trip Setpoint (LTSP) specified in Table 3.3.1.1-1 is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the LTSP accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the LTSP ensures that SLs are not exceeded. Therefore, the LTSP meets the definition of an LSSS (Ref. 13).

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)." Relying solely on the LTSP to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as-found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the LTSP due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the LTSP and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as-found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around the LTSP to account for further drift during the next 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).

However, there is also some point beyond which the channel may not be able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channels and is designated as the Allowable Value.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the LTSP (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

BASES

BACKGROUND (continued)

The RPS, as described in the FSAR, Section 7.2 (Ref. 1), 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 governor valve (TGV) fast closure, trip oil pressure low; turbine throttle valve (TTV) position; primary containment 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. Most channels include equipment (e.g., pressure switches) that compares measured input signals with pre-established setpoints. When a setpoint is exceeded, the channel outputs an RPS trip signal to the trip logic.

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 1. The outputs of the logic channels in a trip system are combined in a one-out-of-two logic so either channel can trip the associated trip system. The tripping of both trip systems will produce a reactor scram. This logic arrangement is referred to as one-out-of-two taken twice logic. Each trip system can be reset by use of a reset switch. If a full scram occurs (both trip systems trip), a relay prevents reset of the trip systems for 10 seconds after the full scram signal is received. This 10 second delay on reset ensures that the scram function will be completed.

Two pilot scram valves are located in the hydraulic control unit (HCU) for each control rod drive (CRD). Each pilot scram valve is solenoid operated, with the solenoids normally energized. The pilot scram valves control the air supply to the scram inlet and outlet valves for the associated CRD. When either pilot scram valve solenoid is energized, air pressure holds the scram valves closed and, therefore, both pilot scram 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 pilot scram 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.

BASES

BACKGROUND (continued)

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, ~~exceed the Allowable Values specified by~~ and APPLICABILITY

The actions of the RPS are assumed in the safety analyses of References ~~2,~~ 3~~, 4,~~ and ~~5~~6. The RPS initiates a reactor scram when monitored parameter values are exceeded to preserve the integrity of the ~~the setpoint methodology and listed in Table 3.3.1.1-1 to preserve the integrity~~ fuel cladding, the RCPB, and the containment by minimizing the energy that must be absorbed following a LOCA.

RPS instrumentation satisfies Criterion 3 of Reference 6. 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.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the RPS is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.1.1-1. Each Function must have a required number of OPERABLE channels per RPS trip system, with their setpoints set within the ~~specified Allowable Value~~setting tolerance of the LTSPs, where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time, where appropriate.

Allowable Values for RPS Instrumentation Functions are specified in Table 3.3.1-1. LTSPs and the methodologies for calculation of the as-left and as-found tolerances are described in the Licensee Controlled Specifications Manual.~~Function specified in the Table. Nominal trip setpoints are specified in the setpoint calculations.~~ The LTSPs~~nominal setpoints~~ are selected to ensure that the actual setpoints remain conservative with respect to the as-found tolerance band ~~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.~~After each calibration the trip setpoint shall be left within the as-left band around the LTSP.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

~~Trip setpoints~~LTSPs are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., differential pressure switch) 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.~~process and all instrument uncertainties, except drift and calibration.~~ The ~~trip setpoints~~LTSPs are ~~derived from the analytic limits, corrected for process and all instrument uncertainties, including drift and calibration.~~ then determined accounting for the remaining instrument errors (e.g., drift). The LTSPs~~trip setpoints~~ derived in this manner provide adequate protection because ~~all~~ instrumentation uncertainties, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for. ~~and process effects are taken into account.~~

The OPERABILITY of pilot scram 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 or other specified conditions specified in the Table that may require an RPS trip to mitigate the consequences of a design basis accident or transient. To ensure a reliable scram function, a combination of ~~F~~functions is required in each MODE to provide primary and diverse initiation signals.

The only MODES specified in Table 3.3.1.1-1 are MODES 1 and 2, and MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies. No RPS Function is required in MODES 3 and 4 since all control rods are fully inserted and the Reactor Mode Switch Shutdown Position control rod withdrawal block (LCO 3.3.2.1) does not allow any control rod to be withdrawn. In MODE 5, 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, no RPS Function is 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.

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

BASES

ACTIONS (continued)

Condition A, B, or C, and the associated Completion Time has expired, Condition D will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1, F.1, and G.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. The Completion Times are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems. In addition, the Completion Time of Required Action E.1 is consistent with the Completion Time provided in LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)."

H.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by immediately initiating action to fully insert all insertable control rods in core cells containing one or more fuel assemblies. Control rods in core cells containing no fuel assemblies do not affect the reactivity of the core and are, therefore, not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

As noted at the beginning of the SRs, the SRs for each RPS instrument~~ation~~ Function are located in the SRs column of Table 3.3.1.1-1.

The Surveillances are modified by a Note to indicate that, when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the RPS reliability analysis (Ref. 11) 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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.1

Performance of a CHANNEL CHECK once every 12 hours is the qualitative assessment, by observation, of channel behavior during operation. This assessment is the comparison, where possible, of the channel status or indication to the status or indication of an independent instrument measuring the same parameter. 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 significant deviation could indicate gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

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

SR 3.3.1.1.2

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are calibrated to the reactor power calculated from a heat balance. LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoint," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within 2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated MFLPD. The Frequency of once per 7 days is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.7.

A restriction to satisfying this SR when < 25% RTP is provided that requires the SR to be met only at ≥ 25% RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when < 25% RTP. At low power levels, a high degree of accuracy is unnecessary because of the large inherent margin to thermal limits (MCPR and APLHGR). At ≥ 25% RTP, the Surveillance is required to have been satisfactorily performed within the last 7 days in accordance with SR 3.0.2. A Note is provided which allows

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.8 and SR 3.3.1.1.13

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

For Function 2.b, the CHANNEL FUNCTIONAL TEST includes the adjustment of the APRM channel to conform to a calibrated flow signal. This ensures that the total loop drive flow signals from the flow unit used to vary the setpoint are appropriately compared to an injection test flow signal to verify the flow signal trip setpoint and, therefore, the APRM Function accurately reflects the required setpoint as a function of flow. If the flow signal trip setpoint is not within the appropriate limit, the APRMs that receive an input from the inoperable flow unit must be declared inoperable.

The 92 day Frequency of SR 3.3.1.1.8 is based on the reliability analysis of Reference 11. The 24 month Frequency of SR 3.3.1.1.13 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 24 month Frequency.

SR 3.3.1.1.9 and SR 3.3.1.1.10

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 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 1130 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.7). 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 moveable links. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 3.3.1.1.10 is based on the assumption of an 18 month calibration interval for Functions 1 through 4, 6, 7, and 9 through 11 in the determination of the magnitude of equipment drift in the setpoint analysis.

A Frequency of 24 months is assumed for Functions 5 and 8 because the position switches that perform these Functions are not susceptible to instrument drift.

Numerous SR 3.3.1.1.9 and SR 3.3.1.1.10 functions are modified by two Notes as identified in Table 3.3.1.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the LTSP. Where a setpoint more conservative than the LTSP is used in the plant surveillance procedures (i.e., nominal trip setpoint, or NTSP), the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the LTSP, then the channel shall be declared inoperable. The second Note also requires that LTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Licensee Controlled Specifications.

SR 3.3.1.1.11

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

BASES

REFERENCES

1. FSAR, Section 7.2.

2. FSAR, Section 5.2.2.

3. Columbia Generating Station Calculation NE-02-94-66, Revision 0, November 13, 1995.

4. FSAR, Section 6.3.3.

5. FSAR, Chapter 15.

6. 10 CFR 50.36(c)(2)(ii).

7. FSAR, Section 15.4.1.

8. NEDO-23842, "Continuous Control Rod Withdrawal in the Startup Range," April 18, 1978.

9. FSAR, Section 15.4.9.

10. Letter, P. Check (NRC) to G. Lainas (NRC), "BWR Scram Discharge System Safety Evaluation," December 1, 1980.

11. NEDO-30851-P-A, "Technical Specification Improvement Analyses for BWR Reactor Protection System," March 1988.

12. Licensee Controlled Specifications Manual.

13. NEDO 32291-A, "System Analyses for Elimination of Selected Response Time Testing Requirements," October 1995.

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.2.7

Performance of a CHANNEL CALIBRATION verifies the performance of the SRM detectors and associated circuitry. The Frequency considers the plant conditions required to perform the test, the ease of performing the test, and the likelihood of a change in the system or component status. The neutron detectors are excluded from the CHANNEL CALIBRATION (Note 1) because they cannot readily be adjusted. The detectors are fission chambers that are designed to have a relatively constant sensitivity over the range, and with an accuracy specified for a fixed useful life.

Note 2 to the Surveillance allows the Surveillance to be delayed until entry into the specified condition of the Applicability. The SR must be performed in MODE 2 within 12 hours of entering MODE 2 with IRMs on Range 2 or below. The allowance to enter the Applicability with the 18 month Frequency not met is reasonable, based on the limited time of 12 hours allowed after entering the Applicability and the inability to perform the Surveillance while at higher power levels. Although the Surveillance could be performed while on IRM Range 3, the plant would not be expected to maintain steady state operation at this power level. In this event, the 12 hour Frequency is reasonable, based on the SRMs being otherwise verified to be OPERABLE (i.e., satisfactorily performing the CHANNEL CHECK) and the time required to perform the Surveillances. There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology.

REFERENCES None.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 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 limits.

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

SR 3.3.2.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. 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. 3).

SR 3.3.2.2.3

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. There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology.

The Frequency is based upon the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

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 the core thermal MCPR Safety Limit (SL).

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 Governor Valve (TGV) Fast Closure, Trip Oil Pressure - Low, or Turbine Throttle Valve (TTV) - Closure. The physical phenomenon involved is that the void reactivity feedback due to a pressurization transient can add positive reactivity at a faster rate than the control rods can add negative reactivity.

The protection functions of the EOC-RPT have been designed to ensure safe operation of the reactor during load rejection transients. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the EOC-RPT, as well as LCOs on other system parameters and equipment performance.

Technical Specifications are required by 10 CFR 50.36 to include LSSSs for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so 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 Safety Limit (SL) is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The Limiting Trip Setpoint (LTSP) is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the LTSP accounts for uncertainties

BASES

BACKGROUND (continued)

in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the LTSP ensures that SLs are not exceeded. Therefore, the LTSP meets the definition of an LSSS (Ref.7).

The Allowable Value specified in SR 3.3.4.1.2.b serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval.

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)." Relying solely on the LTSP to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the LTSP due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the LTSP and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around the LTSP to account for further drift during the next 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).

BASES

BACKGROUND (continued)

However, there is also some point beyond which the channel may not be able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channels and is designated as the Allowable Value.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the LTSP (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

The EOC-RPT instrumentation as described in Reference 1 is comprised of sensors that detect initiation of closure of the TTVs, or fast closure of the TGVs, combined with relays, logic circuits, and fast acting circuit breakers that interrupt the power to each of the recirculation pump motors. The channels include electronic equipment (e.g., trip relays) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel outputs an EOC-RPT signal to the trip logic. When the drive motor 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 TTV - Closure or two TGV 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 drive motor breakers in series per recirculation pump. One trip system trips one of the two drive motor breakers for each recirculation pump and the second trip system trips the other drive motor breaker for each recirculation pump.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The TTV - Closure and the TGV 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 pressurization 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 and 3.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

To mitigate pressurization transient effects, the EOC-RPT must trip the recirculation pumps after initiation of initial closure movement of either the TTVs or the TGVs. 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 THERMAL POWER, as sensed by turbine first stage pressure, is < 30% RTP.

EOC-RPT instrumentation satisfies Criterion 3 of Reference 4.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the EOC-RPT is dependent on the OPERABILITY of the individual instrumentation channel Functions. Each Function must have a required number of OPERABLE channels in each trip system, with their setpoints set within the ~~specified Allowable Value of SR 3.3.4.1.2~~setting tolerance of the LTSP where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Channel OPERABILITY also includes the associated EOC-RPT breakers. Each channel (including the associated EOC-RPT breakers) must also respond within its assumed response time.

Allowable Values are specified for each EOC-RPT Function specified in the LCO. LTSPs and the methodologies for calculation of the as-left and as-found tolerances are described in the Licensee Controlled Specifications~~Nominal trip setpoints are specified in the setpoint calculations~~. The ~~nominal setpoints~~LTSPs are selected to ensure the setpoints remain conservative with respect to the as-found tolerance band ~~do not exceed the Allowable Value~~ between successive CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the LTSP~~Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value~~. LTSPs~~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., TGV

digital-electro hydraulic (DEH) pressure), and when the measured output value of the process parameter exceeds the setpoint, the

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

associated device (e.g., trip relay) 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 account for the remaining instrument errors (e.g., drift). The LTSPs ~~trip setpoints~~ derived in this manner provide adequate protection because all instrumentation uncertainties~~-~~, process effects, calibration tolerance, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.~~and process effects are taken into account.~~

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 Throttle Valve - Closure

Closure of the TTVs 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 TTV - 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 the MCPR SL is not exceeded during the worst case transient.

Closure of the TTVs is determined by measuring the position of each throttle valve. While there are two separate position switches associated with each throttle valve, only the signal from one switch for each TTV is used, with each of the four channels being assigned to a separate trip channel. The logic for the TTV - Closure Function is such that two or more TTVs 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 switches sensing turbine first stage pressure; therefore, opening of the turbine bypass valves may affect this Function. Four channels of TTV - 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 TTV - Closure Allowable Value is selected to detect imminent TTV closure.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.4.1.1

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. 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).

SR 3.3.4.1.2

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 for SR 3.3.4.1.2.b is based upon the assumption of an 18 month calibration interval, in the determination of the magnitude of equipment drift in the setpoint analysis.

A Frequency of 24 months is assumed for SR 3.3.4.1.2.a because the TTV position switches are not susceptible to instrument drift.

SR 3.3.4.1.2.b for the TGV Fast Closure function is modified by two Notes. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the LTSP. Where a setpoint more conservative than the LTSP is used in the plant surveillance procedures (NTSP), 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

channel setting cannot be returned to a setting within the as-left tolerance of the LTSP, then the channel shall be declared inoperable. The second Note also requires that the LTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Licensee Controlled Specifications.

SR 3.3.4.1.3

This SR ensures that an EOC-RPT initiated from the TTV - Closure and TGV Fast Closure, Trip Oil Pressure - Low Functions will not be inadvertently bypassed when THERMAL POWER is ≥ 30% RTP. This involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodologies are incorporated into the actual setpoint. Because main turbine bypass flow can affect this setpoint nonconservatively (THERMAL POWER is derived from first stage pressure), the main turbine bypass valves must remain closed during an in-service calibration at THERMAL POWER ≥ 30% RTP to ensure that the calibration is valid. If any bypass channel's setpoint is nonconservative (i.e., the Functions are bypassed at ≥ 30% RTP either due to open main turbine bypass valves or other reasons), the affected TTV - Closure and TGV Fast Closure, Trip Oil Pressure - Low Functions are considered inoperable. Alternatively, the bypass channel can be placed in the conservative condition (nonbypass). If placed in the nonbypass condition, this SR is met and the channel considered OPERABLE.

The Frequency of 18 months is based on engineering judgement and reliability of the components.

SR 3.3.4.1.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The system functional test of the pump breakers is included as a part of this test, overlapping the LOGIC SYSTEM FUNCTIONAL TEST, to provide complete testing of the associated safety function. Therefore, if a breaker is incapable of operating, the associated instrument channel would also be inoperable.

BASES

REFERENCES

1. FSAR, Section 7.6.1.5.

2. FSAR, Section 5.2.2.

3. FSAR, Sections 15.2.2, 15.2.3, 15.2.5, and 15.2.6.

4. 10 CFR 50.36(c)(2)(ii).

5. GENE-770-06-1-A, "Bases for Changes To Surveillance Test Intervals And Allowed Out-Of-Service Times For Selected Instrumentation Technical Specifications," December 1992.

6. Licensee Controlled Specifications Manual.

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

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 required channels of this LCO.

SR 3.3.4.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. 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 3.3.4.2.3

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. There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology. 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 3.3.4.2.4

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, included as part of this Surveillance, overlaps the LOGIC SYSTEM FUNCTIONAL TEST to provide complete testing of the assumed safety function. Therefore, if a

breaker is incapable of operating, the associated instrument channel(s) would 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.

Technical Specifications are required by 10 CFR 50.36 to include LSSSs for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so 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 Safety Limit (SL) is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The Limiting Trip Setpoint (LTSP) specified in the Licensee Controlled Specifications is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the LTSP accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the LTSP ensures that SLs are not exceeded. Therefore the LTSP meets the definition of an LSSS (Ref. 6).

The Allowable Value specified in Table 3.3.5.1-1 serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval.

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)." Relying solely on the LTSP to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the LTSP due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the LTSP and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around LTSP to account for further drift during the next 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).

However, there is also some point beyond which the channel may not be able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channels and is designated as the Allowable Value.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the LTSP (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

BASES

BACKGROUND (continued)

level is monitored by two redundant differential pressure switches and drywell pressure is monitored by two redundant pressure switches per DG, which are, in turn, connected to two level switch and two pressure switch contacts, respectively. The outputs of the four divisionalized switches (two switches from each of the two variables) are connected to relays whose contacts are connected to a one-out-of-two taken twice logic. The DGs receive their initiation signals from the associated Divisions' ECCS logic (i.e., DG 1 receives an initiation signal from Division 1 ECCS (LPCS and LPCI A); DG 2 receives an initiation signal from Division 2 ECCS (LPCI B and LPCI C); and DG 3 receives an initiation signal from Division 3 ECCS (HPCS)). The DGs can also be started manually from the control room and locally in 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 an ECCS initiation signal, each DG is automatically started, is ready to load in approximately 15 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 Reference 4. Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The OPERABILITY of the ECCS instrumentation is dependent ~~and~~ upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints set within the setting tolerance of the specified ~~Allowable Values~~LTSPs, where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each ECCS injection/spray subsystem must also respond within its assumed response time. Table 3.3.5.1-1, footnote (b), is added to show that certain ECCS instrumentation Functions are also required to be OPERABLE to perform DG initiation.

Allowable Values are specified for each ECCS Function specified in ~~the Table~~Table 3.3.5.1-1. LTSPs and the methodologies for calculation of the as-left and as-found tolerances are described in the Licensee Controlled Specifications.~~ Nominal trip setpoints are specified in the setpoint calculations.~~ The LTSPs ~~nominal setpoints~~ are selected to ensure that the setpoints remain conservative with respect to the as-found tolerance band ~~do not exceed the Allowable Value~~ between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the LTSP. LTSPs ~~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 relay) 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 ~~process and all instrument uncertainties, except drift and calibration. The trip setpoints are derived from the analytic limits, corrected for process and all instrument uncertainties, including drift and calibration.~~ calibration, process, and some of the instrument errors. The LTSPs are then determined, accounting for the remaining instrument errors (e.g., drift). The ~~trip setpoints~~LTSPs derived in this manner provide adequate protection because ~~all~~ instrumentation uncertainties ~~and process effects are taken into account~~, 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. Some functions have both an upper and lower analytic limit that must be evaluated. The Allowable Values and the trip setpoints are derived from both an upper and lower analytic limit using the methodology described above. Due to the upper and lower analytic limits, Allowable Values of these Functions appear to incorporate a range. However, the upper and

lower Allowable Values are unique, with each Allowable Value associated with one unique analytic limit and trip setpoint.

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.

BASES

ACTIONS (continued)

H.1

With any Required Action and associated Completion Time not met, the associated feature(s) may be incapable of performing the intended function and the supported feature(s) associated with the inoperable untripped channels must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

As noted at the beginning of the SRs, the SRs for each ECCS instrument~~ation~~ Function are found in the SRs column of Table 3.3.5.1-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours as follows: (a) for Functions 3.c, 3.f, and 3.g; and (b) for Functions other than 3.c, 3.f, and 3.g provided the associated Function or redundant Function maintains ECCS initiation capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 5) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the ECCS will initiate when necessary.

SR 3.3.5.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK 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)

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 channel will perform the intended function. 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, SR 3.3.5.1.4, and SR 3.3.5.1.5

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 Frequencies are based upon the assumption of a 92 day, 18 month, or 24 month calibration interval, as applicable, in the determination of the magnitude of equipment drift in the setpoint analysis. For SR 3.3.5.1.3 there is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology.

SR 3.3.5.1.4 for designated functions is modified by two Notes as identified in Table 3.3.5.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective

Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the

BASES

SURVEILLANCE REQUIREMENTS (continued)

channel be within the as-left tolerance of the LTSP. Where a setpoint more conservative than the LTSP is used in the plant surveillance procedures (i.e., nominal trip setpoint, or NTSP), the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the LTSP, then the channel shall be declared inoperable.

The second Note also requires that LTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Licensee Controlled Specifications

SR 3.3.5.1.6

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.1, LCO 3.5.2, LCO 3.8.1, and LCO 3.8.2 overlaps this Surveillance to provide complete testing of the assumed safety function.

The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage (except for Division 3 which can be tested in any operational condition) and the potential for unplanned transients if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 24 month Frequency.

REFERENCES

1. FSAR, Section 6.2.
2. FSAR, Section 6.3.
3. FSAR, Chapter 15.
4. 10 CFR 50.36(c)(2)(ii).
5. NEDC-30936-P-A, "BWR Owners' Group Technical Specification Improvement Analyses for ECCS Actuation Instrumentation, Part 2," December 1988.
6. Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation."

B 3.3 INSTRUMENTATION

B 3.3.5.2 Reactor Core Isolation Cooling (RCIC) System Instrumentation

BASES

BACKGROUND

The purpose of the RCIC System instrumentation is to initiate actions to ensure adequate core cooling when the reactor vessel is isolated from its primary heat sink (the main condenser) and normal coolant makeup flow from the Reactor Feedwater System is insufficient or unavailable, such that RCIC System initiation occurs and maintains sufficient reactor water level 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.

Technical Specifications are required by 10 CFR 50.36 to include LSSSs for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so 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 protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The Limiting Trip Setpoint (LTSP) specified in the Licensee Controlled Specifications is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the LTSP accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the LTSP ensures that SLs are not exceeded. Therefore the LTSP meets the definition of an LSSS (Ref. 3).

BASES

Background (continued)

The Allowable Value specified in Table 3.3.5.2-1 serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval.

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)." Relying solely on the LTSP to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the LTSP due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the LTSP and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around LTSP to account for further drift during the next 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).

However, there is also some point beyond which the channel may not be able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channels and is designated as the Allowable Value.

BASES

Background (continued)

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the LTSP (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

The RCIC System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of Reactor Vessel Water Level - Low Low, Level 2. The variable is monitored by four differential pressure switches. The switch contacts are arranged in a one-out-of-two taken twice logic arrangement. The logic can also be initiated by use of a manual switch and push button, whose two contacts are arranged in a two-out-of-two logic. 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 is closed on a RCIC initiation signal to allow full system flow.

The RCIC System also monitors the water levels in the condensate storage tanks (CST) since this is the initial source 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 valve from the suppression pool 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 switches 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 (one-out-of-two 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.

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 valve closes (the injection valve also closes due to the closure of the steam supply valve). The RCIC System restarts if vessel level again drops to the low level initiation point (Level 2).

BASES

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. Based on its contribution to the reduction of overall plant risk, however, the RCIC System, and therefore its instrumentation, meets Criterion 4 of Reference 1. Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy

The OPERABILITY of the RCIC System instrumentation is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.2-1. Each Function must have a required number of OPERABLE channels with their setpoints set within the setting tolerance of the specified ~~Allowable Values~~LTSPs, where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable Values are specified for each RCIC System instrumentation Function specified in ~~the Table~~ Table 3.3.5.2-1. LTSPs and the methodologies for calculation of the as-left and as-found tolerances are described in the Licensee Controlled Specifications. ~~Nominal trip setpoints are specified in the setpoint calculations.~~ The LTSPs ~~nominal setpoints~~ are selected to ensure that the setpoints ~~do not exceed the Allowable Value~~ remain conservative with respect to the as-found tolerance band between CHANNEL CALIBRATIONS. ~~Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.~~ After each calibration the trip setpoint shall be left within the as-left band around the LTSP. LTSPs~~Trip setpoints are~~ 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 relay) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the 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). ~~process and all instrument uncertainties, except drift and calibration. The trip setpoints are derived from the analytic limits, corrected for process and all instrument uncertainties, including drift and calibration.~~ The LTSPs~~trip setpoints~~ derived in this manner provide adequate protection because ~~all~~ instrumentation uncertainties, process effects, calibration tolerances,

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

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 metholology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

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.

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four differential pressure switches that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is set high enough such that for complete loss of feedwater flow, the RCIC System flow with high pressure core spray assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

BASES

ACTIONS (continued)

cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1, which performs the intended function of the channel (shifting the suction source to the suppression pool). Alternatively, Required Action D.2.2 allows the manual alignment of the RCIC suction to the suppression pool, which also performs the intended function. If Required Action D.2.1 or D.2.2 is performed, measures should be taken to ensure that the RCIC System piping remains filled with water. If it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the RCIC suction piping), Condition E must be entered and its Required Action taken.

E.1

With any Required Action and associated Completion Time not met, the RCIC System may be incapable of performing the intended function, and the RCIC System must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RCIC System instrument~~ation~~ Function are found in the SRs column of Table 3.3.5.2-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 4; and (b) for up to 6 hours for Functions 1 and 3 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. 2) 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 a CHANNEL CHECK once every 12 hours is the qualitative assessment, by observation, of channel behavior during operation. This assessment is the comparison, where possible, of the channel status or indication to the status or indication of an independent instrument measuring the same parameter. Significant deviations

BASES

SURVEILLANCE REQUIREMENTS (continued)

between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A significant deviation could indicate gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

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

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. 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 2.

SR 3.3.5.2.3

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 3.3.5.2.3 is modified by two Notes as identified in Table 3.3.5.2-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will

BASES

SURVEILLANCE REQUIREMENTS (continued)

continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the LTSP. Where a setpoint more conservative than the LTSP is used in the plant surveillance procedures (i.e., nominal trip setpoint, or NTSP), the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the LTSP, then the channel shall be declared inoperable. The second Note also requires that LTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Licensee Controlled Specifications.

SR 3.3.5.2.4

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 24 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 24 month Frequency.

REFERENCES

1. 10 CFR 50.36(c)(2)(ii).

2. GENE-770-06-2-A, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," December 1992.

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.6.1.1

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

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency is based on 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 3.3.6.1.2 and SR 3.3.6.1.3

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The 92 day Frequency of SR 3.3.6.1.2 is based on reliability analysis described in References 10 and 11. The 184 day Frequency of SR 3.3.6.1.3 is based on engineering judgment and the reliability of the components.

SR 3.3.6.1.4 and SR 3.3.6.1.5

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. There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology.

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 on 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 3.3.6.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based upon the reliability analysis of References 4 and 5.

SR 3.3.6.2.3

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. There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology. 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 3.3.6.2.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required isolation logic for a specific channel. The system functional testing, performed on SCIVs and the SGT System in LCO 3.6.4.2 and LCO 3.6.4.3, respectively, overlaps this Surveillance to provide complete testing of the assumed safety function.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.7.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. 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 References 5, 6, and 7.

SR 3.3.7.1.3

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. There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology. 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 3.3.7.1.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.7.3, "Control Room Emergency Filtration (CREF) System," overlaps this Surveillance to provide complete testing of the assumed safety function.

The 24 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 24 month Frequency.

BASES

SURVEILLANCE REQUIREMENTS

As noted at the beginning of the SRs, the SRs for each LOP Instrumentation Function are located in the SRs column of Table 3.3.8.1-1.

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 2 hours provided the associated Function maintains initiation capability. Initiation capability is maintained provided the following can be initiated by the Function (i.e., Loss of Voltage and Degraded Voltage) for two of the three DGs and 4.16 kV ESF buses: DG start, disconnect from the offsite power source, transfer to the alternate offsite power source, if available, DG output breaker closure, and load shed. Upon completion of the Surveillance, or expiration of the 2 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken.

SR 3.3.8.1.1

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. Any setpoint adjustments shall be consistent with the assumptions of the current plant specific setpoint methodology.

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

SR 3.3.8.1.2 and SR 3.3.8.1.3

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. There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations, consistent with the plant specific setpoint methodology.

The Frequencies are based on the assumption of an 18 month or 24 month calibration interval, as applicable, in the determination of the magnitude of equipment drift in the setpoint analysis.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The CHANNEL FUNCTIONAL TEST is only required to be performed while the plant is in a condition in which the loss of the RPS bus will not jeopardize operation (the design of the system is such that the power source must be removed from service to conduct the Surveillance). In addition, if the plant will be shutdown in MODE 4 or 5 for an extended period of time it is acceptable to postpone the Surveillance until the plant is ready to go back to MODE 2 or 3. Performance of the SR immediately after shutdown would jeopardize the reliability of shutdown cooling during a time of high decay heat load. However, prior to restart it is reasonable to perform the surveillance to provide further assurance of the operability of equipment before returning to MODE 1. The 24 hours is intended to indicate an outage of sufficient duration to allow for scheduling and proper performance of the Surveillance if it has not been performed in the last 184 days. The 184 day Frequency and the Note in the Surveillance are based on guidance provided in Generic Letter 91-09 (Ref. 3).

SR 3.3.8.2.2

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. There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found setting are consistent with those established by the setpoint methodology. 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 a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.8.2.3

Performance of a system functional test demonstrates a required system actuation (simulated or actual) signal. The logic of the system will automatically trip open the associated power monitoring assembly circuit breaker. Only one signal per power monitoring assembly is required to be tested. This Surveillance overlaps with the CHANNEL CALIBRATION to provide complete testing of the safety function. The system functional test of the Class 1E circuit breakers is included as part of this test to provide complete testing of the safety function. If the breakers are incapable of operating, the associated electric power monitoring assembly would be inoperable.

Columbia Generating Station

Revised (Clean) Technical Specification Pages

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 3.3.1.1.3 SR 3.3.1.1.5 SR 3.3.1.1.6 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 122/125 divisions of full scale
	5[a]	3	H	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 122/125 divisions of full scale
b. Inop	2	3	G	SR 3.3.1.1.3 SR 3.3.1.1.14	NA
	5[a]	3	H	SR 3.3.1.1.4 SR 3.3.1.1.14	NA
2. Average Power Range Monitors					
a. Neutron Flux - High, Setdown	2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.3 SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.9 SR 3.3.1.1.14	≤ 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 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.11 SR 3.3.1.1.14	≤ 0.58 W + 62% RTP and ≤ 114.9% RTP

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

(b) Reserved

(c) Reserved

(d) 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.

(e) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 120% RTP
d. Inop	1,2	2	G	SR 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.14	NA
3. Reactor Vessel Steam Dome Pressure - High	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.10[(d)(e)] SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 1079 psig
4. Reactor Vessel Water Level - Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.10[(d)(e)] SR 3.3.1.1.14 SR 3.3.1.1.15	≥ 9.5 inches
5. Main Steam Isolation Valve - Closure	1	8	F	SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 12.5% closed
6. Primary Containment Pressure - High	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.10[(d)(e)] SR 3.3.1.1.14	≤ 1.88 psig

(d) 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.

(e) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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. Transmitter/Trip Unit	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 529 ft 9 inches elevation
	5[a]	2	H	SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.14	≤ 529 ft 9 inches elevation
b. Float Switch	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.14	≤ 529 ft 9 inches elevation
	5[a]	2	H	SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.14	≤ 529 ft 9 inches elevation
8. Turbine Throttle Valve - Closure	≥ 30% RTP	4	E	SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.12 SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 7% closed
9. Turbine Governor Valve Fast Closure, Trip Oil Pressure - Low	≥ 30% RTP	2	E	SR 3.3.1.1.8 SR 3.3.1.1.10[d][e] SR 3.3.1.1.12 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ 1000 psig

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

(d) 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.

(e) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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
10. Reactor Mode Switch - Shutdown Position	1,2	2	G	SR 3.3.1.1.13 SR 3.3.1.1.14	NA
	5[a]	2	H	SR 3.3.1.1.13 SR 3.3.1.1.14	NA
11. Manual Scram	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.14	NA
	5[a]	2	H	SR 3.3.1.1.4 SR 3.3.1.1.14	NA

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

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.3.4.1.2.a	Perform CHANNEL CALIBRATION. The Allowable Value shall be: TTV - Closure: ≤ 7% closed.	24 months
	----------NOTE---------- 1. For the TGV 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 TGV 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications. ----------	18 months
SR 3.3.4.1.2.b	Perform CHANNEL CALIBRATION. The Allowable Value shall be: TGV Fast Closure, Trip Oil Pressure - Low: ≥ 1000 psig.	
SR 3.3.4.1.3	Verify TTV – Closure and TGV Fast Closure, Trip Oil Pressure – Low Functions are not bypassed when THERMAL POWER is ≥ 30% RTP.	18 months

Table 3.3.5.1-1 (page 1 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
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3, 4[a], 5[a]	2[b]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -142.3 inches
b. Drywell Pressure – High	1, 2, 3	2[b]	B	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≤ 1.88 psig
c. LPCS Pump Start - LOCA Time Delay Relay	1, 2, 3, 4[a], 5[a]	1[e]	C	SR 3.3.5.1.5[f][g] SR 3.3.5.1.6	≥ 8.53 seconds and ≤ 10.64 seconds
d. LPCI Pump A Start - LOCA Time Delay Relay	1, 2, 3, 4[a], 5[a]	1[e]	C	SR 3.3.5.1.5[f][g] SR 3.3.5.1.6	≥ 17.24 seconds and ≤ 21.53 seconds
e. LPCI Pump A Start - LOCA/LOOP Time Delay Relay	1, 2, 3, 4[a], 5[a]	1	C	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.6	≥ 3.04 seconds and ≤ 6.00 seconds
f. Reactor Vessel Pressure - Low (Injection Permissive)	1, 2, 3	1 per valve	C	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 psig and ≤ 492 psig
	4[a], 5[a]	1 per valve	B	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 psig and ≤ 492 psig

(a) When associated subsystem(s) are required to be OPERABLE.

(b) Also required to initiate the associated diesel generator (DG).

(e) Also supports OPERABILITY of 230 kV offsite power circuit pursuant to LCO 3.8.1 and LCO 3.8.2.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

Table 3.3.5.1-1 (page 2 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
1. LPCI and LPCS Subsystems					
g. LPCS Pump Discharge Flow - Low (Minimum Flow)	1, 2, 3, 4[a], 5[a]	1	E	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 668 gpm and ≤ 1067 gpm
h. LPCI Pump A Discharge Flow - Low (Minimum Flow)	1, 2, 3, 4[a], 5[a]	1	E	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 605 gpm and ≤ 984 gpm
i. Manual Initiation	1, 2, 3, 4[a], 5[a]	2	C	SR 3.3.5.1.6	NA
2. LPCI B and LPCI C Subsystems					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3, 4[a], 5[a]	2[b]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -142.3 inches
b. Drywell Pressure - High	1, 2, 3	2[b]	B	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≤ 1.88 psig
c. LPCI Pump B Start - LOCA Time Delay Relay	1, 2, 3, 4[a], 5[a]	1[e]	C	SR 3.3.5.1.5[f][g] SR 3.3.5.1.6	≥ 17.24 seconds and ≤ 21.53 seconds
d. LPCI Pump C Start - LOCA Time Delay Relay	1, 2, 3, 4[a], 5[a]	1[e]	C	SR 3.3.5.1.5[f][g] SR 3.3.5.1.6	≥ 8.53 seconds and ≤ 10.64 seconds

(a) When associated subsystem(s) are required to be OPERABLE.

(b) Also required to initiate the associated DG.

(e) Also supports OPERABILITY of 230 kV offsite power circuit pursuant to LCO 3.8.1 and LCO 3.8.2.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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 Start - LOCA/LOOP Time Delay Relay	1, 2, 3, 4[a], 5[a]	1	C	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.6	≥ 3.04 seconds and ≤ 6.00 seconds
f. Reactor Vessel Pressure - Low (Injection Permissive)	1, 2, 3,	1 per valve	C	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 psig and ≤ 492 psig
	4[a], 5[a]	1 per valve	B	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 psig and ≤ 492 psig
g. LPCI Pumps B & C Discharge Flow - Low (Minimum flow)	1, 2, 3, 4[a], 5[a]	1 per pump	E	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 605 gpm and ≤ 984 gpm
h. Manual Initiation	1, 2, 3, 4[a], 5[a]	2	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 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -58 inches
b. Drywell Pressure - High	1, 2, 3	4[b]	B	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≤ 1.88 psig

(a) When associated subsystem(s) are required to be OPERABLE.

(b) Also required to initiate the associated DG.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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					
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 3.3.5.1.4[f][g] SR 3.3.5.1.6	≤ 56.0 inches
d. Condensate Storage Tank Level - Low	1, 2, 3, 4[c], 5[c]	2	D	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 448 ft 1 inch elevation
e. Suppression Pool Water Level - High	1, 2, 3	2	D	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≤ 466 ft 11 inches elevation
f. HPCS System Flow Rate - Low (Minimum Flow)	1, 2, 3, 4[a], 5[a]	1	E	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 1200 gpm and ≤ 1512 gpm
g. Manual Initiation	1, 2, 3, 4[a], 5[a]	2	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], 3[d]	2	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -142.3 inches
b. ADS Initiation Timer	1, 2[d], 3[d]	1	G	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.6	≤ 115.0 seconds

(a) When associated subsystem(s) are required to be OPERABLE.

(c) 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.

(d) With reactor steam dome pressure > 150 psig.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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					
c. Reactor Vessel Water Level - Low, Level 3 (Permissive)	1, 2[d], 3[d]	1	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 9.5 inches
d. LPCS Pump Discharge Pressure - High	1, 2[d], 3[d]	2	G	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 119 psig and ≤ 171 psig
e. LPCI Pump A Discharge Pressure - High	1, 2[d], 3[d]	2	G	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 116 psig and ≤ 134 psig
f. Accumulator Backup Compressed Gas System Pressure - Low	1, 2[d], 3[d]	3	F	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 151.4 psig
g. Manual Initiation	1, 2[d], 3[d]	4	G	SR 3.3.5.1.6	NA

(d) With reactor steam dome pressure > 150 psig.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2[d], 3[d]	2	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ -142.3 inches
b. ADS Initiation Timer	1, 2[d], 3[d]	1	G	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.6	≤ 115.0 seconds
c. Reactor Vessel Water Level - Low, Level 3 (Permissive)	1, 2[d], 3[d]	1	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 9.5 inches
d. LPCI Pumps B & C Discharge Pressure - High	1, 2[d], 3[d]	2 per pump	G	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ 116 psig and ≤ 134 psig
e. Accumulator Backup Compressed Gas System Pressure - Low	1, 2[d], 3[d]	3	F	SR 3.3.5.1.2 SR 3.3.5.1.4[f][g] SR 3.3.5.1.6	≥ 151.4 psig
f. Manual Initiation	1, 2[d], 3[d]	4	G	SR 3.3.5.1.6	NA

(d) With reactor steam dome pressure > 150 psig.

(f) 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.

(g) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.

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	≥ -58 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[(a)(b)] SR 3.3.5.2.4	≤ 56 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	≥ 447 ft 7 inches elevation
4. Manual Initiation	2	C	SR 3.3.5.2.4	NA

(a) 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.

(b) 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 (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and the as-left tolerances are specified in the Licensee Controlled Specifications.