Exelon.
Nuclear

Exelon Nuclear
200 Exelon Way
Kennett Square, PA 19348

www.exeloncorp.com

10 CFR 50.90

February 27, 2004

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

Peach Bottom Atomic Power Station, Units 2 and 3
Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: License Amendment Request
Activation of the Trip Outputs of the Oscillation Power Range Monitor
Portion of the Power Range Neutron Monitoring System

References:
(1) NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," dated October 1995

(2) NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," Supplement 1, dated November 1997

(3) Letter from Keith R. Jury (Exelon Generation Company, LLC) to U. S. NRC, "Schedule for Completing Actions to Implement Long-Term Stability Solution," dated December 19, 2003

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (Exelon), hereby requests a change to the Technical Specifications (TS), Appendix A, of Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, respectively.

The proposed change to TS supports the activation of the trip outputs of the previously-installed Oscillation Power Range Monitor (OPRM) portion of the Power Range Neutron Monitoring (PRNM) system. Specifically, this proposed change will revise TS Sections 3.3.1.1, "Reactor Protection System Instrumentation" and 3.4.1, "Recirculation Loops Operating Reporting Requirements" and their associated TS Bases, and TS Section 5.6.5, "Core Operating Limits Report (COLR)." In addition, the proposed change deletes the Interim Corrective Action (ICA) requirements from the Recirculation Loops Operating Technical Specifications.

Exelon has been following the industry approach for implementation/activation of the OPRM trip function in accordance with NRC approved Licensing Topical Reports. In addition, Exelon has been reviewing and incorporating industry operating experience, as appropriate, regarding OPRM trip activations at other utilities.

A001

Information supporting this License Amendment Request (LAR) is contained in Attachment 1 to this letter. The proposed changes to the PBAPS Unit 2 and Unit 3 TS are contained in Attachment 2 (marked-up TS pages) and Attachment 3 (typed TS pages). In addition, Attachment 4 provides plant-specific responses required by the generic NRC approved General Electric (GE) Nuclear Measurement Analysis and Control (NUMAC) PRNM Licensing Topical Report (LTR) NEDC-32410P-A (including Supplement 1), "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," (References 1 and 2). Attachment 4 also provides descriptions and justifications for each deviation from the NUMAC PRNM LTRs, and includes a discussion of changes not addressed in the LTR.

Exelon has concluded that the proposed changes present no significant hazards consideration under the standards set forth in 10 CFR 50.92(c).

Exelon requests approval of the proposed amendments by February 27, 2005. Once approved, the amendments shall be implemented within 60 days. However, as indicated in the schedule provided in Reference 3, the OPRM portion of the PRNM system will be declared operational on both Units 2 and 3 following NRC approval of this license amendment request, but no earlier than 30 days following the end of the next refueling outage for PBAPS, Unit 2, currently scheduled to be completed by the end of September, 2004.

There are no commitments contained within this letter.

The proposed changes have been reviewed by the Plant Operations Review Committee and approved by the Nuclear Safety Review Board.

We are notifying the State of Pennsylvania of this application for changes to the TS and Operating License by transmitting a copy of this letter and its attachments to the designated State Official.

If you have any questions or require additional information, please contact Glenn Stewart at 610-765-5529.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully,

Executed on 02-27-04

Michael P. Gallagher
Director, Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachments:

1. Evaluation of the Proposed Changes
2. Technical Specifications and Bases Markup Pages
3. Technical Specifications and Bases Typed Pages
4. Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

cc:	Regional Administrator - NRC Region I	w/ attachments
	NRC Senior Resident Inspector - Peach Bottom Atomic Power Station	"
	NRC Project Manager, NRR - Peach Bottom Atomic Power Station	"
	Director, Bureau of Radiation Protection - Pennsylvania Department of Environmental Protection	"

ATTACHMENT 1

LICENSE AMENDMENT REQUEST

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3
DOCKET NOS. 50-277 AND 50-278

EVALUATION OF THE PROPOSED CHANGES

Subject: Activation of the Trip Outputs of the Oscillation Power Range Monitor Portion of the Power Range Neutron Monitoring System

EVALUATION OF PROPOSED CHANGES

1.0 DESCRIPTION

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (Exelon), requests a change to the Technical Specifications (TS), Appendix A, of Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, respectively.

The proposed change to TS supports the activation of the trip outputs of the previously-installed Oscillation Power Range Monitor (OPRM) portion of the Power Range Neutron Monitoring (PRNM) system. Concurrent with the OPRM TS changes, some of the Average Power Range Monitor (APRM) related TS Bases will be changed to clarify issues that have arisen during the time since the installation of the PRNM system.

Exelon has been following the industry approach for implementation/activation of the OPRM trip function in accordance with NRC approved Licensing Topical Reports. In addition, Exelon has been reviewing and incorporating industry operating experience, as appropriate, regarding OPRM trip activations at other utilities.

As indicated in the schedule provided in Reference 1, implementation of this phase of the modification is planned for both Units 2 and 3 following NRC approval of this license amendment request, but no earlier than 30 days following the end of the next refueling outage for PBAPS, Unit 2, currently scheduled to be completed by the end of September, 2004.

The proposed changes to the PBAPS Unit 2 and Unit 3 TS are contained in Attachment 2 (marked-up TS pages) and Attachment 3 (typed TS pages). In addition, Attachment 4 provides plant-specific responses required by the generic NRC approved General Electric (GE) Nuclear Measurement Analysis and Control (NUMAC) PRNM Licensing Topical Report (LTR) NEDC-32410P-A (including Supplement 1), "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," (References 2 and 3). Attachment 4 also provides descriptions and justifications for each deviation from the NUMAC PRNM LTRs, and includes a discussion of changes not addressed in the LTR.

This Attachment 1 provides a discussion and description of the proposed TS changes, a technical analysis, a regulatory analysis, including information supporting a finding of No Significant Hazards Consideration, and information supporting an Environmental Assessment.

2.0 PROPOSED CHANGES

This proposed change revises TS Sections 3.3.1.1, "Reactor Protection System [*RPS*] Instrumentation" and 3.4.1, "Recirculation Loops Operating Reporting Requirements" and their associated TS Bases, and TS Section 5.6.5, "Core Operating Limits Report (COLR)." In addition, the proposed change deletes the Interim Corrective Action (ICA) requirements from the Recirculation Loops Operating Technical Specifications. A detailed description of the proposed TS changes is provided below.

EVALUATION OF PROPOSED CHANGES

A. RPS Instrumentation, Section 3.3.1.1, APRM Related Functions

A.1 Functions

This modification has no impact on any of the previously installed PRNM functions. The OPRM monitoring function is currently installed and fully functional but is not connected to the associated RPS or trip annunciator circuitry. The only change in this modification is connecting the existing OPRM trip outputs in series with the APRM trip outputs.

A new OPRM Upscale Function 2.f will be added.

A.2 Minimum Number of Operable OPRM Channels

The required minimum number of operable OPRM channels will be three channels.

The OPRM Upscale Function will have operability requirements associated with OPRM cells of a minimum of 2 operable Local Power Range Monitors (LPRMs) per cell for an OPRM cell to be operable and a minimum of 25 OPRM cells per OPRM channel for channel operability. The specific numerical values for these two parameters are identified as "plant specific" in the NUMAC PRNM LTRs.

A.3 Applicable Modes of Operation

The OPRM Instability Detect-and-Suppress Trip (new OPRM Upscale Function) is a safety-related function and will be required to be operable only with Reactor Power ≥ 25% Reactor Thermal Power (RTP).

A.4 Channel Check Surveillance Requirements (SRs)

The new OPRM Upscale Function will have a Channel Check requirement, SR 3.3.1.1.1, of once per 12 hours.

A.5 Channel Functional Test Surveillance Requirements

The new OPRM Upscale Function will have a Channel Functional Test requirement, SR 3.3.1.1.11, with a frequency of every 184 days (6 months). The Channel Functional Test includes both the OPRM channels and the 2-out-of-4 voter channels plus the flow input function, excluding the flow transmitters. Note 2 of SR 3.3.1.1.11 will be modified to show that the flow transmitter exclusion also applies to Function 2.f. A notation will be added to the SR 3.3.1.1.11 Bases to clarify that the actual OPRM Upscale trip auto-enable setpoints are confirmed by SR 3.3.1.1.19 (a new SR added to support the OPRM Upscale function).

A.6 Channel Calibration Surveillance Requirements

The new OPRM Upscale Function will have a Channel Calibration requirement, SR 3.3.1.1.12, with a frequency of every 24 months, and an LPRM calibration requirement, SR 3.3.1.1.8, with a frequency of every 1000 MWD/T. Channel Calibration of the recirculation loop flow channel will be included in the SR 3.3.1.1.12 Channel Calibration of this function (flow is an input to the auto-enable logic of the OPRM Upscale function), the same as the current requirement for APRM Simulated Thermal Power – High Function at 24-month intervals. The only change required for OPRM Upscale is to modify Note 3 of SR 3.3.1.1.12 to include Function 2.f. The flow channel calibration requirements associated with the OPRM Upscale function are the same as those previously added for the APRM Simulated Thermal Power – High Function.

A.7 Response Time Testing Surveillance Requirements

The new OPRM Upscale Function will have no Response Time Testing Surveillance Requirement. [Note: The NUMAC PRNM LTR describes response time testing as including the output relays for the 2-out-of-4 voter; however, the original PRNM installation licensing submittal justified response time testing from the PRNM panel terminals for PBAPS. This was based on the current response time testing commitments for PBAPS. The OPRM implementation is consistent with that justification. Since the OPRM Upscale trip outputs are in series with the APRM trip outputs, no change is required to the 2-out-of-4 Voter Function response time testing requirements.]

A.8 Logic System Functional Testing (LSFT) Surveillance Requirements

The new OPRM Upscale Function 2.f, similar to existing Functions 2.a, 2.b, 2.c, and 2.d, will have no LSFT Surveillance Requirement. However, the SR 3.3.1.1.17 Bases description, applicable to Function 2.e, will be modified to add "OPRM" to show that the simulated trip conditions must include the OPRM logic as well as the APRM High/Inop logic. This clarification is required because the 2-out-of-4 Voter, Function 2.e, votes the OPRM trip independently from the APRM High/Inop trip. The Bases description for Function 2.e will be modified to document the independent voting of the OPRM and APRM trips. In addition, some Bases discussion will be added to clarify that the 2-out-of-4 Voter Function does not need to be declared inoperable if plant interface portions of the 2-out-of-4 Logic Module that are not necessary to perform the 2-out-of-4 Voter Function are found to be inoperable.

A.9 Verify OPRM auto-enable setpoints

The new OPRM Upscale Function will have a new surveillance requirement, SR 3.3.1.1.19, to confirm, with a frequency of every 24 months, that the OPRM auto-enable setpoints are correctly set.

A.10 Limiting Conditions for Operation (LCO) Conditions and Actions

LCO Condition A, and the associated Required Actions, apply to the OPRM Upscale function the same as for the APRM Functions 2.a, 2.b., 2.c and 2.d. Required Action A.2 and Condition B do not apply to Function 2.f. Therefore, the "Notes" for Action A.2 and Condition B will be modified to add "2.f" to the functions excepted.

New Conditions I and J with associated Required Actions and Completion Times will be defined. These new Conditions apply when the OPRM channel Condition A Required Actions and associated Completion Times are not met. Required Action I.1 allows a Completion Time of 12 hours to initiate alternate methods of detecting and suppressing instabilities. Required Action I.2 allows a Completion time of 120 days to restore the

EVALUATION OF PROPOSED CHANGES

OPRM Operability. Condition J applies if the Completion Times for Required Actions I.1 or I.2 are not met. The Required Action J.1 will allow 4 hours to reduce power to less than 25 percent.

The alternate method for detection and suppression required by Required Action I.1 is intended to be temporary re-establishment of the ICAs, but controlled by plant procedures rather than Technical Specifications. An exception to LCO 3.0.4 has been noted for Required Action I.2. This exception note is not discussed in the NUMAC PRNM LTR. This exception allows restarting the plant in the event of a shutdown during the 120-day Completion Time for Required Action I.2, consistent with the original intent of the LTR which was to allow normal plant operations to continue during the recovery time from a hypothesized design problem with the Option III algorithms or equipment.

A.11 Setpoints and Allowable Values

There are no allowable values associated with the OPRM Upscale Function. The OPRM period based detection algorithm (PBDA) upscale trip setpoints are determined based on the Option III licensing methodology developed by the Boiling Water Reactor Owner's Group (BWROG) and described in NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," (Reference 4) previously approved by the NRC. The PBDA trip setpoints will be documented in the COLR. There are also TS related setpoints for the auto-enable (not-bypassed) region, which are established as nominal setpoints as described in the TS Bases markup, and defined in SR 3.3.1.1.19. The minimum operable OPRM cells setpoint (25) is defined by GE analyses based on PBAPS's selection of the OPRM cell assignments and a minimum of 2 operable LPRMs per cell. The setpoint is established to conform to the licensing bases defined in NEDO-31960-A (including Supplement 1), "BWR Owner's Group Long-Term Stability Solutions Licensing Methodology," (References 5 and 6) and NEDO-32465-A. This setpoint, along with the PBAPS selection of a minimum of 2 LPRMs per cell, is documented in the TS Bases. The PBDA algorithm includes several "tuning" parameters. These are established in accordance with PBAPS procedures as part of the system setup, and are not defined in Technical Specifications.

Finally, there are also setpoints for the "defense-in-depth" algorithms discussed in the OPRM Upscale Function description in the TS Bases markup. These are treated as nominal setpoints based on qualitative studies performed by the BWROG and documented in Appendix A of NEDO-32465-A and NEDO-31960-A (including Supplement 1). Use of these LTRs as a basis for establishing these defense-in-depth settings is consistent with the approach used by previous Licensees for activating the OPRM trip function. These algorithms are not credited in the safety analysis and their settings are controlled by PBAPS procedures. A note will be added to Table 3.3.1.1-1 for the OPRM Upscale Function to state that the PBDA setpoint limits are defined in the COLR.

Some PRNM TS Bases changes, beyond those required for inclusion of the OPRM Upscale Function, are being implemented to clarify system requirements. Specifically, text has been added to the Bases discussion for Function 2.b (APRM Simulated Thermal Power – High) to clarify the basis for the "ΔW" flow offset, applicable to single loop operation (SLO). A minor change is being made to note (b) in Table 3.3.1.1-1 to show the SLO equation as "0.65(W–ΔW) + 63.7%" instead of "0.65W + 63.7% – 0.65ΔW". The change, while mathematically equivalent, states the equation in the same form that is actually implemented in the equipment. This change is being made to clarify the system's calculation of this setpoint.

Bases discussion for Function 2.e (2-out-of-4 Voter) has been added to clarify that inoperability of those portions of the 2-out-of-4 Logic Module that do not affect the voter function does not require that the voter function be declared inoperable. The Bases discussion for SR 3.3.1.1.12 has been modified to clarify that the SR applies also to the recirculation flow loop, and includes once-per-cycle correlation adjustments between drive flow and core flow measurements.

B. Recirculation Loops Operating, Section 3.4.1

B.1 Functions

This modification has no impact on any of the recirculation loop functions. It does remove TS required prohibitions against operating in the "restricted region". These prohibitions and other restrictions were implemented as part of the "Interim Corrective Actions" (ICAs). Present TS Section 3.4.1 requirements to operate outside the restricted region, and associated surveillances and actions will be deleted. Surveillance requirements related to monitoring LPRM and APRM indications for oscillations, will also be deleted. TS requirements not related to ICAs will be retained.

B-1 LCO Conditions and Actions

LCO restrictions on operating region (references to Figure 3.4.1-1) will be deleted from the LCO both for two loop and single loop operating conditions. Conditions A, B and C and their associated Required Actions, and Required Action F.1, each associated with operation in the Restricted Region and included previously as part of the ICA actions, will be deleted. These changes, along with deletion of the related Bases discussions, effectively delete the TS requirements for the ICAs. [Note: The NUMAC PRNM LTR does not address deletion of ICA related Technical Specifications. Therefore, all Specification 3.4.1 changes are beyond those covered by the NUMAC PRNM LTR.]

A change in the "no loops operating" Completion Time (for Required Action F.2), unrelated to OPRM, is being implemented concurrently with the OPRM. Specifically, the Completion Time for Required Action F.2 will be increased from 6 hours to 12 hours. The 12-hour Completion Time is more reasonable for an orderly shutdown of the plant, and more consistent with both the current Completion Time for Required Action E.1 and the improved Standard Technical Specifications, NUREG-1433, "Standard Technical Specifications, General Electric Plants (BWR/4)," (Reference 7) equivalent Completion Time for the no loops operating Condition, both of which are 12 hours. This change will be accomplished by combining the current Condition F as an "OR" with the current Condition E, and retaining the current Required Action E.1 and Completion Time of 12 hours for Required Action E.1. The present Required Action F.2 and associated Completion Time will be deleted.

The Conditions D and E will then be renumbered as Conditions A and B, with references to deleted Conditions also deleted.

EVALUATION OF PROPOSED CHANGES

C. Reporting Requirements, Core Operating Limits, Section 5.6.5

The procedural method of controlling the limits used to establish the OPRM period based detection algorithm (PBDA) upscale trip setpoints is not discussed in the NUMAC PRNM LTRs, but a required utility action is to identify the method that will be used. The requirements for cycle specific confirmation or change of the limits is established in the BWROG LTRs NEDC-32465-A and NEDO-31960-A (including Supplement 1) but not the specific method of documentation. The required information will be included in the reload licensing report. It has been determined that recording the PBDA limits in the COLR is the preferred method. This method is utilized at PBAPS for documenting similar cycle specific limits such as Rod Block Monitor limits, and has been utilized by other Licensees for the OPRM.

To document this requirement, a new item will be added under Specification 5.6.5.a to note that the OPRM limits associated with Specification 3.3.1.1 will be included in the COLR. Also, a new item has been added under Specification 5.6.5.b to identify the BWROG LTR NEDO-32465-A as the NRC approved documentation of the method for establishing the limits.

TS Bases Changes

The discussion below provides a description of the proposed changes to the TS Bases to reflect the addition of the OPRM trip function and other unrelated Bases changes for clarification. Where appropriate, deviations from the NUMAC PRNM LTRs, are also discussed below.

Function 2.b: APRM Simulated Thermal Power -- High

The Bases text will be expanded to include specific discussion of the "ΔW" term in the simulated thermal power high equation, and the limits of applicability of the required adjustment. This is being added to document the basis for the "offset" and to clarify that a hardware "clamp" limits the Allowable Value to 63.7% for flow values of $W < \Delta W$.

Function 2.e: 2-out-of-4 Voter

The Bases text for Function 2.e will be modified differently from that shown in the NUMAC PRNM LTR. The LTR discussion of "partial operability" related to the separate voting of the APRM High/Inop and the OPRM Upscale function will not be included. Deletion of this discussion is conservative and provides simplicity based on the determination that the added alternatives discussed in the LTR are complicated to evaluate and are very unlikely to ever be applied. However, discussion will be added to clarify that the "plant interface" portion of the 2-out-of-4 Logic Module is separate from the voter functions, and that inoperability of plant interface only portion of the module does not necessitate declaring the voter function inoperable. Specific examples are inoperable plant interface output modules that might affect only annunciator functions or even rod block functions, but which do not affect any of the RPS functions and should not require entering an RPS LCO.

EVALUATION OF PROPOSED CHANGES

Function 2.f: OPRM Upscale

The specific number of LPRMs per OPRM cell, the minimum required number of OPERABLE LPRMs for an OPRM cell to be considered OPERABLE, and the minimum number of OPRM cells required to be OPERABLE for an OPRM channel to be considered OPERABLE are identified as plant specific values in the NUMAC PRNM LTRs with no specific criteria on selection or calculation of the values. The NUMAC PRNM LTR also does not discuss the specific assignment of LPRMs to OPRM cells or any criteria for those assignments. The NRC approved BWROG LTRs, NEDO-31960-A (including Supplement 1) and NEDO-32465-A, provide the criteria related to determination of those values.

Based on the criteria in the BWROG LTRs, PBAPS has selected an LPRM-to-OPRM Cell assignment pattern that includes either 3 or 4 LPRMs per OPRM cell, depending on where the cell is located in the core. This selection meets the criteria in the BWROG LTRs. Similarly, PBAPS has selected 2 LPRMs as the minimum required per OPRM cell for OPRM cell operability. Based on these two PBAPS selected aspects of the OPRM system, cell assignments and minimum number of LPRMs per cell, analyses will be performed in accordance with the methodology defined in the BWROG LTRs to establish the period based detection algorithm (PBDA) trip setpoint limit criteria. The setpoint values will be documented in the COLR prior to trip activation. Also, based on the PBAPS selected cell assignments and minimum number of LPRMs per cell, analyses have been performed to establish a recommended minimum of 25 OPRM cells required for OPRM channel operability. The minimum number of LPRMs per cell, and minimum required OPRM cells are included in the PBAPS specific TS Bases markups.

The Bases description of the OPRM power level for operability (25% RTP) and for "trip enable" (29.5% RTP, 60% rated flow) has been modified somewhat from the NUMAC LTR version for clarity. There is no technical change from the intent. These values are identified as plant-specific in the NUMAC PRNM LTRs. Based on a BWROG Letter to the NRC providing background and guidance (the letter is included as a reference in the SR 3.3.1.1.19 Bases), PBAPS has selected the above values. The values will be treated as nominal values with no additional margin added to determine the actual setpoints to be entered in the equipment.

Action I.2

The PBAPS Required Action I.2 differs from that shown in the NUMAC PRNM LTRs in that an LCO 3.0.4 "exception" is identified. The LCO 3.0.4 exception is consistent with the intent of the original Required Action I.2, which was to allow 120 days to resolve a significant OPRM design issue. However, as written in the LTR, plant restart during the 120-day Completion Time would not be allowed by LCO 3.0.4. The PBAPS TS Bases description has been expanded from that in the NUMAC LTR to address the inclusion of the LCO 3.0.4 exception.

Channel Functional Test, SR 3.3.1.1.11

The Bases description for PBAPS has been modified from that in the NUMAC LTR to clarify that this SR coverage of the recirculation flow loop function also supports the automatic trip enable function in the OPRM. A notation has been included to clarify that the actual OPRM trip auto-enable setpoints are confirmed by SR 3.3.1.1.19, not 3.3.1.1.11. In addition, the Bases will be expanded to clarify the role of the internal self-test routine in meeting the requirements of the Channel Functional Test Surveillance Requirements as detailed in the NUMAC PRNM LTR.

Channel Calibration, SR 3.3.1.1.12

The NUMAC PRNM LTRs identify no specific changes to the Channel Calibration Bases. However, reviews associated with the OPRM Upscale TS changes identified a concern that the SR 3.3.1.1.12 Bases discussion of the flow channel calibration requirements previously added (to support the APRM Simulated Thermal Power – High function channel calibration) was not clear. In addition, the Bases should identify that the flow channel calibration also applies to the OPRM Upscale function (auto-enable of the trip). To address these issues and assure that the flow channel calibration requirements are correctly and completely understood, the SR 3.3.1.1.12 Bases discussion related to flow channel calibration will be expanded. The expanded discussion will also clarify that SR 3.3.1.1.12 includes the once-per-cycle drive flow / core flow correlation adjustment. [Note: The NUMAC PRNM LTR Bases discussion includes only the statement that the APRM Simulated Thermal Power – High Function channel calibration includes the flow channel. The NUMAC PRNM LTR Bases discussions do not address the applicability of the flow channel calibration to the OPRM Upscale, or include any additional discussion of the flow channel calibration specifics.]

The Bases section that includes SR 3.3.1.1.12 also includes three other non-related Channel Calibration SRs. The section has been reorganized somewhat to improve the flow of the discussion and reduce the risk of confusion.

Confirmation of OPRM trip enable setpoints, SR 3.3.1.1.19

The Bases description of this SR has been reworded somewhat from that in the NUMAC LTR to clarify that the surveillance is only a confirmation of setpoints, that the setpoints are considered "nominal" (reference to a BWROG letter supporting this position has been added), and that the APRM Simulated Thermal Power/THERMAL POWER and core flow/recirculation flow correlations are confirmed by SR 3.3.1.1.2 and SR 3.3.1.1.12, respectively. Some additional rewording has been done to clarify the intent of the SR and to identify alternate actions available to satisfy the SR.

Response Time Testing Surveillance Requirements

The NUMAC PRNM LTR describes response time testing including the APRM "sensors." PBAPS, per existing SR 3.3.1.1.18, is only required to verify response time testing of the RPS logic (Reference NRC Safety Evaluation Reports dated October 14, 1999 [Unit 3] and August 1, 2000 [Unit 2]; References 21 and 22, respectively). Therefore, the changes included in the NUMAC PRNM LTR that relate to response time testing of the PRNM electronics and logic are not applicable to PBAPS, and no change to SR 3.3.1.1.18 is required for the OPRM Upscale addition.

3.0 BACKGROUND

The NRC issued Generic Letter (GL) 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal Hydraulic Instabilities in Boiling Water Reactors" (Reference 8), which required PECO Energy Company to develop and submit to the NRC a plan for long term stability corrective actions. In response to GL 94-02, by letter dated March 2, 1998, from G. D. Edwards, PECO Energy Company to the USNRC (Reference 9), PECO Energy (now Exelon Generation Company, LLC) committed to implement the long-term solution designated as Option III in NEDO-31960-A (including Supplement 1).

The functionality required for the Option III stability solution was implemented as part of the initial phase of PRNM system replacement modification P00507, which has been completed for both PBAPS, Units 2 and 3. That modification replaced the original PRNM system, including the APRM system, the Rod Block Monitor system and the LPRM system, except for the detectors and signal cables, with the GE NUMAC PRNM System.

The NUMAC PRNM System utilizes the OPRM detect-and-suppress function to implement Option III. The safety function of the OPRM function within the PRNM is to monitor its LPRM signals for signs of neutron flux oscillations. The OPRM also monitors power and recirculation flow conditions to automatically enable the OPRM trip when in a predefined region of the power to flow map. The OPRM initiates a trip whenever it detects an instability condition when in the predefined region of the power to flow map. Following installation of the new PRNM System, the OPRM has been fully operational except for the trip and associated trip alarm functions. These OPRM trip functions have been de-activated (not connected to the Reactor Protection System logic) in order to allow evaluation of the performance of the OPRM algorithms without the risk of spurious scrams. During this evaluation period, in 2001, General Electric (GE) Company initiated a report in accordance with 10 CFR Part 21, "Reporting of defects and noncompliances," concerning stability reload licensing calculations that support the development of setpoints for the OPRM trip function. The OPRM trip functions were not armed pending resolution of this reportable condition. The reportable condition has now been resolved as described in Reference 10. Consistent with NRC Bulletin 88-07 Supplement 1 (Reference 11), as committed to in the letter dated September 9, 1994, from G. A. Hunger, PECO Nuclear to USNRC (Reference 12), Exelon has continued to implement the Interim Corrective Actions (ICAs) to detect and suppress power oscillations. During this time frame, the OPRM system has been tuned per recent GE criteria (Reference 13) to establish proper sensitivity. Performance of the system at PBAPS during this interim phase, as well as at other plants, has been reliable thus warranting activation of the trip outputs.

License amendments to support the activation of the trip outputs of the OPRM portion of the PRNM system have been approved by the NRC for Hatch Units 1 and 2 (Reference 14), Browns Ferry Unit 2 (Reference 15), Browns Ferry Unit 3 (Reference 16), Nine Mile Point Unit 2 (Reference 17), Fermi Unit 2 (Reference 18) and Brunswick Units 1 and 2 (Reference 19).

The final phase of this modification will accomplish the following:

- Activate the OPRM trip (OPRM Upscale Function) and annunciator;
- Add OPRM Technical Specifications;
- Delete the Recirculation Loops Operating Technical Specification requirements associated with the Interim Corrective Actions;
- Implement equipment modifications limited to minor wiring changes in the PRNM Panel 2(3)0C037 and an annunciator window label change; and
- Implement appropriate procedures and training to reflect the OPRM system.

EVALUATION OF PROPOSED CHANGES

4.0 TECHNICAL ANALYSIS

The technical bases for the requested TS changes are presented in Section 8.0 of the NRC approved NUMAC PRNM LTR NEDC-32410P-A (including Supplement 1), and as described above in Section 2.0 of this attachment, including exceptions to the NUMAC PRNM LTRs, and below. In addition, Attachment 4 provides plant-specific responses required by the NUMAC PRNM LTRs, including a discussion of the justifications and deviations related to the Utility Required Actions specified in the LTRs.

Enabling the OPRM trip function of the GE NUMAC PRNM system implements the long-term stability solution required by Generic Letter 94-02. The PRNM hardware incorporates the Option III detect and suppress solution reviewed and approved by the NRC. The OPRM meets 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 10, "Reactor design," and GDC 12, "Suppression of reactor power oscillations," requirements by automatically detecting and suppressing design basis thermal-hydraulic oscillations prior to exceeding the fuel MCPR Safety Limit.

The current plant design utilizing Interim Corrective Actions (ICAs) depends on operator action to, if possible, avoid regions where instability may occur, to exit such regions when necessary, and to detect an actual instability and take mitigating action by manual means. The modification replaces procedural actions (i.e., the ICAs) with an NRC approved automatic detect and suppress function (i.e., the OPRM trip function). The OPRM trip function includes sophisticated algorithms that can automatically detect an instability condition and provide a RPS trip input if the oscillation magnitude exceeds acceptable limits.

The OPRM trip function is capable of more quickly and reliably detecting a true reactor instability than was possible with the manual procedures. The OPRM also provides a reactor scram trip only if an actual instability is detected while the current ICAs require reactor shutdown if the plant is in a condition that may result in an instability, regardless of whether or not an instability occurs. Extensive analyses performed by the Boiling Water Reactor Owner's Group (BWROG) and reviewed and approved by the NRC demonstrate that the OPRM can detect reactor instabilities and initiate a scram trip before the MCPR safety limit is exceeded, thus maintaining the integrity of the fuel.

The only hardware impact for the proposed activity is a “disconnect and tie back” of a few terminations to remove connections which “jumpered out” the OPRM trip outputs, the addition of jumpers to connect the OPRM trip to the annunciator and plant computer inputs, and minor re-labeling of one annunciator window. All jumper removal/addition is accomplished in Panel 2(3)0C037.

The OPRM trip actuation phase of PBAPS Modification P00507 and its associated TS changes will not adversely affect the ability of the RPS to perform its intended function. The significant change in this phase of the modification involves removing jumpers across the existing OPRM trip outputs to RPS. The Surveillance Requirements and their frequency of performance will assure reliability of the OPRM portion of the PRNM systems. The modification replaces procedural actions (ICAs) with an NRC approved automatic detection and suppression function which provides an RPS trip input if acceptable reactor operational limits are exceeded. Therefore, the proposed modifications and associated TS changes will not adversely affect the health and safety of the public.

EVALUATION OF PROPOSED CHANGES

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

Exelon Generation Company, LLC (Exelon) proposes changes to the Technical Specifications (TS) for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed changes support the activation of the trip outputs of the previously-installed Oscillation Power Range Monitor (OPRM) portion of the Power Range Neutron Monitoring (PRNM) system. The OPRM system monitors neutron flux signals for signs of neutron flux oscillations and initiates a reactor trip whenever it detects an instability condition when in the predefined region of the power to flow map. Activation of the OPRM will replace manual methods for avoiding instabilities and for detecting and suppressing potential instabilities.

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

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

   Response: No. This modification has no impact on any of the previously installed PRNM functions. Plant operation in portions of the former restricted region may potentially cause a marginal increase in the probability of occurrence of an instability event. This potential increase in probability is acceptable because the OPRM function will automatically detect the condition and initiate a reactor scram before the Minimum Critical Power Ratio (MCPR) Safety Limit is reached. Consequences of the potential instability event are reduced because of the more reliable automatic detection and suppression of an instability event, and the elimination of dependence on the manual operator actions.

   Therefore, the proposed changes do 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 modification replaces procedural actions that were established to avoid operating conditions where reactor instabilities might occur with an NRC approved automatic detect and suppress function.

   Potential failures in the OPRM Upscale function could result in either failure to take the required mitigating action or an unintended reactor scram. These are the same potential effects of failure of the operator to take the correct appropriate action under the current procedural actions. The net effect of the modification changes the method by which an instability event is detected and by which mitigating action is initiated, but does not change the type of stability event that could occur. The effects of failure of the OPRM equipment are limited to reduced or failed mitigation, but such failure cannot cause an instability event or other type of accident.

EVALUATION OF PROPOSED CHANGES

Therefore, since no radiological barrier will be challenged as a result of activating the OPRM trip function, it is concluded that this proposed activity does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

Response: No. The current safety analyses assume that the existing procedural actions are adequate to prevent an instability event. As a result, there is currently no quantitative or qualitative assessment of an instability event with respect to its impact on MCPR.

The OPRM trip function is being implemented to automate the detection (via direct measurement of neutron flux) and subsequent suppression (via scram) of an instability event prior to exceeding the MCPR Safety Limit. The OPRM trip provides a trip output of the same type as currently used for the Average Power Range Monitor (APRM). Its failure modes and types are identical to those for the present APRM output. Currently, the MCPR Safety Limit is not impacted by an instability event since the event is "mitigated" by manual means via the procedural actions, which prevent plant operating conditions where an instability event is possible. In both methods of mitigation (manual and automated), the margin of safety associated with the MCPR Safety Limit is maintained.

Therefore, since the MCPR Safety Limit will not be exceeded as a result of an instability event following implementation of the OPRM trip function, it is concluded that the proposed change does not involve a significant reduction in a margin of safety.

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

5.2 Applicable Regulatory Requirements/Criteria

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 10, "Reactor design," requires that the reactor core be designed with appropriate margin to assure that specified acceptable fuel design limits will not be exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. GDC 12, "Suppression of reactor power oscillations," requires assurance that power oscillations which can result in conditions exceeding specified acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed.

Enabling the OPRM Upscale trip implements the long-term stability solution required by Generic Letter 94-02. The PRNM hardware incorporates the Option III detect and suppress solution reviewed and approved by the NRC in Licensing Topical Reports. The OPRM meets the GDC 10 and 12 requirements by automatically detecting and suppressing design basis thermal-hydraulic oscillations prior to exceeding the fuel Minimum Critical Power Ratio (MCPR) Safety Limit.

EVALUATION OF PROPOSED CHANGES

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

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment 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, and (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment 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 amendment.

7.0 REFERENCES

1. Letter from Keith R. Jury (Exelon Generation Company, LLC) to U. S. NRC, "Schedule for Completing Actions to Implement Long-Term Stability Solution," dated December 19, 2003.

2. NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," dated October 1995.

3. NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," Supplement 1, dated November 1997.

4. NEDO-32465-A, “Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications,” August 1996.

5. NEDO-31960-A, “BWR Owner's Group Long-Term Stability Solutions Licensing Methodology,” dated November 1995.

6. NEDO-31960-A, “BWR Owner's Group Long-Term Stability Solutions Licensing Methodology,” Supplement 1, dated November 1995.

7. NUREG-1433, “Standard Technical Specifications, General Electric Plants (BWR/4).”

8. Generic Letter (GL) 94-02, “Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal Hydraulic Instabilities in Boiling Water Reactors,” dated July 11, 1994.

9. Letter dated March 2, 1998, from G. D. Edwards, PECO Energy Company to the USNRC.

EVALUATION OF PROPOSED CHANGES

10. Letter from K. S. Putnam (Boiling Water Reactor Owners' Group) to U. S. NRC, "Resolution of Reportable Condition for Stability Reload Licensing Calculations Using Generic Regional Mode DIVOM Curve," dated September 30, 2003.

11. NRC Bulletin 88-07, "Power Oscillations In Boiling Water Reactors (BWR)," Supplement 1, dated December 30, 1988.

12. Letter dated September 9, 1994, from G. A. Hunger, PECO Nuclear to USNRC.

13. Letter dated October 4, 2003, from J. S. Post, GE Nuclear Energy, to USNRC, "Part 21 Notification: Stability Option III Period Based Detection Algorithm Allowable Settings."

14. Letter dated August 20, 1998, from L. N. Olshan, USNRC to H. L. Sumner, Hatch Plant, Southern Nuclear Operating Company, Inc., "Issuance of Amendments - Edwin I. Hatch Nuclear Plant, Units 1 and 2 (TAC Nos. M99066 and M99067)."

15. Letter dated March 5, 1999, from L. Raghavan, USNRC, to J. A. Scalice, Tennessee Valley Authority, "Amendment No. 258 to Facility Operating License No. DPR-52: Oscillation Power Range Monitor Upscale Trip Function in the Average Power Range Monitor – Technical Specification Change TS-354 (TAC No. MA3556)."

16. Letter dated September 27, 1999, from W. O. Long, USNRC, to J. A. Scalice, Tennessee Valley Authority, "Browns Ferry Nuclear Plant, Unit 3 – Issuance of Amendment Regarding Oscillation Power Range Monitor (TAC No. MA5976)."

17. Letter dated March 2, 2000, from P. S. Tam, USNRC, to J. H. Mueller, Niagara Mohawk Power Corporation, Nine Mile Point Station, "Nine Mile Point Station, Unit No. 2 – Issuance of Amendment RE: Oscillation Power Range Monitoring System (TAC No. MA7119)."

18. Letter dated March 31, 2000, from A. J. Kugler, USNRC, to D. R. Gipson, Detroit Edison company, "Fermi 2- Issuance of Amendment RE: Enabling the Oscillation Power Range Monitor Upscale Trip Function (TAC No. MA6267)."

19. Letter dated March 8, 2002, from A. G. Hansen, USNRC, to J. S. Keenan, Brunswick Steam Electric Plant, Carolina Power & Light, "Brunswick Steam Electric Plant, Units 1 and 2 – Issuance of Amendment to Incorporate the General Electric Digital Power Range Neutron Monitoring System (TAC Nos. MB2321 and MB2322)."

20. Letter dated March 1, 1999, from G. D. Edwards, PECO Energy Company, to USNRC, "Peach Bottom Atomic Power Station, Units 2 and 3, License Change Request ECR 98-01802."

21. Letter dated October 14, 1999, from B. C. Buckley, USNRC, to J. A. Hutton, PECO Energy Company, "Peach Bottom Atomic Power Station, Unit 3 – Issuance of Amendment RE: GE NUMAC PRNMS Upgrade (TAC No. MA4978)."

22. Letter dated August 1, 2000, from B. C. Buckley, USNRC, to J. A. Hutton, PECO Energy Company, "Peach Bottom Atomic Power Station, Unit 2 – Issuance of Amendment RE: GE NUMAC PRNMS Upgrade (TAC No. MA9135)."

Attachment 2

License Amendment Request

Peach Bottom Atomic Power Station, Units 2 and 3
Docket Nos. 50-277 and 50-278

Activation of the Trip Outputs of the Oscillation Power Range Monitor Portion of the Power Range Neutron Monitoring System

Marked-up Technical Specifications and Bases Pages for Proposed Changes

UNIT 2

3.3-1
3.3-3
3.3-5
3.3-6
3.3-7
3.4-1
3.4-2
3.4-3
3.4-4
3.4-5
B 3.3-7
B 3.3-8
B 3.3-12
B 3.3-24
B 3.3-25
B 3.3-27

UNIT 2

B 3.3-32
B 3.3-33
B 3.3-34
B 3.3-35
B 3.3-35a
B 3.4-3
B 3.4-4
B 3.4-5
B 3.4-6
B 3.4-7
B 3.4-8
B 3.4-9
B 3.4-10
5.0-21
5.0-22

UNIT 3

3.3-1
3.3-3
3.3-5
3.3-6
3.3-7
3.4-1
3.4-2
3.4-3
3.4-4
3.4-5
B 3.3-7
B 3.3-8
B 3.3-12
B 3.3-24
B 3.3-25
B 3.3-27

UNIT 3

B 3.3-32
B 3.3-33
B 3.3-34
B 3.3-35
B 3.3-36
B 3.4-3
B 3.4-4
B 3.4-5
B 3.4-6
B 3.4-7
B 3.4-8
B 3.4-9
B 3.4-10
5.0-21
5.0-22

TECH SPEC MARKUP
for
Stability (PRNM) OPRM
Trip Activation MOD
at
PEACH BOTTOM UNIT 2

PB ECR 99-00012 Rev ____
Attachment Page 54 of ____
Dwg ____
Sht ____ Rev ____
initials ____

3.3 INSTRUMENTATION

3.3.1.1 Reactor Protection System (RPS) Instrumentation

LCO 3.3.1.1 The RPS instrumentation for each Function in Table 3.3.1.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.1-1.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required channels inoperable.	A.1	Place channel in trip.	12 hours
	<u>OR</u>		
	A.2	-----NOTE----- Not applicable for Functions 2.a, 2.b, 2.c, ~~or~~ 2.d~~.~~, or 2.f. ----- Place associated trip system in trip.	12 hours
B. -----NOTE----- Not applicable for Functions 2.a, 2.b, 2.c, ~~or~~ 2.d~~.~~, or 2.f. ----- One or more Functions with one or more required channels inoperable in both trip systems.	B.1	Place channel in one trip system in trip.	6 hours
	<u>OR</u>		
	B.2	Place one trip system in trip.	6 hours

(continued)

Attachment Page 55 of
Dwg
Sht Rev
initials

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
H. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	H.1	Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

INSERT 1

SURVEILLANCE REQUIREMENTS

-----------------------------------NOTES-----------------------------------

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.
2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.1.2	------------------NOTE------------------ Not required to be performed until 12 hours after THERMAL POWER ≥ 25% RTP. -- Verify the absolute difference between the average power range monitor (APRM) channels and the calculated power is ≤ 2% RTP while operating at ≥ 25% RTP.	7 days

(continued)

TECH SPEC MARKUP

INSERT 1:

I. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	I.1 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations. AND I.2 --------------NOTE---------------- LCO 3.0.4 is not applicable. ------------------------------------ Restore required channels to OPERABLE.	12 hours 120 days
J. Required Action and associated Completion Time of Condition I not met.	J.1 Reduce THERMAL POWER to <25% RTP.	4 hours

PB ECR 99-00015 Rev
Attachment Page 57 of
Dwg
Sht Rev
initials OMN

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.9	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.1.1.10	-------------------NOTE------------------- Radiation detectors are excluded. -- Perform CHANNEL CALIBRATION.	92 days
SR 3.3.1.1.11	-------------------NOTES------------------- 1. For Function 2.a, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. 2. For Functions 2.b and 2.f, the CHANNEL FUNCTIONAL TEST includes the recirculation flow input processing, excluding the flow transmitters. -- Perform CHANNEL FUNCTIONAL TEST.	184 days
SR 3.3.1.1.12	-------------------NOTES------------------- 1. Neutron detectors are excluded. 2. For Function 1, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. 3. For Functions 2.b and 2.f, the recirculation flow transmitters that feed the APRMs are included. -- Perform CHANNEL CALIBRATION.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.13	Verify Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions are not bypassed when THERMAL POWER is ≥ 29.5% RTP.	24 months
SR 3.3.1.1.14	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.1.1.15	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.1.16	Calibrate each radiation detector.	24 months
SR 3.3.1.1.17	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.1.18	Verify the RPS RESPONSE TIME is within limits.	24 months

INSERT 2

TECH SPEC MARKUP

INSERT 2:

SR 3.3.1.1.19	Verify OPRM is not bypassed when APRM Simulated Thermal Power is ≥ 29.5% and recirculation drive flow is < 60%.	24 months

Table 3.3.1.1-1 (page 1 of 3)
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. Wide Range Neutron Monitors					
a. Period-Short	2	3	G	SR 3.3.1.1.1 SR 3.3.1.1.5 SR 3.3.1.1.12 SR 3.3.1.1.17 SR 3.3.1.1.18	≥ 13 seconds
	5(a)	3	H	SR 3.3.1.1.1 SR 3.3.1.1.6 SR 3.3.1.1.12 SR 3.3.1.1.17 SR 3.3.1.1.18	≥ 13 seconds
b. Inop	2	3	G	SR 3.3.1.1.5 SR 3.3.1.1.17	NA
	5(a)	3	H	SR 3.3.1.1.6 SR 3.3.1.1.17	NA
2. Average Power Range Monitors					
a. Neutron Flux-High (Setdown)	2	3(c)	G	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 15.0% RTP
b. Simulated Thermal Power-High	1	3(c)	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 0.65 W + 63.7% RTP(b) and ≤ 118.0% RTP
c. Neutron Flux-High	1	3(c)	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 119.7% RTP
d. Inop	1,2	3(c)	G	SR 3.3.1.1.11	NA
e. 2-Out-Of-4 Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.11 SR 3.3.1.1.17 SR 3.3.1.1.18	NA

← INSERT 3

(continued)

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

(b) ~~0.65 W + 63.7% − 0.65 ΔW~~ RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."

0.65 (W − ΔW) + 63.7%

(c) Each APRM channel provides inputs to both trip systems.

INSERT 3A

TECH SPEC MARKUP

INSERT 3:

f.	OPRM Upscale	≥ 25% RTP	3(c)	I	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12 SR 3.3.1.1.19	NA(d)

INSERT 3A:

(d) See COLR for OPRM period based detection algorithm (PBDA) setpoint limits.

PB ECR 99-00015 Rev ____
Attachment Page 62 of ____
Dwg ____
Sht ____ Rev ____
initials ____

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1

Two recirculation loops with matched flows shall be in operation ~~with core flow as a function of THERMAL POWER in the "Unrestricted" Region of Figure 3.4.1-1~~.

OR

One recirculation loop shall be in operation with ~~core flow as a function of THERMAL POWER in the "Unrestricted" Region of Figure 3.4.1-1 and with~~ the following limits applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specifi~~e~~ed in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR; and

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Simulated Thermal Power-High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.

---------------------------NOTE---------------------------
Required limit modifications for single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.

APPLICABILITY: MODES 1 and 2.

~~ACTIONS~~

~~CONDITION~~	~~REQUIRED ACTION~~		~~COMPLETION TIME~~
~~A. One or two recirculation loops in operation with core flow as a function of THERMAL POWER in the "Restricted" Region of Figure 3.4.1-1.~~	~~A.1~~	~~Verify APRM and LPRM neutron flux noise levels are ≤ 4% and ≤ 3 times baseline noise levels.~~	~~1 hour~~ ~~AND~~ ~~Once per 8 hours thereafter~~ ~~AND~~ ~~1 hour after completion of any THERMAL POWER increase ≥ 5% RTP~~
~~B. Required Action and associated Completion Time of Condition A not met.~~	~~B.1~~	~~Restore APRM and LPRM neutron flux noise levels to ≤ 4% and ≤ 3 times baseline noise levels.~~	~~2 hours~~
~~C. One recirculation loop in operation with core flow ≤ 39% of rated core flow and THERMAL POWER in the "Restricted" Region of Figure 3.4.1-1.~~	~~C.1~~	~~Reduce THERMAL POWER to the "Unrestricted" Region of Figure 3.4.1-1.~~	~~4 hours~~
	~~OR~~		
	~~C.2~~	~~Increase core flow to > 39% of rated core flow.~~	~~4 hours~~

~~(continued)~~

PB ECR 99-00015 Rev ____
Attachment Page 63 of ____
Dwg ____
Sht ____ Rev ____
initials ____

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ~~D.~~ Requirements of the LCO not met. ~~for reasons other than Conditions A, B, C, and F.~~	A.1 ~~D.1~~ Satisfy the requirements of the LCO.	24 hours
B. ~~E.~~ Required Action and associated Completion Time of Condition ~~B, C, or D~~ A not met.	B.1 ~~E.1~~ Be in MODE 3.	12 hours
~~F.~~ No recirculation loops in operation. OR	~~F.1 Initiate action to reduce THERMAL POWER to the "Unrestricted" Region of Figure 3.4.1-1.~~ ~~AND~~ ~~F.2 Be in MODE 3.~~	~~Immediately~~ ~~6 hours~~

PB ECR
Attachment Page 65 of
Dwg
Sht Rev
initials

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	--------------------NOTE-------------------- Not required to be performed until 24 hours after both recirculation loops are in operation. -- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is: a. $\leq 10.25 \text{ X } 10^6$ lbm/hr when operating at $< 71.75 \text{ X } 10^6$ lbm/hr; and b. $\leq 5.125 \text{ X } 10^6$ lbm/hr when operating at $\geq 71.75 \text{ X } 10^6$ lbm/hr.	24 hours
~~SR 3.4.1.2~~	~~Verify core flow as a function of THERMAL POWER is in the "Unrestricted" Region of Figure 3.4.1-1.~~	~~24 hours~~

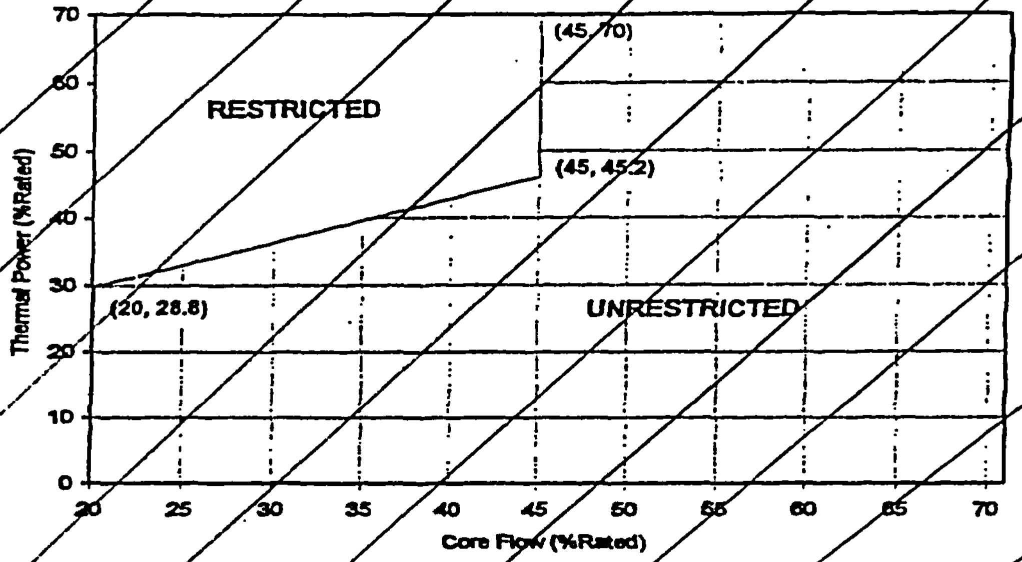

Figure 3.4.1-1 (page 1 of 1)

THERMAL POWER VERSUS CORE FLOW
STABILITY REGIONS

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1.b. Wide Range Neutron Monitor—Inop (continued)

Six channels of the Wide Range Neutron Monitor—Inop Function, with three channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. Since this Function is not assumed in the safety analysis, there is no Allowable Value for this Function.

This Function is required to be OPERABLE when the Wide Range Neutron Monitor Period-Short Function is required.

Average Power Range Monitor (APRM)

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The APRM channels receive input signals from the local power range monitors (LPRMs) within the reactor core to provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP. INSERT 4

The APRM System is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. A trip from any one unbypassed APRM will result in a "half-trip" in all four of the voter channels, but no trip inputs to either RPS trip system. ~~A~~ INSERT 5 trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system INSERT 6 thus resulting in a full scram signal. INSERT 7 Three of the four APRM channels and all four of the voter channels are required to be OPERABLE to ensure that no single failure will preclude a scram on a valid signal. In addition, to provide adequate coverage of the entire core, consistent with the design bases for the APRM ~~functions~~, INSERT 8 at least 20 LPRM inputs, with at least three LPRM inputs from each of the four axial levels at which the LPRMs are located, must be operable for each APRM channel, and the number of LPRM inputs that have become inoperable (and bypassed) since the last APRM calibration (SR 3.3.1.1.2) must be less than ten for each APRM channel. INSERT 9

(continued)

TECH SPEC MARKUP

INSERT 4:

Each APRM also includes an Oscillation Power Range Monitor (OPRM) Upscale Function which monitors small groups of LPRM signals to detect thermal-hydraulic instabilities.

INSERT 5:

APRM trip Functions 2.a, 2.b, 2.c, and 2.d are voted independently from OPRM Upscale Function 2.f. Therefore, any Function 2.a, 2.b, 2.c, or 2.d

INSERT 6:

logic channel (A1, A2, B1, and B2)

INSERT 7:

Similarly, a Function 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels.

INSERT 8:

Functions 2.a, 2.b, and 2.c

INSERT 9:

For the OPRM Upscale, Function 2.f, LPRMs are assigned to "cells" of 3 or 4 detectors. A minimum of 25 cells, each with a minimum of 2 OPERABLE LPRMs, must be OPERABLE for the OPRM Upscale Function 2.f to be OPERABLE.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.a. Average Power Range Monitor Neutron Flux-High (Setdown) (continued)

For operation at low power (i.e., MODE 2), the Average Power Range Monitor Neutron Flux-High (Setdown) Function is capable of generating a trip signal that prevents fuel damage resulting from abnormal operating transients in this power range. For most operation at low power levels, the Average Power Range Monitor Neutron Flux-High (Setdown) Function will provide a secondary scram to the Wide Range Neutron Monitor Period-Short Function because of the relative setpoints. At higher power levels, it is possible that the Average Power Range Monitor Neutron Flux-High (Setdown) Function will provide the primary trip signal for a corewide increase in power.

No specific safety analyses take direct credit for the Average Power Range Monitor Neutron Flux-High (Setdown) Function. However, this Function indirectly ensures that before the reactor mode switch is placed in the run position, reactor power does not exceed 25% RTP (SL 2.1.1.1) when operating at low reactor pressure and low core flow. Therefore, it indirectly prevents fuel damage during significant reactivity increases with THERMAL POWER < 25% RTP.

The Allowable Value is based on preventing significant increases in power when THERMAL POWER is < 25% RTP.

The Average Power Range Monitor Neutron Flux-High (Setdown) Function must be OPERABLE during MODE 2 when control rods may be withdrawn since the potential for criticality exists. In MODE 1, the Average Power Range Monitor Neutron Flux-High Function provides protection against reactivity transients and the RWM and rod block monitor protect against control rod withdrawal error events.

2.b. Average Power Range Monitor Simulated Thermal Power-High

The Average Power Range Monitor Simulated Thermal Power-High Function monitors average neutron flux to approximate the THERMAL POWER being transferred to the reactor coolant. The APRM neutron flux is electronically filtered with a time constant representative of the fuel heat transfer dynamics to generate a signal proportional to the THERMAL POWER in the reactor. The trip level is varied as a function of recirculation drive flow (i.e., at lower core flows, the setpoint is reduced proportional to the reduction in power experienced as core flow is reduced with a fixed control rod pattern) but is clamped at an upper limit that is always lower than the Average Power Range Monitor Neutron Flux-High Function Allowable Value.

INSERT 9a

(continued)

TECH SPEC MARKUP

INSERT 9a:

A note is included, applicable when the plant is in single recirculation loop operation per LCO 3.4.1, which requires the flow value, used in the Allowable Value equation, be reduced by ΔW. The value of ΔW is established to conservatively bound the inaccuracy created in the core flow/drive flow correlation due to back flow in the jet pumps associated with the inactive recirculation loop. The Allowable Value thus maintains thermal margins essentially unchanged from those for two loop operation. The value of ΔW is plant specific and is defined in plant procedures. The Allowable Value equation for single loop operation is only valid for flows down to W = ΔW; the Allowable Value does not go below 63.7% RTP. This is acceptable because back flow in the inactive recirculation loop is only evident with drive flows of approximately 35% or greater (Reference 19).

PB ECR 99-00015 Rev
Attachment Page 21 of
Dwg
Sht Rev
initials 9MJ

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2.d. Average Power Range Monitor—Inop

Three of the four APRM channels are required to be OPERABLE for each of the APRM Functions. This Function (Inop) provides assurance that the minimum number of APRM channels are OPERABLE.

For any APRM channel, any time its mode switch is not in the "Operate" position, an APRM module required to issue a trip is unplugged, or the automatic self-test system detects a critical fault with the APRM channel, an Inop trip is sent to all four voter channels. Inop trips from two or more ~~non-bypassed~~ unbypassed APRM channels result in a trip output from each of the four voter channels to it's associated trip system. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

There is no Allowable Value for this Function.

This Function is required to be OPERABLE in the MODES where the APRM Functions are required.

2.e. 2-Out-Of-4 Voter

The 2-Out-Of-4 Voter Function provides the interface between the APRM Functions INSERT 10 and the final RPS trip system logic. As such, it is required to be OPERABLE in the MODES where the APRM Functions are required and is necessary to support the safety analysis applicable to each of those Functions. Therefore, the 2-Out-Of-4 Voter Function needs to be OPERABLE in MODES 1 and 2.

All four voter channels are required to be OPERABLE. Each voter channel includes self-diagnostic functions. If any voter channel detects a critical fault in its own processing, a trip is issued from that voter channel to the associated trip system.

INSERT 11 → ¶

There is no Allowable Value for this Function.

INSERT 12 →

(continued)

TECH SPEC MARKUP

INSERT 10:

, including the OPRM Upscale Function,

INSERT 11:

The 2-Out-Of-4 Logic Module includes 2-Out-Of-4 Voter hardware and the APRM Interface hardware. The 2-Out-Of-4 Voter Function 2.e votes APRM Functions 2.a, 2.b, 2.c, and 2.d independently of Function 2.f. This voting is accomplished by the 2-Out-Of-4 Voter hardware in the 2-Out-Of-4 Logic Module. Each 2-Out-Of-4 Voter includes two redundant sets of outputs to RPS. Each output set contains two independent contacts; one contact for Functions 2.a, 2.b, 2.c and 2.d, and the other contact for Function 2.f. The analysis in Reference 12 took credit for this redundancy in the justification of the 12-hour Completion Time for Condition A, so the voter Function 2.e must be declared inoperable if any of its functionality is inoperable. However, the voter Function 2.e does not need to be declared inoperable due to any failure affecting only the plant interface portions of the 2-Out-Of-4 Logic Module that are not necessary to perform the 2-Out-Of-4 Voter function.

TECH SPEC MARKUP

INSERT 12:

2.f. Oscillation Power Range Monitor (OPRM) Upscale

The OPRM Upscale Function provides compliance with 10 CFR 50, Appendix A, General Design Criteria (GDC) 10 and 12, thereby providing protection from exceeding the fuel MCPR safety limit (SL) due to anticipated thermal-hydraulic power oscillations.

References 14, 15 and 16 describe three algorithms for detecting thermal-hydraulic instability related neutron flux oscillations: the period based detection algorithm (PBDA), the amplitude based algorithm (ABA), and the growth rate algorithm (GRA). All three are implemented in the OPRM Upscale Function, but the safety analysis takes credit only for the PBDA. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. OPRM Upscale Function OPERABILITY for Technical Specifications purposes is based only on the PBDA.

The OPRM Upscale Function receives input signals from the local power range monitors (LPRMs) within the reactor core, which are combined into "cells" for evaluation by the OPRM algorithms. Each channel is capable of detecting thermal-hydraulic instabilities, by detecting the related neutron flux oscillations, and issuing a trip signal before the MCPR SL is exceeded. Three of the four channels are required to be OPERABLE.

The OPRM Upscale trip is automatically enabled (bypass removed) when THERMAL POWER is ≥ 29.5% RTP, as indicated by the APRM Simulated Thermal Power, and reactor core flow is < 60% of rated flow, as indicated by APRM measured recirculation drive flow. This is the operating region where actual thermal-hydraulic instability and related neutron flux oscillations may occur (Reference 18). These setpoints, which are sometimes referred to as the "auto-bypass" setpoints, establish the boundaries of the OPRM Upscale trip enabled region.

The OPRM Upscale Function is required to be OPERABLE when the plant is at ≥ 25% RTP. The 25% RTP level is selected to provide margin in the unlikely event that a reactor power increase transient occurring while the plant is operating below 29.5% RTP causes a power increase to or beyond the 29.5% APRM Simulated Thermal Power OPRM Upscale trip auto-enable setpoint without operator action. This OPERABILITY requirement assures that the OPRM Upscale trip auto-enable function will be OPERABLE when required.

An OPRM Upscale trip is issued from an APRM channel when the PBDA in that channel detects oscillatory changes in the neutron flux, indicated by the combined signals of the LPRM detectors in a cell, with period confirmations and relative cell amplitude exceeding specified setpoints. One or more cells in a channel exceeding the trip conditions will result in a channel trip. An OPRM Upscale trip is also issued from the channel if either the GRA or ABA detects oscillatory changes in the neutron flux for one or more cells in that channel.

There are four "sets" of OPRM related setpoints or adjustment parameters: a) OPRM trip auto-enable setpoints for APRM Simulated Thermal Power (29.5%) and drive flow (60%); b) PBDA confirmation count and amplitude setpoints; c) PBDA tuning parameters; and d) GRA and ABA setpoints.

The first set, the OPRM auto-enable region setpoints, as discussed in the SR 3.3.1.1.19 Bases, are treated as nominal setpoints without the application of setpoint methodology per Reference 18. The settings, 29.5% APRM Simulated Thermal Power and 60% drive flow, are defined (limit values) in and confirmed by SR 3.3.1.1.19. The second set, the OPRM PBDA trip setpoints, are established in accordance with methodologies defined in Reference 16, and are documented in the COLR. There are no Technical Specifications allowable values for these setpoints. The third set, the OPRM PBDA "tuning" parameters, are established or adjusted in accordance with and controlled by PBAPS procedures. The fourth set, the GRA and ABA setpoints, in accordance with References 14, 15 and 16, are established as nominal values only, and are controlled by PBAPS procedures.

PB ECR 99-00015 Rev
Attachment Page 74 of
Dwg
Sht Rev
initials

ACTIONS

A.1 and A.2 (continued)

Function's inoperable channel is in one trip system and the Function still maintains RPS trip capability (refer to Required Actions B.1, B.2, and C.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel or the associated trip system must be placed in the tripped condition per Required Actions A.1 and A.2. Placing the inoperable channel in trip (or the associated trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternatively, if it is not desired to place the channel (or trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), Condition D must be entered and its Required Action taken.

As noted, Action A.2 is not applicable for APRM Functions 2.a, 2.b, 2.c, ~~and~~ 2.d, or 2.f. Inoperability of one required APRM channel affects both trip systems. For that condition, Required Action A.1 must be satisfied, and is the only action (other than restoring operability) that will restore capability to accommodate a single failure. Inoperability of more than one required APRM channel of the same trip function results in loss of trip capability and entry into Condition C, as well as entry into Condition A for each channel.

B.1 and B.2

Condition B exists when, for any one or more Functions, at least one required channel is inoperable in each trip system. In this condition, provided at least one channel per trip system is OPERABLE, the RPS still maintains trip capability for that Function, but cannot accommodate a single failure in either trip system.

Required Actions B.1 and B.2 limit the time the RPS scram logic, for any Function, would not accommodate single failure in both trip systems (e.g., one-out-of-one and one-out-of-one arrangement for a typical four channel Function). The reduced reliability of this logic arrangement was not evaluated in References 9, 12 or 13 for the 12 hour Completion Time. Within the 6 hour allowance, the associated Function will have all required channels OPERABLE or in trip (or any combination) in one trip system.

(continued)

PB ECR 99-00015 Rev
Attachment Page 25 of
Dwg
Sht Rev
initials

ACTIONS

B.1 and B.2 (continued)

Completing one of these Required Actions restores RPS to a reliability level equivalent to that evaluated in References 9, 12 or 13, which justified a 12 hour allowable out of service time as presented in Condition A. The trip system in the more degraded state should be placed in trip or, alternatively, all the inoperable channels in that trip system should be placed in trip (e.g., a trip system with two inoperable channels could be in a more degraded state than a trip system with four inoperable channels if the two inoperable channels are in the same Function while the four inoperable channels are all in different Functions). The decision of which trip system is in the more degraded state should be based on prudent judgment and take into account current plant conditions (i.e., what MODE the plant is in). If this action would result in a scram or RPT, it is permissible to place the other trip system or its inoperable channels in trip.

The 6 hour Completion Time is judged acceptable based on the remaining capability to trip, the diversity of the sensors available to provide the trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of a scram.

Alternately, if it is not desired to place the inoperable channels (or one trip system) in trip (e.g., as in the case where placing the inoperable channel or associated trip system in trip would result in a scram, Condition D must be entered and its Required Action taken.

As noted, Condition B is not applicable for APRM Functions 2.a, 2.b, 2.c, ~~and~~ 2.d, or 2.f. Inoperability of an APRM channel affects both trip systems and is not associated with a specific trip system as are the APRM 2-Out-Of-4 voter and other non-APRM channels for which Condition B applies. For an inoperable APRM channel, Required Action A.1 must be satisfied, and is the only action (other than restoring operability) that will restore capability to accommodate a single failure. Inoperability of a Function in more than one required APRM channel results in loss of trip capability for that Function and entry into Condition C, as well as entry into Condition A for each channel. Because Condition A and C provide Required Actions that are appropriate for the inoperability of APRM Functions 2.a, 2.b, 2.c, ~~and 2.d,~~ 2.d, or 2.f, and these functions are not associated with specific trip systems as are the APRM 2-Out-Of-4 voter and other non-APRM channels, Condition B does not apply.

(continued)

PB ECR 99-00015 Rev____
Attachment Page 76 of____
Dwg____
Sht____ Rev____
initials JMhJ

ACTIONS (continued)

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

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

INSERT 13

SURVEILLANCE REQUIREMENTS

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

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Refs. 9, 12 & 13) 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.

(continued)

TECH SPEC MARKUP

INSERT 13:

I.1

If OPRM Upscale trip capability is not maintained, Condition I exists. References 12 and 13 justified use of alternate methods to detect and suppress oscillations for a limited period of time. The alternate methods are procedurally established consistent with the guidelines identified in Reference 17 requiring manual operator action to scram the plant if certain predefined events occur. The 12-hour allowed Completion Time for Required Action I.1 is based on engineering judgment to allow orderly transition to the alternate methods while limiting the period of time during which no automatic or alternate detect and suppress trip capability is formally in place. *Based on the small probability of an instability event occurring at all, the 12 hour duration is judged to be reasonable.*

I.2

The alternate method to detect and suppress oscillations implemented in accordance with I.1 was evaluated (References 12 and 13) based on use up to 120 days only. The evaluation, based on engineering judgment, concluded that the likelihood of an instability event that could not be adequately handled by the alternate methods during this 120 day period was negligibly small. The 120-day period is intended to be an outside limit to allow for the case where design changes or extensive analysis might be required to understand or correct some unanticipated characteristic of the instability detection algorithms or equipment. This action is not intended and was not evaluated as a routine alternative to returning failed or inoperable equipment to OPERABLE status. *Correction of routine equipment failure or inoperability is expected to* normally be accomplished within the completion times allowed for Actions for Condition A.

A note is provided to indicate that LCO 3.0.4 is not applicable. The intent of that note is to allow plant startup while operating within the 120-day completion time for action I.2. The primary purpose of this exclusion is to allow an orderly completion of design and verification activities, in the event of a required design change, without undue impact on plant operation.

PB ECR 99-00015 Rev ____
Attachment Page 78 of ____
Dwg ____________
Sht ____ Rev ____
initials OWW ____________

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.9 and SR 3.3.1.1.14 (continued)

In addition, Function 5 and 7 instruments are not accessible while the unit is operating at power due to high radiation and the installed indication instrumentation does not provide accurate indication of the trip setting. For the Function 9 channels, verification that the trip settings are less than or equal to the specified Allowable Value during the CHANNEL FUNCTIONAL TEST is not required since the instruments are not accessible while the unit is operating at power due to high radiation and the installed indication instrumentation does not provided accurate indication of the trip setting. Waiver of these verifications for the above functions is considered acceptable since the magnitude of drift assumed in the setpoint calculation is based on a 24 month calibration interval. The 92 day Frequency of SR 3.3.1.1.9 is based on the reliability analysis of Reference 9.

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 will pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.10, SR 3.3.1.1.12, SR 3.3.1.1.15, and SR 3.3.1.1.16

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations, consistent with the current plant specific setpoint methodology. ~~SR 3.3.1.1.16, however, is only a calibration of the radiation detectors using a standard radiation source.~~

INSERT 13a

As noted for SR 3.3.1.1.12, neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in

(continued)

TECH SPEC MARKUP

INSERT 13a:

As noted for SR 3.3.1.1.10, radiation detectors are excluded from CHANNEL CALIBRATION due to ALARA reasons (when the plant is operating, the radiation detectors are generally in a high radiation area; the steam tunnel). This exclusion is acceptable because the radiation detectors are passive devices, with minimal drift. To complete the radiation CHANNEL CALIBRATION, SR 3.3.1.1.16 requires that the radiation detectors be calibrated on a once per 24 months Frequency.

The once per 92 days Frequency of SR 3.3.1.1.10 is conservative with respect to the magnitude of equipment drift assumed in the setpoint analysis. The Frequency of SR 3.3.1.1.16 is based upon the assumption of a 24-month calibration interval used in the determination of the equipment drift in the setpoint analysis.

PB ECR 99-00015 Rev ____
Attachment Page 80 of ____
Dwg ____
Sht ____ Rev ____
initials ____

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10, SR 3.3.1.1.12, SR 3.3.1.1.15, and SR 3.3.1.1.16 (continued)

neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.8).

INSERT ¶ BREAK

A second note is provided for SR 3.3.1.1.12 that allows the WRNM SR to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 WRNM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads or movable links. This Note allows entry into MODE 2 from MODE 1, if the 24 month Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR. ~~For the APRM Simulated Thermal Power-High Function, SR 3.3.1.1.12 also includes calibrating the associated recirculation loop flow channel. A third note is provided for SR 3.3.1.1.12 to include the recirculation flow transmitters that feed the APRMs as applied to Function 2.b. The Average Power Range Monitor Simulated Thermal Power-High Function uses the recirculation loop drive flows to vary the trip setpoint. This SR ensures that the recirculation flow transmitters that supply the recirculation flow signal to the APRMs respond to the measured recirculation flow within the necessary range and accuracy by use of a standard pressure source.~~

~~As noted for SR 3.3.1.1.10, radiation detectors are excluded from CHANNEL CALIBRATION due to ALARA reasons (when the plant is operating, the radiation detectors are generally in a high radiation area; the steam tunnel). This exclusion is acceptable because the radiation detectors are passive devices, with minimal drift. The radiation detectors are calibrated in accordance with SR 3.3.1.1.16 on a 24 month Frequency.~~

~~The 92 day Frequency of SR 3.3.1.1.10 is conservative with respect to the magnitude of equipment drift assumed in the setpoint analysis. The Frequencies of SR 3.3.1.1.12, SR 3.3.1.1.15 and SR 3.3.1.1.16 are based upon the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the applicable setpoint analysis.~~

INSERT 13b

SR 3.3.1.1.11

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the

(continued)

TECH SPEC MARKUP

INSERT 13b:

A third note is provided for SR 3.3.1.1.12 that includes in the SR the recirculation flow (drive flow) transmitters, which supply the flow signal to the APRMs. The APRM Simulated Thermal Power-High Function (Function 2.b) and the OPRM Upscale Function (Function 2.f), both require a valid drive flow signal. The APRM Simulated Thermal Power-High Function uses drive flow to vary the trip setpoint. The OPRM Upscale Function uses drive flow to automatically enable or bypass the OPRM Upscale trip output to RPS. A CHANNEL CALIBRATION of the APRM drive flow signal requires both calibrating the drive flow transmitters and establishing a valid drive flow / core flow relationship. The drive flow / core flow relationship is established once per refuel cycle, while operating at or near rated power and flow conditions. This method of correlating core flow and drive flow is consistent with GE recommendations. Changes throughout the cycle in the drive flow / core flow relationship due to the changing thermal hydraulic operating conditions of the core are accounted for in the margins included in the bases or analyses used to establish the setpoints for the APRM Simulated Thermal Power-High Function and the OPRM Upscale Function.

The Frequencies of SR 3.3.1.1.12 and SR 3.3.1.1.15 are based upon the assumption of a 24-month calibration interval used in the determination of the equipment drift in the setpoint analysis.

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.11 (continued)

INSERT 13c

intended function. For the APRM Functions, this test supplements the automatic self-test functions that operate continuously in the APRM and voter channels. The APRM CHANNEL FUNCTIONAL TEST covers the APRM channels (including recirculation flow processing - applicable to Function 2.b only), the 2-Out-Of 4 voter channels, and the interface connections into the RPS trip systems from the voter channels. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. The 184 day Frequency of SR 3.3.1.1.11 is based on the reliability analyses of References 12 and 13. (NOTE: The actual voting logic of the 2-Out-Of-4 Voter Function is tested as part of SR 3.3.1.1.17.)

INSERT 13d

INSERT 13e

A Note is provided for Function 2.a that requires this SR to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM Function cannot be performed in MODE 1 without utilizing jumpers or lifted leads. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2.

A second Note is provided for Function 2.b that clarifies that the CHANNEL FUNCTIONAL TEST for Function 2.b includes testing of the recirculation flow processing electronics, excluding the flow transmitters.

SR 3.3.1.1.13

This SR ensures that scrams initiated from the Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions will not be inadvertently bypassed when THERMAL POWER is ≥ 29.5% RTP. This involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodologies are incorporated into the Allowable Value (≤ 28.9% RTP which is equivalent to ≤ 138.4 psig as measured from turbine first stage pressure) and the actual setpoint. Because main turbine bypass flow can affect this setpoint nonconservatively (THERMAL POWER is derived from turbine first stage pressure), the main turbine bypass valves must remain closed during the calibration at THERMAL POWER ≥ 29.5% RTP to ensure that the calibration is valid.

If any bypass channel's setpoint is nonconservative (i.e., the Functions are bypassed at ≥ 29.5% RTP, either due to open main turbine bypass valve(s) or other reasons), then the

(continued)

TECH SPEC MARKUP

INSERT 13c:

The scope of the APRM CHANNEL FUNCTIONAL TEST is limited to verification of system trip output hardware. Software controlled functions are tested only incidentally. Automatic internal self-test functions check the EPROMs in which the software-controlled logic is defined. Any changes in the EPROMs will be detected by the self-test function resulting in a trip and/or alarm condition.

INSERT 13d:

and the auto-enable portion of Function 2.f

INSERT 13e:

The actual auto-enable setpoints for the OPRM Upscale trip are confirmed by SR 3.3.1.1.19.

PB ECR 99-00015 Rev ____
Attachment Page 84 of ____
Dwg ____
Sht ____ Rev ____
initials ____

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.13 (continued)

affected Turbine Stop Valve—Closure and Turbine Control Valve 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 is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

SR 3.3.1.1.17

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods (LCO 3.1.3), and SDV vent and drain valves (LCO 3.1.8), 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 that these components will pass the Surveillance when performed at the 24 month Frequency.

The LOGIC SYSTEM FUNCTIONAL TEST for APRM Function 2.e simulates APRM and OPRM trip conditions at the 2-Out-Of-4 voter channel inputs to check all combinations of two tripped inputs to the 2-Out-Of-4 logic in the voter channels and APRM related redundant RPS relays.

SR 3.3.1.1.18

This SR ensures that the individual channel response times are maintained less than or equal to the original design value. The RPS RESPONSE TIME acceptance criterion is included in Reference 11.

RPS RESPONSE TIME tests are conducted on a 24 month Frequency. The 24 month Frequency is consistent with the PBAPS refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

INSERT 14

(continued)

TECH SPEC MARKUP

INSERT 14:

SR 3.3.1.1.19

This surveillance involves confirming the OPRM Upscale trip auto-enable setpoints. The auto-enable setpoint values are considered to be nominal values as discussed in Reference 18. This surveillance ensures that the OPRM Upscale trip is enabled (not bypassed) for the correct values of APRM Simulated Thermal Power and recirculation drive flow. Other surveillances ensure that the APRM Simulated Thermal Power and recirculation drive flow properly correlate with THERMAL POWER (SR 3.3.1.1.2) and core flow (SR 3.3.1.1.12), respectively.

If any auto-enable setpoint is nonconservative (i.e., the OPRM Upscale trip is bypassed when APRM Simulated Thermal Power ≥ 29.5% and recirculation drive flow < 60%), then the affected channel is considered inoperable for the OPRM Upscale Function. Alternatively, the OPRM Upscale trip auto-enable setpoint(s) may be adjusted to place the channel in a conservative condition (not bypassed). If the OPRM Upscale trip is placed in the not-bypassed condition, this SR is met and the channel is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

PB ECR 99-00015 Rev____
Attachment Page 86 of ____
Dwg ____
Sht ____ Rev ____
initials ____

REFERENCES

1. UFSAR, Section 7.2.
2. UFSAR, Chapter 14.
3. NEDO-32368, "Nuclear Measurement Analysis and Control Wide Range Neutron Monitoring System Licensing Report for Peach Bottom Atomic Power Station, Units 2 and 3," November 1994.
4. NEDC-32183P, "Power Rerate Safety Analysis Report for Peach Bottom 2 & 3," dated May 1993.
5. UFSAR, Section 14.6.2.
6. UFSAR, Section 14.5.4.
7. UFSAR, Section 14.5.1.
8. P. Check (NRC) letter to G. Lainas (NRC), "BWR Scram Discharge System Safety Evaluation," December 1, 1980.
9. NEDO-30851-P-A , "Technical Specification Improvement Analyses for BWR Reactor Protection System," March 1988.
10. MDE-87-0485-1, "Technical Specification Improvement Analysis for the Reactor Protection System for Peach Bottom Atomic Power Station Units 2 and 3," October 1987.
11. UFSAR, Section 7.2.3.9.
12. NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function", ~~March~~ October 1995.
13. NEDC-32410P Supplement 1, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function, Supplement 1", November 1997.

INSERT 15

TECH SPEC MARKUP

INSERT 15:

14. NEDO-31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995.

15. NEDO-31960-A, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995.

16. NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications," August 1996.

17. Letter, L. A. England (BWROG) to M. J. Virgilio, "BWR Owners' Group Guidelines for Stability Interim Corrective Action", June 6, 1994.

18. BWROG Letter 96113, K. P. Donovan (BWROG) to L. E. Phillips (NRC), "Guidelines for Stability Option III 'Enable Region' (TAC M92882)," September 17, 1996.

19. NEDO-24229-1, "Peach Bottom Atomic Power Station Units 2 and 3 Single-Loop Operation," May 1980.

PB ECR 99-00015 Rev
Attachment Page 88 of
Dwg
Sht Rev
initials

APPLICABLE SAFETY ANALYSES (continued)

Plant specific LOCA and average power range monitor/rod block monitor Technical Specification/maximum extended load line limit analyses have been performed assuming only one operating recirculation loop. These analyses demonstrate that, in the event of a LOCA caused by a pipe break in the operating recirculation loop, the Emergency Core Cooling System response will provide adequate core cooling (Refs. 2, 3, and 4).

The transient analyses of Chapter 14 of the UFSAR have also been performed for single recirculation loop operation (Ref. 5) and demonstrate sufficient flow coastdown characteristics to maintain fuel thermal margins during the abnormal operational transients analyzed provided the MCPR requirements are modified. During single recirculation loop operation, modification to the Reactor Protection System (RPS) average power range monitor (APRM) instrument setpoints is also required to account for the different relationships between recirculation drive flow and reactor core flow. The MCPR limits and APLHGR limits (power-dependent APLHGR multipliers, $MAPFAC_P$, and flow-dependent APLHGR multipliers, $MAPFAC_F$) for single loop operation are specified in the COLR. The APRM Simulated Thermal Power-High Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation."

~~Safety analyses performed for UFSAR Chapter 14 implicitly assume core conditions are stable. However, at the high power/low flow corner of the power/flow map, an increased probability for limit cycle oscillations exists (Ref. 6) depending on combinations of operating conditions (e.g., power shape, bundle power, and bundle flow). Generic evaluations indicate that when regional power oscillations become detectable on the APRMs, the safety margin may be insufficient under some operating conditions to ensure actions taken to respond to the APRMs signals would prevent violation of the MCPR Safety Limit (Ref. 7). NRC Generic Letter 86-02 (Ref. 8) addressed stability calculation methodology and stated that due to uncertainties, 10 CFR 50, Appendix A, General Design Criteria (GDC) 10 and 12 could not be met using analytic procedures on a BWR 4 design. However, Reference 8 concluded that operating limitations which provide for the detection (by monitoring neutron flux noise levels) and suppression of flux oscillations in operating regions of potential instability consistent with~~

(continued)

APPLICABLE SAFETY ANALYSES (continued)

~~the recommendations of Reference 6 are acceptable to demonstrate compliance with GDC 10 and 12. The NRC concluded that regions of potential instability could occur at calculated decay ratios of 0.8 or greater by the General Electric methodology.~~

~~Stability tests at operating BWRs were reviewed to determine a generic region of the power/flow map in which surveillance of neutron flux noise levels should be performed. A conservative decay ratio was chosen as the basis for determining the generic region for surveillance to account for the plant to plant variability of decay ratio with core and fuel designs. This decay ratio also helps ensure sufficient margin to an instability occurrence is maintained. The generic region ("Restricted" Region of Figure 3.4.1-1) has been determined to be bounded by the 78.7% rod line and the 45% core flow line. This conforms to Reference 6 recommendations. Operation is permitted in the "Restricted" Region when two recirculation loops are in operation provided neutron flux noise levels are verified to be within limits. Operation is permitted in the "Restricted" Region when only one recirculation loop is in operation provided core flow is > 39% of rated core flow and neutron flux levels are verified to be within limits. Single recirculation loop operation in the "Restricted" Region with core flow ≤ 39% of rated core flow shall be avoided due to the increased potential for thermal hydraulic instability in this condition. The "Unrestricted" Region of Figure 3.4.1-1 is the area of the power/flow map where unrestricted operation (with respect to thermal hydraulic stability concerns) is allowed, and includes any area not shown as the "Restricted" Region of the figure. The full power/flow map is not shown in Figure 3.4.1-1 to enhance the readability of the bounds of the "Restricted" Region. Operation outside the bounds of Figure 3.4.1-1 is governed by the plant operating procedures.~~

Recirculation loops operating satisfies Criterion 2 of the NRC Policy Statement.

LCO

Two recirculation loops are normally required to be in operation with their flows matched within the limits specified in SR 3.4.1.1 to ensure that during a LOCA caused by a break of the piping of one recirculation loop the

(continued)

PB ECR 99-00015 Rev
Attachment Page 90 of
Dwg
Sht Rev
initials

LCO

assumptions of the LOCA analysis are satisfied. ~~In addition, the core flow expressed as a function of THERMAL POWER must be in the "Unrestricted" Region of Figure 3.4.1-1, "THERMAL POWER Versus Core Flow Stability Regions."~~ Alternatively, with only one recirculation loop in operation, modifications to the required APLHGR limits (power- and flow-dependent APLHGR multipliers, MAPFAC$_P$ and MAPFAC$_F$, respectively of LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)") and APRM Simulated Thermal Power-High Allowable Value (LCO 3.3.1.1) must be applied to allow continued operation consistent with the assumptions of Reference~~s~~ 5 ~~and 6~~.

The LCO is modified by a Note which allows up to 12 hours before having to put in effect the required modifications to required limits after a change in the reactor operating conditions from two recirculation loops operating to single recirculation loop operation. If the required limits are not in compliance with the applicable requirements at the end of this period, the associated equipment must be declared inoperable or the limits "not satisfied," and the ACTIONS required by nonconformance with the applicable specifications implemented. This time is provided due to the need to stabilize operation with one recirculation loop, including the procedural steps necessary to limit flow in the operating loop, ~~limit total THERMAL POWER, monitor for excessive APRM and local power range monitor (LPRM) neutron flux noise levels;~~ and the complexity and detail required to fully implement and confirm the required limit modifications.

APPLICABILITY

In MODES 1 and 2, requirements for operation of the Reactor Coolant Recirculation System are necessary since there is considerable energy in the reactor core and the limiting design basis transients and accidents are assumed to occur.

In MODES 3, 4, and 5, the consequences of an accident are reduced and the coastdown characteristics of the recirculation loops are not important.

(continued)

ACTIONS

~~A.1~~

~~With one or two recirculation loops in operation with core flow as a function of THERMAL POWER in the "Restricted" Region of Figure 3.4.1-1, the plant is operating in a region where the potential for thermal hydraulic instability exists. In order to assure sufficient margin is provided for operator response to detect and suppress potential limit cycle oscillations, APRM and local power range monitor (LPRM) neutron flux noise levels must be periodically monitored and verified to be ≤ 4% and ≤ 3 times baseline noise levels. Detector levels A and C of one LPRM string per core quadrant plus detectors A and C of one LPRM string in the center of the core shall be monitored. A minimum of three APRMs shall also be monitored. The Completion Times of this verification (within 1 hour and once per 8 hours thereafter and within 1 hour after completion of any THERMAL POWER increase ≥ 5% RATED THERMAL POWER) are acceptable for ensuring potential limit cycle oscillations are detected to allow operator response to suppress the oscillation. These Completion Times were developed considering the operator's inherent knowledge of reactor status and sensitivity to potential thermal hydraulic instabilities when operating in this condition.~~

~~B.1~~

~~With the Required Action and associated Completion Time of Condition A not met, sufficient margin may not be available for operator response to suppress potential limit cycle oscillations since APRM or LPRM neutron flux noise levels may be > 4% and > 3 times baseline noise levels. As a result, action must be immediately initiated to restore noise levels to within required limits. The 2 hour Completion Time for restoring APRM and LPRM neutron flux noise levels to within required limits is acceptable because it minimizes risk while allowing time for restoration before subjecting the plant to transients associated with shutdown.~~

(continued)

ACTIONS (continued)

~~C.1 and C.2~~

~~With one recirculation loop in operation with core flow ≤ 39% of rated core flow and THERMAL POWER in the "Restricted" Region of Figure 3.4.1-1, an increased potential for thermal hydraulic instability exists. As a result, immediate action should be initiated to reduce THERMAL POWER to the "Unrestricted" Region of Figure 3.4.1-1 or increase core flow to > 39% of rated core flow. The 4 hour Completion Time provides a reasonable amount of time to complete the Required Action and is considered acceptable based on the frequent core monitoring by the operators (Required Action A.1) allowing potential limit cycle oscillations to be quickly detected.~~

A.1 ~~D.1~~

With the requirements of the LCO not met ~~for reasons other than Conditions A, B, C, and D,~~ the recirculation loops must be restored to operation with matched flows within 24 hours. A recirculation loop is considered not in operation when the pump in that loop is idle or when the mismatch between total jet pump flows of the two loops is greater than required limits. The loop with the lower flow must be considered not in operation. ~~(However, the flow rate of both loops shall be used for the purposes of determining if the THERMAL POWER and core flow combination is in the Unrestricted Region of Figure 3.4.1-1.)~~ Should a LOCA occur with one recirculation loop not in operation, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed to restore the inoperable loop to operating status.

Alternatively, if the single loop requirements of the LCO are applied to operating limits and RPS setpoints, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 24 hour Completion Time is based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

(continued)

PB ECR 99-00015 Rev
Attachment Page 93 of
Dwg
Sht Rev
initials

ACTIONS A.1 ~~D.1~~ (continued)

This Required Action does not require tripping the recirculation pump in the lowest flow loop when the mismatch between total jet pump flows of the two loops is greater than the required limits. However, in cases where large flow mismatches occur, low flow or reverse flow can occur in the low flow loop jet pumps, causing vibration of the jet pumps. If zero or reverse flow is detected, the condition should be alleviated by changing pump speeds to re-establish forward flow or by tripping the pump.

B.1 ~~E.1~~

With ~~any~~ no recirculation loops in operation or the Required Action and associated Completion Time of Condition ~~B, C, or D~~ A not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours. In this condition, the recirculation loops are not required to be operating because of the reduced severity of DBAs and minimal dependence on the recirculation loop coastdown characteristics. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

~~F.1~~

~~With no recirculation loops in operation, the plant must be brought to a MODE in which the LCO does not apply. Action must be initiated immediately to reduce THERMAL POWER to be within the "Unrestricted" Region of Figure 3.4.1-1 to assure thermal hydraulic stability concerns are addressed. The plant is then required to be placed in MODE 3 in 6 hours. In this condition, the recirculation loops are not required to be operating because of the reduced severity of DBAs and minimal dependence on the recirculation loop coastdown characteristics. The allowed Completion Time is reasonable to reach MODE 3 considering the potential for thermal hydraulic instability in this condition.~~

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This SR ensures the recirculation loops are within the allowable limits for mismatch. At low core flow (i.e., < 71.75 X 10^6 lbm/hr), the MCPR requirements provide larger margins to the fuel cladding integrity Safety Limit such that the potential adverse effect of early boiling transition during a LOCA is reduced. A larger flow mismatch can therefore be allowed when core flow is < 71.75 X 10^6 lbm/hr. The recirculation loop jet pump flow, as used in this Surveillance, is the summation of the flows from all of the jet pumps associated with a single recirculation loop.

The mismatch is measured in terms of core flow. (Rated core flow is 102.5 X 10^6 lbm/hr. The first limit is based on mismatch ≤ 10% of rated core flow when operating at < 70% of rated core flow. The second limit is based on mismatch ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.) If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. ~~(However, for the purposes of performing SR 3.4.1.2, the flow rate of both loops shall be used.)~~ The SR is not required when both loops are not in operation since the mismatch limits are meaningless during single loop or natural circulation operation. The Surveillance must be performed within 24 hours after both loops are in operation. The 24 hour Frequency is consistent with the Surveillance Frequency for jet pump OPERABILITY verification and has been shown by operating experience to be adequate to detect off normal jet pump loop flows in a timely manner.

~~SR 3.4.1.2~~

~~This SR ensures the reactor THERMAL POWER and core flow are within appropriate parameter limits to prevent uncontrolled power oscillations. At low recirculation flows and high reactor power, the reactor exhibits increased susceptibility to thermal hydraulic instability. Figure 3.4.1-1 is based on guidance provided in References 6 and 9 which are used to respond to operation in these conditions. The 24 hour Frequency is based on operating experience and the operators' inherent knowledge of reactor status, including significant changes in THERMAL POWER and core flow.~~

(continued)

BASES

REFERENCES

1. UFSAR, Section 14.6.3.

2. NEDC-32163P, "PBAPS Units 2 and 3 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," January 1993.

3. NEDC-32162P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Unit 2 and 3," Revision 1, February 1993.

4. NEDC-32428P, "Peach Bottom Atomic Power Station Unit 2 Cycle 11 ARTS Thermal Limits Analyses," December 1994.

5. NEDO-24229-1, "PBAPS Units 2 and 3 Single-Loop Operation," May 1980.

~~6. GE Service Information Letter No. 380, "BWR Core Thermal Hydraulic Stability," Revision 1, February 10, 1984.~~

~~7. NRC Bulletin 88-07, "Power Oscillations in Boiling Water Reactors (BWRs)," Supplement 1, December 30, 1988.~~

~~8. NRC Generic Letter 86-02, "Technical Resolution of Generic Issue B-19 Thermal Hydraulic Stability," January 22, 1986.~~

6 → ~~9.~~ NEDC-33064P, "Safety Analysis Report For Peach Bottom Atomic Power Station Units 2 & 3 Thermal Power Optimization," May 2002.

PB ECR 99-00015 Rev
Attachment Page 96 of
Dwg
Sht 1 Rev
initials MAJ

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. The Average Planar Linear Heat Generation Rate for Specification 3.2.1;

2. The Minimum Critical Power Ratio for Specifications 3.2.2 and 3.3.2.1;

3. The Linear Heat Generation Rate for Specification 3.2.3; ~~and~~

4. The Control Rod Block Instrumentation for Specification 3.3.2.1; and

INSERT 16

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (latest approved version as specified in the COLR);

2. NEDC-32162P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Units 2 and 3," Revision 2, March, 1995;

3. PECo-FMS-0001-A, "Steady-State Thermal Hydraulic Analysis of Peach Bottom Units 2 and 3 using the FIBWR Computer Code";

4. PECo-FMS-0002-A, "Method for Calculating Transient Critical Power Ratios for Boiling Water Reactors (RETRAN-TCPPECo)";

5. PECo-FMS-0003-A, "Steady-State Fuel Performance Methods Report";

6. PECo-FMS-0004-A, "Methods for Performing BWR Systems Transient Analysis";

(continued)

TECH SPEC MARKUP

INSERT 16:

5. The Oscillation Power Range Monitor (OPRM) Instrumentation for Specification 3.3.1.1.

PB ECR 99-00015 Rev ____
Attachment Page 98 of ____
Dwg ____
Sht ____ Rev ____
initials ____

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

7. PECo-FMS-0005-A, "Methods for Performing BWR Steady-State Reactor Physics Analysis"; ~~and~~

8. PECo-FMS-0006-A, "Methods for Performing BWR Reload Safety Evaluations"; and

INSENT 17

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Post Accident Monitoring (PAM) Instrumentation Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

TECH SPEC MARKUP

INSERT 17:

9. NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications," August 1996.

TECH SPEC MARKUP
for
Stability (PRNM) OPRM
Trip Activation MOD
at
PEACH BOTTOM UNIT 3

PB ECR 77-[illegible] Rev ____
Attachment Page 101 of ____
Dwg ________
Sht ____ Rev ____
initials [illegible]

3.3 INSTRUMENTATION

3.3.1.1 Reactor Protection System (RPS) Instrumentation

LCO 3.3.1.1 The RPS instrumentation for each Function in Table 3.3.1.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.1-1.

ACTIONS

-----------------------------------NOTE-----------------------------------
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable.	A.1 Place channel in trip.	12 hours
	OR	
	A.2 --------NOTE-------- Not applicable for Functions 2.a, 2.b, 2.c, ~~or~~ 2.d, or 2.f. --------------------- Place associated trip system in trip.	12 hours
B. ---------NOTE--------- Not applicable for Functions 2.a, 2.b, 2.c, ~~or~~ 2.d, or 2.f. --------------------- One or more Functions with one or more required channels inoperable in both trip systems.	B.1 Place channel in one trip system in trip.	6 hours
	OR	
	B.2 Place one trip system in trip.	6 hours

(continued)

PB ECR 99-00015 Rev ____
Attachment Page 102 of ____
Dwg ____
Sht ____ Rev ____
initials ____

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
H. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	H.1	Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

INSERT 1

SURVEILLANCE REQUIREMENTS

-----------------------------------NOTES-----------------------------------

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.1.2	------------------NOTE------------------ Not required to be performed until 12 hours after THERMAL POWER ≥ 25% RTP. -- Verify the absolute difference between the average power range monitor (APRM) channels and the calculated power is ≤ 2% RTP while operating at ≥ 25% RTP.	7 days

(continued)

TECH SPEC MARKUP

INSERT 1:

I.	As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	I.1	Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	12 hours
		AND		
		I.2	--------------NOTE---------------- LCO 3.0.4 is not applicable. ------------------------------------- Restore required channels to OPERABLE.	120 days
J.	Required Action and associated Completion Time of Condition I not met.	J.1	Reduce THERMAL POWER to <25% RTP.	4 hours

PB ECR 99-00015 Rev
Attachment Page 104 of
Dwg
Sht Rev
initials Jkw

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.9	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.1.1.10	------------------NOTE------------------ Radiation detectors are excluded. -- Perform CHANNEL CALIBRATION.	92 days
SR 3.3.1.1.11	------------------NOTES------------------ 1. For Function 2.a, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. 2. For Functions 2.b and 2.f, the CHANNEL FUNCTIONAL TEST includes the recirculation flow input processing, excluding the flow transmitters. -- Perform CHANNEL FUNCTIONAL TEST.	184 days
SR 3.3.1.1.12	------------------NOTES------------------ 1. Neutron detectors are excluded. 2. For Function 1, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. 3. For Functions 2.b and 2.f, the recirculation flow transmitters that feed the APRMs are included. -- Perform CHANNEL CALIBRATION.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.13	Verify Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions are not bypassed when THERMAL POWER is ≥ 29.5% RTP.	24 months
SR 3.3.1.1.14	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.1.1.15	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.1.16	Calibrate each radiation detector.	24 months
SR 3.3.1.1.17	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.1.18	Verify the RPS RESPONSE TIME is within limits.	24 months

INSERT 2

TECH SPEC MARKUP

INSERT 2:

SR 3.3.1.1.19	Verify OPRM is not bypassed when APRM Simulated Thermal Power is ≥ 29.5% and recirculation drive flow is < 60%.	24 months

Table 3.3.1.1-1 (page 1 of 3)
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. Wide Range Neutron Monitors					
a. Period-Short	2	3	G	SR 3.3.1.1.1 SR 3.3.1.1.5 SR 3.3.1.1.12 SR 3.3.1.1.17 SR 3.3.1.1.18	≥ 13 seconds
	5(a)	3	H	SR 3.3.1.1.1 SR 3.3.1.1.6 SR 3.3.1.1.12 SR 3.3.1.1.17 SR 3.3.1.1.18	≥ 13 seconds
b. Inop	2	3	G	SR 3.3.1.1.5 SR 3.3.1.1.17	NA
	5(a)	3	H	SR 3.3.1.1.6 SR 3.3.1.1.17	NA
2. Average Power Range Monitors					
a. Neutron Flux-High (Setdown)	2	3(c)	G	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 15.0% RTP
b. Simulated Thermal Power-High	1	3(c)	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 0.65 W + 63.7% RTP(b) and ≤ 118.0% RTP
c. Neutron Flux-High	1	3(c)	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 119.7% RTP
d. Inop	1,2	3(c)	G	SR 3.3.1.1.11	NA
e. 2-Out-Of-4 Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.11 SR 3.3.1.1.17 SR 3.3.1.1.18	NA

← INSERT 3

(continued)

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

(b) ~~0.65 W + 63.7% − 0.65 ΔW~~ RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."

0.65(W − ΔW) + 63.7%

(c) Each APRM channel provides inputs to both trip systems.

INSERT 3A

TECH SPEC MARKUP

INSERT 3:

f. OPRM Upscale	≥ 25% RTP	3(c)	I	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12 SR 3.3.1.1.19	NA(d)

INSERT 3A:

(d) See COLR for OPRM period based detection algorithm (PBDA) setpoint limits.

PB ECR 99-00015 Rev ____
Attachment Page 109 of ____
Dwg ____
Sht ____ Rev ____
initials KHW

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation. ~~with core flow as a function of THERMAL POWER in the "Unrestricted" Region of Figure 3.4.1-1.~~

OR

One recirculation loop shall be in operation with ~~core flow as a function of THERMAL POWER in the "Unrestricted" Region of Figure 3.4.1-1 and with~~ the following limits applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specif~~ic~~ed in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR; and

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Simulated Thermal Power-High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.

-----NOTE-----
Required limit modifications for single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.

APPLICABILITY: MODES 1 and 2.

PB ECR ______ Rev ____
Attachment Page 110 of ____
Dwg ________
Sht ____ Rev ____
initials ____ ____

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two recirculation loops in operation with core flow as a function of THERMAL POWER in the "Restricted" Region of Figure 3.4.1-1.	A.1 Verify APRM and LPRM neutron flux noise levels are ≤ 4% and ≤ 3 times baseline noise levels.	1 hour __AND__ Once per 8 hours thereafter __AND__ 1 hour after completion of any THERMAL POWER increase ≥ 5% RTP
B. Required Action and associated Completion Time of Condition A not met.	B.1 Restore APRM and LPRM neutron flux noise levels to ≤ 4% and ≤ 3 times baseline noise levels.	2 hours
C. One recirculation loop in operation with core flow ≤ 39% of rated core flow and THERMAL POWER in the "Restricted" Region of Figure 3.4.1-1.	C.1 Reduce THERMAL POWER to the "Unrestricted" Region of Figure 3.4.1-1.	4 hours
	__OR__	
	C.2 Increase core flow to > 39% of rated core flow.	4 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ~~D.~~ Requirements of the LCO not met. ~~for reasons other than Conditions A, B, C, and F.~~	A.1 ~~D.1~~ Satisfy the requirements of the LCO.	24 hours
B. ~~E.~~ Required Action and associated Completion Time of Condition ~~B, C, or D~~ A not met.	B.1 ~~E.1~~ Be in MODE 3.	12 hours
~~F.~~ No recirculation loops in operation. OR	~~F.1 Initiate action to reduce THERMAL POWER to the "Unrestricted" Region of Figure 3.4.1-1.~~ ~~AND~~ ~~F.2 Be in MODE 3.~~	~~Immediately~~ ~~6 hours~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	-------------------NOTE------------------- Not required to be performed until 24 hours after both recirculation loops are in operation. -- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is: a. $\leq$ 10.25 X 10^6 lbm/hr when operating at $<$ 71.75 X 10^6 lbm/hr; and b. $\leq$ 5.125 X 10^6 lbm/hr when operating at $\geq$ 71.75 X 10^6 lbm/hr.	24 hours
~~SR 3.4.1.2~~	~~Verify core flow as a function of THERMAL POWER is in the "Unrestricted" Region of Figure 3.4.1-1.~~	~~24 hours~~

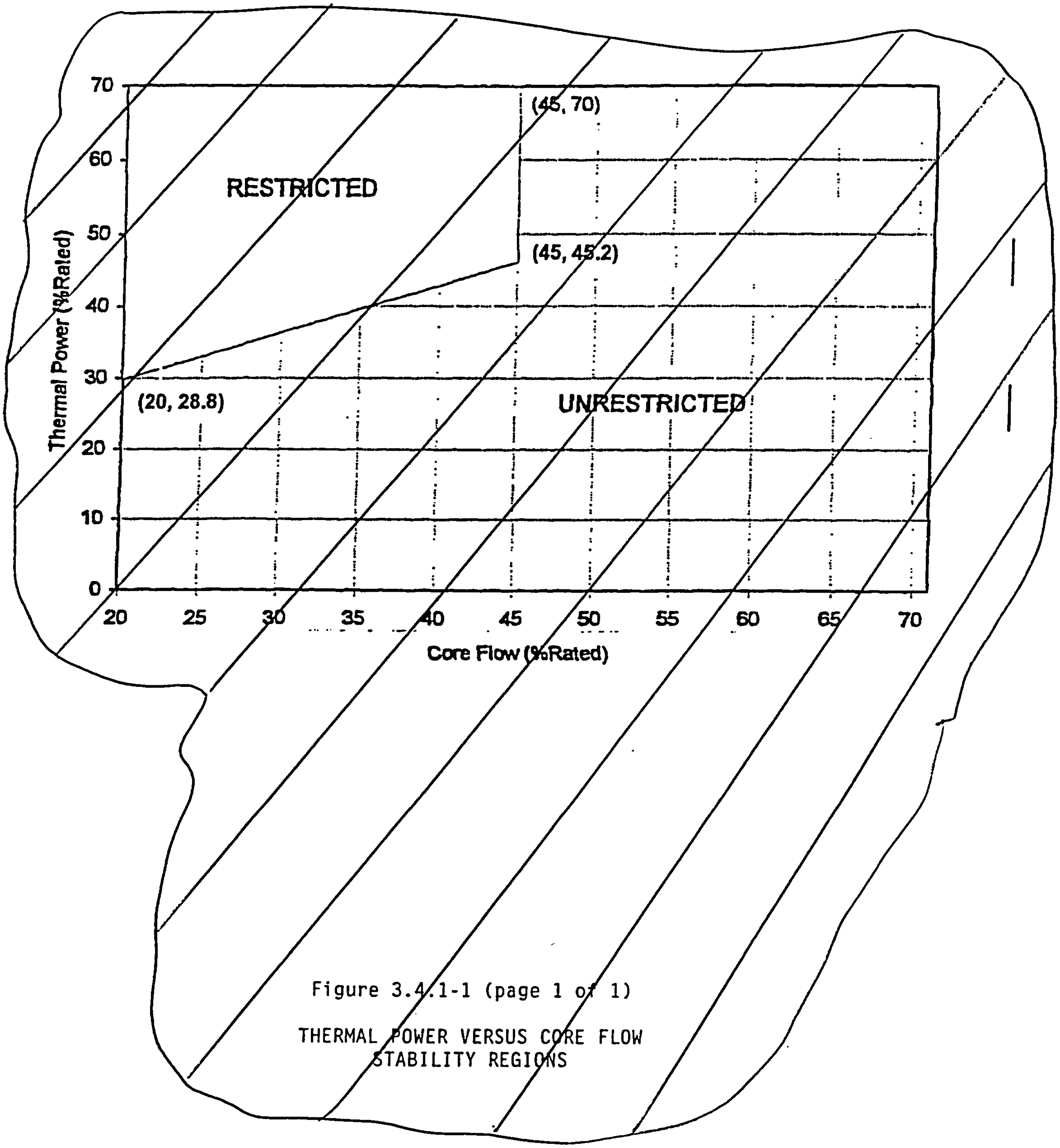

Figure 3.4.1-1 (page 1 of 1)

THERMAL POWER VERSUS CORE FLOW
STABILITY REGIONS

PB ECR 99-00015 Rev ____
Attachment Page 114 of ____
Dwg ____
Sht ____ Rev ____
initials ____

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1.b. Wide Range Neutron Monitor—Inop (continued)

Six channels of the Wide Range Neutron Monitor—Inop Function, with three channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. Since this Function is not assumed in the safety analysis, there is no Allowable Value for this Function.

This Function is required to be OPERABLE when the Wide Range Neutron Monitor Period-Short Function is required.

Average Power Range Monitor (APRM)

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The APRM channels receive input signals from the local power range monitors (LPRMs) within the reactor core to provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP. ← INSERT 4

The APRM System is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. INSE 5 A trip from any one unbypassed APRM will result in a "half-trip" in all four of the voter channels, but no trip inputs to either RPS trip system. ~~A~~ a trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system~~;~~ INS 6 thus resulting in a full scram signal. INSERT 7 Three of the four APRM channels and all four of the voter channels are required to be OPERABLE to ensure that no single failure will preclude a scram on a valid signal. In addition, to provide adequate coverage of the entire core, consistent with the design bases for the APRM ~~functions,~~ INSERT 8 at least 20 LPRM inputs, with at least three LPRM inputs from each of the four axial levels at which the LPRMs are located, must be operable for each APRM channel, and the number of LPRM inputs that have become inoperable (and bypassed) since the last APRM calibration (SR 3.3.1.1.2) must be less than ten for each APRM channel. INSERT 9

(continued)

TECH SPEC MARKUP

INSERT 4:

Each APRM also includes an Oscillation Power Range Monitor (OPRM) Upscale Function which monitors small groups of LPRM signals to detect thermal-hydraulic instabilities.

INSERT 5:

APRM trip Functions 2.a, 2.b, 2.c, and 2.d are voted independently from OPRM Upscale Function 2.f. Therefore, any Function 2.a, 2.b, 2.c, or 2.d

INSERT 6:

logic channel (A1, A2, B1, and B2)

INSERT 7:

Similarly, a Function 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels.

INSERT 8:

Functions 2.a, 2.b, and 2.c

INSERT 9:

For the OPRM Upscale, Function 2.f, LPRMs are assigned to "cells" of 3 or 4 detectors. A minimum of 25 cells, each with a minimum of 2 OPERABLE LPRMs, must be OPERABLE for the OPRM Upscale Function 2.f to be OPERABLE.

PB ECR 99-00015 Rev ____
Attachment Page 116 of ____
Dwg ____
Sht ____ Rev ____
initials ____

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.a. Average Power Range Monitor Neutron Flux-High (Setdown) (continued)

For operation at low power (i.e., MODE 2), the Average Power Range Monitor Neutron Flux-High (Setdown) Function is capable of generating a trip signal that prevents fuel damage resulting from abnormal operating transients in this power range. For most operation at low power levels, the Average Power Range Monitor Neutron Flux-High (Setdown) Function will provide a secondary scram to the Wide Range Neutron Monitor Period-Short Function because of the relative setpoints. At higher power levels, it is possible that the Average Power Range Monitor Neutron Flux-High (Setdown) Function will provide the primary trip signal for a corewide increase in power.

No specific safety analyses take direct credit for the Average Power Range Monitor Neutron Flux-High (Setdown) Function. However, this Function indirectly ensures that before the reactor mode switch is placed in the run position, reactor power does not exceed 25% RTP (SL 2.1.1.1) when operating at low reactor pressure and low core flow. Therefore, it indirectly prevents fuel damage during significant reactivity increases with THERMAL POWER < 25% RTP.

The Allowable Value is based on preventing significant increases in power when THERMAL POWER is < 25% RTP.

The Average Power Range Monitor Neutron Flux-High (Setdown) Function must be OPERABLE during MODE 2 when control rods may be withdrawn since the potential for criticality exists. In MODE 1, the Average Power Range Monitor Neutron Flux-High Function provides protection against reactivity transients and the RWM and rod block monitor protect against control rod withdrawal error events.

2.b. Average Power Range Monitor Simulated Thermal Power-High

The Average Power Range Monitor Simulated Thermal Power-High Function monitors average neutron flux to approximate the THERMAL POWER being transferred to the reactor coolant. The APRM neutron flux is electronically filtered with a time constant representative of the fuel heat transfer dynamics to generate a signal proportional to the THERMAL POWER in the reactor. The trip level is varied as a function of recirculation drive flow (i.e., at lower core flows, the setpoint is reduced proportional to the reduction in power experienced as core flow is reduced with a fixed control rod pattern) but is clamped at an upper limit that is always lower than the Average Power Range Monitor Neutron Flux-High Function Allowable Value.

INSERT 9a

(continued)

TECH SPEC MARKUP

INSERT 9a:

A note is included, applicable when the plant is in single recirculation loop operation per LCO 3.4.1, which requires the flow value, used in the Allowable Value equation, be reduced by ΔW. The value of ΔW is established to conservatively bound the inaccuracy created in the core flow/drive flow correlation due to back flow in the jet pumps associated with the inactive recirculation loop. The Allowable Value thus maintains thermal margins essentially unchanged from those for two loop operation. The value of ΔW is plant specific and is defined in plant procedures. The Allowable Value equation for single loop operation is only valid for flows down to W = ΔW; the Allowable Value does not go below 63.7% RTP. This is acceptable because back flow in the inactive recirculation loop is only evident with drive flows of approximately 35% or greater (Reference 19).

PB ECR 99-00015 Rev ____
Attachment Page 118 of ____
Dwg ____
Sht ____ Rev ____
initials Ovw

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2.d. Average Power Range Monitor - Inop

Three of the four APRM channels are required to be OPERABLE for each of the APRM Functions. This Function (Inop) provides assurance that the minimum number of APRM channels are OPERABLE.

For any APRM channel, any time its mode switch is not in the "Operate" position, an APRM module required to issue a trip is unplugged, or the automatic self-test system detects a critical fault with the APRM channel, an Inop trip is sent to all four voter channels. Inop trips from two or more ~~non-bypassed~~ unbypassed APRM channels result in a trip output from each of the four voter channels to it's associated trip system. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

There is no Allowable Value for this Function.

This Function is required to be OPERABLE in the MODES where the APRM Functions are required.

2.e. 2-Out-Of-4 Voter

The 2-Out-Of-4 Voter Function provides the interface between the APRM Functions, INSERT 10 and the final RPS trip system logic. As such, it is required to be OPERABLE in the MODES where the APRM Functions are required and is necessary to support the safety analysis applicable to each of those Functions. Therefore, the 2-Out-Of-4 Voter Function needs to be OPERABLE in MODES 1 and 2.

All four voter channels are required to be OPERABLE. Each voter channel includes self-diagnostic functions. If any voter channel detects a critical fault in its own processing, a trip is issued from that voter channel to the associated trip system.

INSERT 11 ¶

There is no Allowable Value for this Function.

INSERT 12

(continued)

TECH SPEC MARKUP

INSERT 10:

, including the OPRM Upscale Function,

INSERT 11:

The 2-Out-Of-4 Logic Module includes 2-Out-Of-4 Voter hardware and the APRM Interface hardware. The 2-Out-Of-4 Voter Function 2.e votes APRM Functions 2.a, 2.b, 2.c, and 2.d independently of Function 2.f. This voting is accomplished by the 2-Out-Of-4 Voter hardware in the 2-Out-Of-4 Logic Module. Each 2-Out-Of-4 Voter includes two redundant sets of outputs to RPS. Each output set contains two independent contacts; one contact for Functions 2.a, 2.b, 2.c and 2.d, and the other contact for Function 2.f. The analysis in Reference 12 took credit for this redundancy in the justification of the 12-hour Completion Time for Condition A, so the voter Function 2.e must be declared inoperable if any of its functionality is inoperable. However, the voter Function 2.e does not need to be declared inoperable due to any failure affecting only the plant interface portions of the 2-Out-Of-4 Logic Module that are not necessary to perform the 2-Out-Of-4 Voter function.

TECH SPEC MARKUP

INSERT 12:

2.f. Oscillation Power Range Monitor (OPRM) Upscale

The OPRM Upscale Function provides compliance with 10 CFR 50, Appendix A, General Design Criteria (GDC) 10 and 12, thereby providing protection from exceeding the fuel MCPR safety limit (SL) due to anticipated thermal-hydraulic power oscillations.

References 14, 15 and 16 describe three algorithms for detecting thermal-hydraulic instability related neutron flux oscillations: the period based detection algorithm (PBDA), the amplitude based algorithm (ABA), and the growth rate algorithm (GRA). All three are implemented in the OPRM Upscale Function, but the safety analysis takes credit only for the PBDA. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. OPRM Upscale Function OPERABILITY for Technical Specifications purposes is based only on the PBDA.

The OPRM Upscale Function receives input signals from the local power range monitors (LPRMs) within the reactor core, which are combined into "cells" for evaluation by the OPRM algorithms. Each channel is capable of detecting thermal-hydraulic instabilities, by detecting the related neutron flux oscillations, and issuing a trip signal before the MCPR SL is exceeded. Three of the four channels are required to be OPERABLE.

The OPRM Upscale trip is automatically enabled (bypass removed) when THERMAL POWER is ≥ 29.5% RTP, as indicated by the APRM Simulated Thermal Power, and reactor core flow is < 60% of rated flow, as indicated by APRM measured recirculation drive flow. This is the operating region where actual thermal-hydraulic instability and related neutron flux oscillations may occur (Reference 18). These setpoints, which are sometimes referred to as the "auto-bypass" setpoints, establish the boundaries of the OPRM Upscale trip enabled region.

The OPRM Upscale Function is required to be OPERABLE when the plant is at ≥ 25% RTP. The 25% RTP level is selected to provide margin in the unlikely event that a reactor power increase transient occurring while the plant is operating below 29.5% RTP causes a power increase to or beyond the 29.5% APRM Simulated Thermal Power OPRM Upscale trip auto-enable setpoint without operator action. This OPERABILITY requirement assures that the OPRM Upscale trip auto-enable function will be OPERABLE when required.

An OPRM Upscale trip is issued from an APRM channel when the PBDA in that channel detects oscillatory changes in the neutron flux, indicated by the combined signals of the LPRM detectors in a cell, with period confirmations and relative cell amplitude exceeding specified setpoints. One or more cells in a channel exceeding the trip conditions will result in a channel trip. An OPRM Upscale trip is also issued from the channel if either the GRA or ABA detects oscillatory changes in the neutron flux for one or more cells in that channel.

There are four "sets" of OPRM related setpoints or adjustment parameters: a) OPRM trip auto-enable setpoints for APRM Simulated Thermal Power (29.5%) and drive flow (60%); b) PBDA confirmation count and amplitude setpoints; c) PBDA tuning parameters; and d) GRA and ABA setpoints.

The first set, the OPRM auto-enable region setpoints, as discussed in the SR 3.3.1.1.19 Bases, are treated as nominal setpoints without the application of setpoint methodology per Reference 18. The settings, 29.5% APRM Simulated Thermal Power and 60% drive flow, are defined (limit values) in and confirmed by SR 3.3.1.1.19. The second set, the OPRM PBDA trip setpoints, are established in accordance with methodologies defined in Reference 16, and are documented in the COLR. There are no Technical Specifications allowable values for these setpoints. The third set, the OPRM PBDA "tuning" parameters, are established or adjusted in accordance with and controlled by PBAPS procedures. The fourth set, the GRA and ABA setpoints, in accordance with References 14, 15 and 16, are established as nominal values only, and are controlled by PBAPS procedures.

PB ECR 99-00015 Rev ____
Attachment Page 121 of ____
Dwg ____________
Sht ____ Rev ____
initials ________

BASES

ACTIONS

A.1 and A.2 (continued)

Function's inoperable channel is in one trip system and the Function still maintains RPS trip capability (refer to Required Actions B.1, B.2, and C.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel or the associated trip system must be placed in the tripped condition per Required Actions A.1 and A.2. Placing the inoperable channel in trip (or the associated trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternatively, if it is not desired to place the channel (or trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), Condition D must be entered and its Required Action taken.

As noted, Action A.2 is not applicable for APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f. ~~and 2.d.~~ Inoperability of one required APRM channel affects both trip systems. For that condition, Required Action A.1 must be satisfied, and is the only action (other than restoring operability) that will restore capability to accommodate a single failure. Inoperability of more than one required APRM channel of the same trip function results in loss of trip capability and entry into Condition C, as well as entery into Condition A for each channel.

B.1 and B.2

Condition B exists when, for any one or more Functions, at least one required channel is inoperable in each trip system. In this condition, provided at least one channel per trip system is OPERABLE, the RPS still maintains trip capability for that Function, but cannot accommodate a single failure in either trip system.

Required Actions B.1 and B.2 limit the time the RPS scram logic, for any Function, would not accommodate single failure in both trip systems (e.g., one-out-of-one and one-out-of-one arrangement for a typical four channel Function). The reduced reliability of this logic arrangement was not evaluated in References 9, 12 or 13 for the 12 hour Completion Time. Within the 6 hour allowance, the associated Function will have all required channels OPERABLE or in trip (or any combination) in one trip system.

(continued)

02
0;

PB ECR 99-00015 Rev 3 DIR. LICENSING
Attachment Page 122 of
Dwg
Sht Rev
initials ОМ

ACTIONS

B.1 and B.2 (continued)

Completing one of these Required Actions restores RPS to a reliability level equivalent to that evaluated in References 9, 12 or 13, which justified a 12 hour allowable out of service time as presented in Condition A. The trip system in the more degraded state should be placed in trip or, alternatively, all the inoperable channels in that trip system should be placed in trip (e.g., a trip system with two inoperable channels could be in a more degraded state than a trip system with four inoperable channels if the two inoperable channels are in the same Function while the four inoperable channels are all in different Functions). The decision of which trip system is in the more degraded state should be based on prudent judgment and take into account current plant conditions (i.e., what MODE the plant is in). If this action would result in a scram or RPT, it is permissible to place the other trip system or its inoperable channels in trip.

The 6 hour Completion Time is judged acceptable based on the remaining capability to trip, the diversity of the sensors available to provide the trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of a scram.

Alternately, if it is not desired to place the inoperable channels (or one trip system) in trip (e.g., as in the case where placing the inoperable channel or associated trip system in trip would result in a scram, Condition D must be entered and its Required Action taken.

As noted, Condition B is not applicable for APRM Functions 2.a, 2.b, 2.c, ~~and 2.d.~~ 2.d, or 2.f. Inoperability of an APRM channel affects both trip systems and is not associated with a specific trip system as are the APRM 2-Out-Of-4 voter and other non-APRM channels for which Condition B applies. For an inoperable APRM channel, Required Action A.1 must be satisfied, and is the only action (other than restoring operability) that will restore capability to accommodate a single failure. Inoperability of a Function in more than one required APRM channel results in loss of trip capability for that Function, and entry into Condition C, as well as entry into Condition A for each channel. Because Condition A and C provide Required Actions that are appropriate for the inoperability of APRM Functions 2.a, 2.b, 2.c, ~~and 2.d,~~ 2.d, or 2.f, and these functions are not associated with specific trip systems as are the APRM 2-Out-Of-4 voter and other non-APRM channels, Condition B does not apply.

(continued)

BASES

ACTIONS (continued)

E.1, F.1, ~~and~~ G.1, and J.1

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

INSERT 13

SURVEILLANCE REQUIREMENTS

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

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Refs. 9, 12 & 13) 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.

(continued)

TECH SPEC MARKUP

INSERT 13:

I.1

If OPRM Upscale trip capability is not maintained, Condition I exists. References 12 and 13 justified use of alternate methods to detect and suppress oscillations for a limited period of time. The alternate methods are procedurally established consistent with the guidelines identified in Reference 17 requiring manual operator action to scram the plant if certain predefined events occur. The 12-hour allowed Completion Time for Required Action I.1 is based on engineering judgment to allow orderly transition to the alternate methods while limiting the period of time during which no automatic or alternate detect and suppress trip capability is formally in place. Based on the small probability of an instability event occurring at all, the 12 hour duration is judged to be reasonable.

I.2

The alternate method to detect and suppress oscillations implemented in accordance with I.1 was evaluated (References 12 and 13) based on use up to 120 days only. The evaluation, based on engineering judgment, concluded that the likelihood of an instability event that could not be adequately handled by the alternate methods during this 120 day period was negligibly small. The 120-day period is intended to be an outside limit to allow for the case where design changes or extensive analysis might be required to understand or correct some unanticipated characteristic of the instability detection algorithms or equipment. This action is not intended and was not evaluated as a routine alternative to returning failed or inoperable equipment to OPERABLE status. Correction of routine equipment failure or inoperability is expected to normally be accomplished within the completion times allowed for Actions for Condition A.

A note is provided to indicate that LCO 3.0.4 is not applicable. The intent of that note is to allow plant startup while operating within the 120-day completion time for action I.2. The primary purpose of this exclusion is to allow an orderly completion of design and verification activities, in the event of a required design change, without undue impact on plant operation.

021

PB ECR 99-00473 Rev ____
Attachment Page 125 of ____
Dwg ____
Sht ____ Rev ____
initials ____

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.9 and SR 3.3.1.1.14 (continued)

In addition, Function 5 and 7 instruments are not accessible while the unit is operating at power due to high radiation and the installed indication instrumentation does not provide accurate indication of the trip setting. For the Function 9 channels, verification that the trip settings are less than or equal to the specified Allowable Value during the CHANNEL FUNCTIONAL TEST is not required since the instruments are not accessible while the unit is operating at power due to high radiation and the installed indication instrumentation does not provided accurate indication of the trip setting. Waiver of these verifications for the above functions is considered acceptable since the magnitude of drift assumed in the setpoint calculation is based on a 24 month calibration interval. The 92 day Frequency of SR 3.3.1.1.9 is based on the reliability analysis of Reference 9.

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 will pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.10, SR 3.3.1.1.12, SR 3.3.1.1.15, and SR 3.3.1.1.16

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations, consistent with the current plant specific setpoint methodology. ~~SR 3.3.1.1.16, however, is only a calibration of the radiation detectors using a standard radiation source.~~

INSERT 13a

As noted for SR 3.3.1.1.12, neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in

(continued)

TECH SPEC MARKUP

INSERT 13a:

As noted for SR 3.3.1.1.10, radiation detectors are excluded from CHANNEL CALIBRATION due to ALARA reasons (when the plant is operating, the radiation detectors are generally in a high radiation area; the steam tunnel). This exclusion is acceptable because the radiation detectors are passive devices, with minimal drift. To complete the radiation CHANNEL CALIBRATION, SR 3.3.1.1.16 requires that the radiation detectors be calibrated on a once per 24 months Frequency.

The once per 92 days Frequency of SR 3.3.1.1.10 is conservative with respect to the magnitude of equipment drift assumed in the setpoint analysis. The Frequency of SR 3.3.1.1.16 is based upon the assumption of a 24-month calibration interval used in the determination of the equipment drift in the setpoint analysis.

02,

PB ECR 99-00015 Rev ____
Attachment Page 127 of ____
Dwg ____
Sht ____ Rev ____
initials JMN ____

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10, SR 3.3.1.1.12, SR 3.3.1.1.15, and SR 3.3.1.1.16 (continued)

neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.8). A second note is provided for SR 3.3.1.1.12 that allows the WRNM SR to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 WRNM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads or movable links. This Note allows entry into MODE 2 from MODE 1, if the 24 month Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR. ~~For the APRM Simulated Thermal Power-High Function, SR 3.3.1.1.12 also includes calibrating the associated recirculation loop flow channel. A third note is provided for SR 3.3.1.1.12 to include the recirculation flow transmitters that feed the APRMs as applied to Function 2.b. The Average Power Range Monitor Simulated Thermal Power-High Function uses the recirculation loop drive flows to vary the trip setpoint. This SR ensures that the recirculation flow transmitters that supply the recirculation flow signal to the APRMs respond to the measured recirculation flow within the necessary range and accuracy by use of a standard pressure source.~~

INSERT 4F break

~~As noted for SR 3.3.1.1.10, radiation detectors are excluded from CHANNEL CALIBRATION due to ALARA reasons (when the plant is operating, the radiation detectors are generally in a high radiation area; the steam tunnel). This exclusion is acceptable because the radiation detectors are passive devices, with minimal drift. The radiation detectors are calibrated in accordance with SR 3.3.1.1.16 on a 24 month Frequency.~~

~~The 92 day Frequency of SR 3.3.1.1.10 is conservative with respect to the magnitude of equipment drift assumed in the setpoint analysis. The Frequencies of SR 3.3.1.1.12, SR 3.3.1.1.15 and SR 3.3.1.1.16 are based upon the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the applicable setpoint analysis.~~

INSERT 13b

SR 3.3.1.1.11

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the

(continued)

TECH SPEC MARKUP

INSERT 13b:

A third note is provided for SR 3.3.1.1.12 that includes in the SR the recirculation flow (drive flow) transmitters, which supply the flow signal to the APRMs. The APRM Simulated Thermal Power-High Function (Function 2.b) and the OPRM Upscale Function (Function 2.f), both require a valid drive flow signal. The APRM Simulated Thermal Power-High Function uses drive flow to vary the trip setpoint. The OPRM Upscale Function uses drive flow to automatically enable or bypass the OPRM Upscale trip output to RPS. A CHANNEL CALIBRATION of the APRM drive flow signal requires both calibrating the drive flow transmitters and establishing a valid drive flow / core flow relationship. The drive flow / core flow relationship is established once per refuel cycle, while operating at or near rated power and flow conditions. This method of correlating core flow and drive flow is consistent with GE recommendations. Changes throughout the cycle in the drive flow / core flow relationship due to the changing thermal hydraulic operating conditions of the core are accounted for in the margins included in the bases or analyses used to establish the setpoints for the APRM Simulated Thermal Power-High Function and the OPRM Upscale Function.

The Frequencies of SR 3.3.1.1.12 and SR 3.3.1.1.15 are based upon the assumption of a 24-month calibration interval used in the determination of the equipment drift in the setpoint analysis.

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.11 (continued)

INSERT 13c

intended function. For the APRM Functions, this test supplements the automatic self-test functions that operate continuously in the APRM and voter channels. The APRM CHANNEL FUNCTIONAL TEST covers the APRM channels (including recirculation flow processing - applicable to Function 2.b only), the 2-Out-Of 4 voter channels, and the interface connections into the RPS trip systems from the voter channels. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. The 184 day Frequency of SR 3.3.1.1.11 is based on the reliability analyses of References 12 and 13. (NOTE: The actual voting logic of the 2-Out-Of-4 Voter Function is tested as part of SR 3.3.1.1.17.)

INSERT 13d

INSERT 13e

A Note is provided for Function 2.a that requires this SR to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM Function cannot be performed in MODE 1 without utilizing jumpers or lifted leads. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2.

A second Note is provided for Function 2.b that clarifies that the CHANNEL FUNCTIONAL TEST for Function 2.b includes testing of the recirculation flow processing electronics, excluding the flow transmitters.

SR 3.3.1.1.13

This SR ensures that scrams initiated from the Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions will not be inadvertently bypassed when THERMAL POWER is ≥ 29.5% RTP. This involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodologies are incorporated into the Allowable Value (≤ 28.9% RTP which is equivalent to ≤ 138.4 psig as measured from turbine first stage pressure) and the actual setpoint. Because main turbine bypass flow can affect this setpoint nonconservatively (THERMAL POWER is derived from turbine first stage pressure), the main turbine bypass valves must remain closed during the calibration at THERMAL POWER ≥ 29.5% RTP to ensure that the calibration is valid.

If any bypass channel's setpoint is nonconservative (i.e., the Functions are bypassed at ≥ 29.5% RTP, either due to open main turbine bypass valve(s) or other reasons), then the

(continued)

TECH SPEC MARKUP

INSERT 13c:

The scope of the APRM CHANNEL FUNCTIONAL TEST is limited to verification of system trip output hardware. Software controlled functions are tested only incidentally. Automatic internal self-test functions check the EPROMs in which the software-controlled logic is defined. Any changes in the EPROMs will be detected by the self-test function resulting in a trip and/or alarm condition.

INSERT 13d:

and the auto-enable portion of Function 2.f

INSERT 13e:

The actual auto-enable setpoints for the OPRM Upscale trip are confirmed by SR 3.3.1.1.19.

PB ECR 99-00815 Rev ____
Attachment Page 131 of ____
Dwg ________
Sht ____ Rev ____
initials ____

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.13 (continued)

affected Turbine Stop Valve—Closure and Turbine Control Valve 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 is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

SR 3.3.1.1.17

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods (LCO 3.1.3), and SDV vent and drain valves (LCO 3.1.8), 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 that these components will pass the Surveillance when performed at the 24 month Frequency.

The LOGIC SYSTEM FUNCTIONAL TEST for APRM Function 2.e simulates APRM and OPRM trip conditions at the 2-Out-Of-4 voter channel inputs to check all combinations of two tripped inputs to the 2-Out-Of-4 logic in the voter channels and APRM related redundant RPS relays.

SR 3.3.1.1.18

This SR ensures that the individual channel response times are maintained less than or equal to the original design value. The RPS RESPONSE TIME acceptance criterion is included in Reference 11.

RPS RESPONSE TIME tests are conducted on a 24 month Frequency. The 24 month Frequency is consistent with the PBAPS refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

INSERT 14

(continued)

TECH SPEC MARKUP

INSERT 14:

SR 3.3.1.1.19

This surveillance involves confirming the OPRM Upscale trip auto-enable setpoints. The auto-enable setpoint values are considered to be nominal values as discussed in Reference 18. This surveillance ensures that the OPRM Upscale trip is enabled (not bypassed) for the correct values of APRM Simulated Thermal Power and recirculation drive flow. Other surveillances ensure that the APRM Simulated Thermal Power and recirculation drive flow properly correlate with THERMAL POWER (SR 3.3.1.1.2) and core flow (SR 3.3.1.1.12), respectively.

If any auto-enable setpoint is nonconservative (i.e., the OPRM Upscale trip is bypassed when APRM Simulated Thermal Power ≥ 29.5% and recirculation drive flow < 60%), then the affected channel is considered inoperable for the OPRM Upscale Function. Alternatively, the OPRM Upscale trip auto-enable setpoint(s) may be adjusted to place the channel in a conservative condition (not bypassed). If the OPRM Upscale trip is placed in the not-bypassed condition, this SR is met and the channel is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

PB ECR 99-00015 Rev
Attachment Page 133 of
Dwg
Sht Rev
initials OMRJ

BASES (continued)

REFERENCES

1. UFSAR, Section 7.2.
2. UFSAR, Chapter 14.
3. NEDO-32368, "Nuclear Measurement Analysis and Control Wide Range Neutron Monitoring System Licensing Report for Peach Bottom Atomic Power Station, Units 2 and 3," November 1994.
4. NEDC-32183P, "Power Rerate Safety Analysis Report for Peach Bottom 2 & 3," dated May 1993.
5. UFSAR, Section 14.6.2.
6. UFSAR, Section 14.5.4.
7. UFSAR, Section 14.5.1.
8. P. Check (NRC) letter to G. Lainas (NRC), "BWR Scram Discharge System Safety Evaluation," December 1, 1980.
9. NEDO-30851-P-A , "Technical Specification Improvement Analyses for BWR Reactor Protection System," March 1988.
10. MDE-87-0485-1, "Technical Specification Improvement Analysis for the Reactor Protection System for Peach Bottom Atomic Power Station Units 2 and 3," October 1987.
11. UFSAR, Section 7.2.3.9.
12. NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function", October ~~March~~ 1995.
13. NEDC-32410P Supplement 1, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function, Supplement 1", November 1997.

INSERT 15

TECH SPEC MARKUP

INSERT 15:

14. NEDO-31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995.

15. NEDO-31960-A, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995.

16. NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications," August 1996.

17. Letter, L. A. England (BWROG) to M. J. Virgilio, "BWR Owners' Group Guidelines for Stability Interim Corrective Action", June 6, 1994.

18. BWROG Letter 96113, K. P. Donovan (BWROG) to L. E. Phillips (NRC), "Guidelines for Stability Option III 'Enable Region' (TAC M92882)," September 17, 1996.

19. NEDO-24229-1, "Peach Bottom Atomic Power Station Units 2 and 3 Single-Loop Operation," May 1980.

PB ECR 99-00015 Rev
Attachment Page 135 of
Dwg
Sht Rev
initials 9UnJ

APPLICABLE SAFETY ANALYSES (continued)

Plant specific LOCA and average power range monitor/rod block monitor Technical Specification/maximum extended load line limit analyses have been performed assuming only one operating recirculation loop. These analyses demonstrate that, in the event of a LOCA caused by a pipe break in the operating recirculation loop, the Emergency Core Cooling System response will provide adequate core cooling (Refs. 2, 3, and 4).

The transient analyses of Chapter 14 of the UFSAR have also been performed for single recirculation loop operation (Ref. 5) and demonstrate sufficient flow coastdown characteristics to maintain fuel thermal margins during the abnormal operational transients analyzed provided the MCPR requirements are modified. During single recirculation loop operation, modification to the Reactor Protection System (RPS) average power range monitor (APRM) instrument setpoints is also required to account for the different relationships between recirculation drive flow and reactor core flow. The MCPR limits and APLHGR limits (power-dependent APLHGR multipliers, MAPFAC,, and flow-dependent APLHGR multipliers, MAPFAC) for single loop operation are specified in the COLR. The APRM Simulated Thermal Power-High Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation."

~~Safety analyses performed for UFSAR Chapter 14 implicitly assume core conditions are stable. However, at the high power/low flow corner of the power/flow map, an increased probability for limit cycle oscillations exists (Ref. 6) depending on combinations of operating conditions (e.g., power shape, bundle power, and bundle flow). Generic evaluations indicate that when regional power oscillations become detectable on the APRMs, the safety margin may be insufficient under some operating conditions to ensure actions taken to respond to the APRMs signals would prevent violation of the MCPR Safety Limit (Ref. 7). NRC Generic Letter 86-02 (Ref. 8) addressed stability calculation methodology and stated that due to uncertainties, 10 CFR 50, Appendix A, General Design Criteria (GDC) 10 and 12 could not be met using analytic procedures on a BWR 4 design. However, Reference 8 concluded that operating limitations which provide for the detection (by monitoring neutron flux noise levels) and suppression of flux oscillations in operating regions of potential instability consistent with~~

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

~~the recommendations of Reference 6 are acceptable to demonstrate compliance with GDC 10 and 12. The NRC concluded that regions of potential instability could occur at calculated decay ratios of 0.8 or greater by the General Electric methodology.~~

~~Stability tests at operating BWRs were reviewed to determine a generic region of the power/flow map in which surveillance of neutron flux noise levels should be performed. A conservative decay ratio was chosen as the basis for determining the generic region for surveillance to account for the plant to plant variability of decay ratio with core and fuel designs. This decay ratio also helps ensure sufficient margin to an instability occurrence is maintained. The generic region ("Restricted" Region of Figure 3.4.1-1) has been determined to be bounded by the 78.7% rod line and the 45% core flow line. This conforms to Reference 6 recommendations. Operation is permitted in the "Restricted" Region when two recirculation loops are in operation provided neutron flux noise levels are verified to be within limits. Operation is permitted in the "Restricted" Region when only one recirculation loop is in operation provided core flow is > 39% of rated core flow and neutron flux levels are verified to be within limits. Single recirculation loop operation in the "Restricted" Region with core flow ≤ 39% of rated core flow shall be avoided due to the increased potential for thermal hydraulic instability in this condition. The "Unrestricted" Region of Figure 3.4.1-1 is the area of the power/flow map where unrestricted operation (with respect to thermal hydraulic stability concerns) is allowed, and includes any area not shown as the "Restricted" Region of the figure. The full power/flow map is not shown in Figure 3.4.1-1 to enhance the readability of the bounds of the "Restricted" Region. Operation outside the bounds of Figure 3.4.1-1 is governed by plant operating procedures.~~ |

Recirculation loops operating satisfies Criterion 2 of the NRC Policy Statement.

LCO

Two recirculation loops are normally required to be in operation with their flows matched within the limits specified in SR 3.4.1.1 to ensure that during a LOCA caused by a break of the piping of one recirculation loop the

(continued)

PB ECR 99-00015 Rev ____
Attachment Page 137 of ____
Dwg ____
Sht 1 Rev ____
initials

BASES

LCO

assumptions of the LOCA analysis are satisfied. ~~In addition, the core flow expressed as a function of THERMAL POWER must be in the "Unrestricted" Region of Figure 3.4.1-1, "THERMAL POWER Versus Core Flow Stability Regions."~~ Alternatively, with only one recirculation loop in operation, modifications to the required APLHGR limits (power- and flow-dependent APLHGR multipliers, MAPFAC, and MAPFAC,, respectively of LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)") and APRM Simulated Thermal Power-High Allowable Value (LCO 3.3.1.1) must be applied to allow continued operation consistent with the assumptions of Reference~~s~~ 5 ~~and 6.~~

The LCO is modified by a Note which allows up to 12 hours before having to put in effect the required modifications to required limits after a change in the reactor operating conditions from two recirculation loops operating to single recirculation loop operation. If the required limits are not in compliance with the applicable requirements at the end of this period, the associated equipment must be declared inoperable or the limits "not satisfied," and the ACTIONS required by nonconformance with the applicable specifications implemented. This time is provided due to the need to stabilize operation with one recirculation loop, including the procedural steps necessary to limit flow in the operating loop, ~~limit total THERMAL POWER, monitor for excessive APRM and local power range monitor (LPRM) neutron flux noise levels,~~ and the complexity and detail required to fully implement and confirm the required limit modifications.

APPLICABILITY

In MODES 1 and 2, requirements for operation of the Reactor Coolant Recirculation System are necessary since there is considerable energy in the reactor core and the limiting design basis transients and accidents are assumed to occur.

In MODES 3, 4, and 5, the consequences of an accident are reduced and the coastdown characteristics of the recirculation loops are not important.

(continued)

PB ECR 99-00015 Rev
Attachment Page 138 of
Dwg
Sht Rev
initials

BASES

ACTIONS

~~A.1~~

~~With one or two recirculation loops in operation with core flow as a function of THERMAL POWER in the "Restricted" Region of Figure 3.4.1-1, the plant is operating in a region where the potential for thermal hydraulic instability exists. In order to assure sufficient margin is provided for operator response to detect and suppress potential limit cycle oscillations, APRM and local power range monitor~~

~~(LPRM) neutron flux noise levels must be periodically monitored and verified to be ≤ 4% and ≤ 3 times baseline noise levels. Detector levels A and C of one LPRM string per core quadrant plus detectors A and C of one LPRM string in the center of the core shall be monitored. A minimum of three APRMs shall also be monitored. The Completion Times of this verification (within 1 hour and once per 8 hours thereafter and within 1 hour after completion of any THERMAL POWER increase ≥ 5% RATED THERMAL POWER) are acceptable for ensuring potential limit cycle oscillations are detected to allow operator response to suppress the oscillation. These Completion Times were developed considering the operator's inherent knowledge of reactor status and sensitivity to potential thermal hydraulic instabilities when operating in this condition.~~

~~B.1~~

~~With the Required Action and associated Completion Time of Condition A not met, sufficient margin may not be available for operator response to suppress potential limit cycle oscillations since APRM or LPRM neutron flux noise levels may be > 4% and > 3 times baseline noise levels. As a result, action must be immediately initiated to restore noise levels to within required limits. The 2 hour Completion Time for restoring APRM and LPRM neutron flux noise levels to within required limits is acceptable because it minimizes risk while allowing time for restoration before subjecting the plant to transients associated with shutdown.~~

(continued)

BASES

ACTIONS (continued)

~~C.1 and C.2~~

~~With one recirculation loop in operation with core flow ≤ 39% of rated core flow and THERMAL POWER in the "Restricted" Region of Figure 3.4.1-1, an increased potential for thermal hydraulic instability exists. As a result, immediate action should be initiated to reduce THERMAL POWER to the "Unrestricted" Region of Figure 3.4.1-1 or increase core flow to > 39% of rated core flow. The 4 hour Completion Time provides a reasonable amount of time to complete the Required Action and is considered acceptable based on the frequent core monitoring by the operators (Required Action A.1) allowing potential limit cycle oscillations to be quickly detected.~~

A.1 ~~D.1~~

With the requirements of the LCO not met, ~~for reasons other than Conditions A, B, C, and F,~~ the recirculation loops must be restored to operation with matched flows within 24 hours. A recirculation loop is considered not in operation when the pump in that loop is idle or when the mismatch between total jet pump flows of the two loops is greater than required limits. The loop with the lower flow must be considered not in operation. ~~(However, the flow rate of both loops shall be used for the purposes of determining if the THERMAL POWER and core flow combination is in the Unrestricted Region of Figure 3.4.1-1.)~~ Should a LOCA occur with one recirculation loop not in operation, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed to restore the inoperable loop to operating status.

Alternatively, if the single loop requirements of the LCO are applied to operating limits and RPS setpoints, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 24 hour Completion Time is based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

(continued)

PB ECR 99-00015 Rev ____
Attachment Page 140 of ____
Dwg ____________
Sht ____ Rev ____
initials

ACTIONS A.1 ~~D.1~~ (continued)

This Required Action does not require tripping the recirculation pump in the lowest flow loop when the mismatch between total jet pump flows of the two loops is greater than the required limits. However, in cases where large flow mismatches occur, low flow or reverse flow can occur in the low flow loop jet pumps, causing vibration of the jet pumps. If zero or reverse flow is detected, the condition should be alleviated by changing pump speeds to re-establish forward flow or by tripping the pump.

B.1 ~~E.1~~

no recirculation Loops in operation or the

With any Required Action and associated Completion Time of Condition ~~B, C, or D~~ A not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours. In this condition, the recirculation loops are not required to be operating because of the reduced severity of DBAs and minimal dependence on the recirculation loop coastdown characteristics. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

~~C.1~~ ~~F.1~~

~~Insert 1B~~

~~With no recirculation loops in operation, the plant must be brought to a MODE in which the LCO does not apply. Action must be initiated immediately to reduce THERMAL POWER to be within the "Unrestricted" Region of Figure 3.4.1-1 to assure thermal hydraulic stability concerns are addressed. The plant is then required to be placed in MODE 3 in 6 hours. In this condition, the recirculation loops are not required to be operating because of the reduced severity of DBAs and minimal dependence on the recirculation loop coastdown characteristics. The allowed Completion Time is reasonable to reach MODE 3 considering the potential for thermal hydraulic instability in this condition.~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This SR ensures the recirculation loops are within the allowable limits for mismatch. At low core flow (i.e., < 71.75 X 10^6 lbm/hr), the MCPR requirements provide larger margins to the fuel cladding integrity Safety Limit such that the potential adverse effect of early boiling transition during a LOCA is reduced. A larger flow mismatch can therefore be allowed when core flow is < 71.75 X 10^6 lbm/hr. The recirculation loop jet pump flow, as used in this Surveillance, is the summation of the flows from all of the jet pumps associated with a single recirculation loop.

The mismatch is measured in terms of core flow. (Rated core flow is 102.5 X 10^6 lbm/hr. The first limit is based on mismatch ≤ 10% of rated core flow when operating at < 70% of rated core flow. The second limit is based on mismatch ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.) If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. ~~(However, for the purposes of performing SR 3.4.1.2, the flow rate of both loops shall be used.)~~ The SR is not required when both loops are not in operation since the mismatch limits are meaningless during single loop or natural circulation operation. The Surveillance must be performed within 24 hours after both loops are in operation. The 24 hour Frequency is consistent with the Surveillance Frequency for jet pump OPERABILITY verification and has been shown by operating experience to be adequate to detect off normal jet pump loop flows in a timely manner.

~~SR 3.4.1.2~~

~~This SR ensures the reactor THERMAL POWER and core flow are within appropriate parameter limits to prevent uncontrolled power oscillations. At low recirculation flows and high reactor power, the reactor exhibits increased susceptibility to thermal hydraulic instability. Figure 3.4.1-1 is based on guidance provided in References 6 and 9 which are used to respond to operation in these conditions. The 24 hour Frequency is based on operating experience and the operators' inherent knowledge of reactor status, including significant changes in THERMAL POWER and core flow.~~

(continued)

BASES

REFERENCES

1. UFSAR, Section 14.6.3.

2. NEDC-32163P, "PBAPS Units 2 and 3 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," January 1993.

3. NEDC-32162P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Unit 2 and 3," Revision 1, February 1993.

4. NEDC-32427P, "Peach Bottom Atomic Power Station Unit 3 Cycle 10 ARTS Thermal Limits Analyses," December 1994.

5. NEDO-24229-1, "PBAPS Units 2 and 3 Single-Loop Operation," May 1980.

~~6. GE Service Information Letter No. 380, "BWR Core Thermal Hydraulic Stability," Revision 1, February 10, 1984.~~

~~7. NRC Bulletin 88-07, "Power Oscillations in Boiling Water Reactors (BWRs)," Supplement 1, December 30, 1988.~~

~~8. NRC Generic Letter 86-02, "Technical Resolution of Generic Issue B-19 Thermal Hydraulic Stability," January 22, 1986.~~

6 → ~~9.~~ NEDC-33064P, "Safety Analysis Report for Peach Bottom Atomic Power Station Units 2 & 3 Thermal Power Optimization," May 2002.

PB ECR 77-00015 Rev —
Attachment Page 143 of ____
Dwg ____
Sht ____ Rev ____
initials ____

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. The Average Planar Linear Heat Generation Rate for Specification 3.2.1;

2. The Minimum Critical Power Ratio for Specifications 3.2.2 and 3.3.2.1;

3. The Linear Heat Generation Rate for Specification 3.2.3; ~~and~~

4. The Control Rod Block Instrumentation for Specification 3.3.2.1; and

INSERT 16

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (latest approved version as specified in the COLR);

2. NEDC-32162P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Units 2 and 3," Revision 2, March, 1995;

3. PECo-FMS-0001-A, "Steady-State Thermal Hydraulic Analysis of Peach Bottom Units 2 and 3 using the FIBWR Computer Code";

4. PECo-FMS-0002-A, "Method for Calculating Transient Critical Power Ratios for Boiling Water Reactors (RETRAN-TCPPECo)";

5. PECo-FMS-0003-A, "Steady-State Fuel Performance Methods Report";

6. PECo-FMS-0004-A, "Methods for Performing BWR Systems Transient Analysis";

(continued)

TECH SPEC MARKUP

INSERT 16:

5. The Oscillation Power Range Monitor (OPRM) Instrumentation for Specification 3.3.1.1.

PB ECR 99-00015 Rev
Attachment Page 145 of
Dwg
Sht Rev
initials

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

7. PECo-FMS-0005-A, "Methods for Performing BWR Steady-State Reactor Physics Analysis"; ~~and~~

8. PECo-FMS-0006-A, "Methods for Performing BWR Reload Safety Evaluations~~.~~"; and

INSERT 17

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Post Accident Monitoring (PAM) Instrumentation Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

TECH SPEC MARKUP

INSERT 17:

9. NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications," August 1996.

Attachment 3

License Amendment Request

Peach Bottom Atomic Power Station, Units 2 and 3
Docket Nos. 50-277 and 50-278

Activation of the Trip Outputs of the Oscillation Power Range Monitor Portion of the Power Range Neutron Monitoring System

Typed Technical Specifications and Bases Pages for Proposed Changes

UNIT 2	UNIT 2	UNIT 3	UNIT 3
3.3-1	B 3.3-27	3.3-1	B 3.3-27
3.3-3	B 3.3-27a	3.3-3	B 3.3-27a
3.3-3a	B 3.3-32	3.3-3a	B 3.3-32
3.3-5	B 3.3-33	3.3-5	B 3.3-33
3.3-6	B 3.3-34	3.3-6	B 3.3-34
3.3-7	B 3.3-35	3.3-7	B 3.3-35
3.4-1	B 3.3-35a	3.4-1	B 3.3-36
3.4-2	B 3.3-35b	3.4-2	B 3-3-36a
3.4-3	B 3.4-3	3.4-3	B 3.4-3
3.4-4	B 3.4-4	3.4-4	B 3.4-4
3.4-5	B 3.4-5	3.4-5	B 3.4-5
B 3.3-7	B 3.4-6	B 3.3-7	B 3.4-6
B 3.3-8	B 3.4-7	B 3.3-8	B 3.4-7
B 3.3-9	B 3.4-8	B 3.3-9	B 3.4-8
B 3.3-12	B 3.4-9	B 3.3-12	B 3.4-9
B 3.3-12a	B 3.4-10	B 3.3-12a	B 3.4-10
B 3.3-12b	5.0-21	B 3.3-12b	5.0-21
B 3.3-24	5.0-22	B 3.3-24	5.0-22
B 3.3-25		B 3.3-25	

3.3 INSTRUMENTATION

3.3.1.1 Reactor Protection System (RPS) Instrumentation

LCO 3.3.1.1 The RPS instrumentation for each Function in Table 3.3.1.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.1-1.

ACTIONS

------------------------------------NOTE------------------------------------
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable.	A.1 Place channel in trip.	12 hours
	<u>OR</u>	
	A.2 --------NOTE--------- Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2.f. --------------------- Place associated trip system in trip.	12 hours
B. --------NOTE--------- Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2.f. --------------------- One or more Functions with one or more required channels inoperable in both trip systems.	B.1 Place channel in one trip system in trip.	6 hours
	<u>OR</u>	
	B.2 Place one trip system in trip.	6 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
H. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	H.1	Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately
I. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	I.1	Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	12 hours
	<u>AND</u>		
	I.2	--------NOTE-------- LCO 3.0.4 is not applicable. -------------------- Restore required channels to OPERABLE.	120 days
J. Required Action and associated Completion Time of Condition I not met.	J.1	Reduce THERMAL POWER to <25% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

-----------------------------------NOTES-----------------------------------

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.1.2	-----------------NOTE------------------ Not required to be performed until 12 hours after THERMAL POWER ≥ 25% RTP. -------------------------------------- Verify the absolute difference between the average power range monitor (APRM) channels and the calculated power is ≤ 2% RTP while operating at ≥ 25% RTP.	7 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.9	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.1.1.10	-----------------NOTE----------------- Radiation detectors are excluded. -------------------------------------- Perform CHANNEL CALIBRATION.	92 days
SR 3.3.1.1.11	-----------------NOTES----------------- 1. For Function 2.a, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. 2. For Functions 2.b and 2.f, the CHANNEL FUNCTIONAL TEST includes the recirculation flow input processing, excluding the flow transmitters. -------------------------------------- Perform CHANNEL FUNCTIONAL TEST.	184 days
SR 3.3.1.1.12	-----------------NOTES----------------- 1. Neutron detectors are excluded. 2. For Function 1, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. 3. For Functions 2.b and 2.f, the recirculation flow transmitters that feed the APRMs are included. -------------------------------------- Perform CHANNEL CALIBRATION.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.13	Verify Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions are not bypassed when THERMAL POWER is ≥ 29.5% RTP.	24 months
SR 3.3.1.1.14	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.1.1.15	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.1.16	Calibrate each radiation detector.	24 months
SR 3.3.1.1.17	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.1.18	Verify the RPS RESPONSE TIME is within limits.	24 months
SR 3.3.1.1.19	Verify OPRM is not bypassed when APRM Simulated Thermal Power is ≥29.5% and recirculation drive flow is <60%.	24 months

Table 3.3.1.1-1 (page 1 of 3)
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. Wide Range Neutron Monitors					
a. Period-Short	2	3	G	SR 3.3.1.1.1 SR 3.3.1.1.5 SR 3.3.1.1.12 SR 3.3.1.1.17 SR 3.3.1.1.18	≥ 13 seconds
	5(a)	3	H	SR 3.3.1.1.1 SR 3.3.1.1.6 SR 3.3.1.1.12 SR 3.3.1.1.17 SR 3.3.1.1.18	≥ 13 seconds
b. Inop	2	3	G	SR 3.3.1.1.5 SR 3.3.1.1.17	NA
	5(a)	3	H	SR 3.3.1.1.6 SR 3.3.1.1.17	NA
2. Average Power Range Monitors					
a. Neutron Flux-High (Setdown)	2	3(c)	G	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 15.0% RTP
b. Simulated Thermal Power-High	1	3(c)	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 0.65 W + 63.7% RTP(b) and ≤ 118.0% RTP
c. Neutron Flux-High	1	3(c)	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 119.7% RTP
d. Inop	1,2	3(c)	G	SR 3.3.1.1.11	NA
e. 2-Out-Of-4 Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.11 SR 3.3.1.1.17 SR 3.3.1.1.18	NA
f. OPRM Upscale	≥25% RTP	3(c)	I	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12 SR 3.3.1.1.19	NA(d)

(continued)

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

(b) 0.65 (W - ΔW) + 63.7% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."

(c) Each APRM channel provides inputs to both trip systems.

(d) See COLR for OPRM period based detection algorithm (PBDA) setpoint limits.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation.

<u>OR</u>

One recirculation loop shall be in operation with the following limits applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR; and

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Simulated Thermal Power-High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.

---------------------------NOTE---------------------------

Required limit modifications for single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

THIS PAGE LEFT BLANK INTENTIONALLY

(The contents of this page have been deleted)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Satisfy the requirements of the LCO.	24 hours
B. No recirculation loops in operation. OR Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	-------------------NOTE------------------ Not required to be performed until 24 hours after both recirculation loops are in operation. -- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is: a. ≤ 10.25 X 10^6 lbm/hr when operating at < 71.75 X 10^6 lbm/hr; and b. ≤ 5.125 X 10^6 lbm/hr when operating at ≥ 71.75 X 10^6 lbm/hr.	24 hours

THIS PAGE LEFT BLANK INTENTIONALLY

(The contents of this page have been deleted)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1.b. Wide Range Neutron Monitor—Inop (continued)

Six channels of the Wide Range Neutron Monitor—Inop Function, with three channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. Since this Function is not assumed in the safety analysis, there is no Allowable Value for this Function.

This Function is required to be OPERABLE when the Wide Range Neutron Monitor Period-Short Function is required.

Average Power Range Monitor (APRM)

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The APRM channels receive input signals from the local power range monitors (LPRMs) within the reactor core to provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP. Each APRM also includes an Oscillation Power Range Monitor (OPRM) Upscale Function which monitors small groups of LPRM signals to detect thermal-hydraulic instabilities.

The APRM System is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. A trip from any one unbypassed APRM will result in a “half-trip” in all four of the voter channels, but no trip inputs to either RPS trip system. APRM trip Functions 2.a, 2.b, 2.c, and 2.d are voted independently from OPRM Upscale Function 2.f. Therefore, any Function 2.a, 2.b, 2.c, or 2.d trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system logic channel (A1, A2, B1, and B2), thus resulting in a full scram signal. Similarly, a Function 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels. Three of the four APRM channels and all four of the voter channels are required to be OPERABLE to ensure that no single failure will preclude a scram on a valid signal. In addition, to provide adequate coverage of the entire core, consistent with the design bases for the APRM Functions 2.a, 2.b, and 2.c, at least 20 LPRM inputs, with at least three LPRM inputs from each of the four axial levels at which the LPRMs are located, must be operable for each APRM channel, and the number of LPRM inputs that have become inoperable (and bypassed) since the last APRM calibration (SR 3.3.1.1.2) must be less than ten for each APRM channel. For the OPRM Upscale, Function 2.f, LPRMs are assigned to “cells” of 3 or 4 detectors. A minimum of 25 cells, each with a minimum of 2 OPERABLE LPRMs, must be OPERABLE for the OPRM Upscale Function 2.f to be OPERABLE.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.a. Average Power Range Monitor Neutron Flux-High (Setdown) (continued)

For operation at low power (i.e., MODE 2), the Average Power Range Monitor Neutron Flux-High (Setdown)Function is capable of generating a trip signal that prevents fuel damage resulting from abnormal operating transients in this power range. For most operation at low power levels, the Average Power Range Monitor Neutron Flux-High (Setdown) Function will provide a secondary scram to the Wide Range Neutron Monitor Period-Short Function because of the relative setpoints. At higher power levels, it is possible that the Average Power Range Monitor Neutron Flux-High (Setdown) Function will provide the primary trip signal for a corewide increase in power.

No specific safety analyses take direct credit for the Average Power Range Monitor Neutron Flux-High (Setdown) Function. However, this Function indirectly ensures that before the reactor mode switch is placed in the run position, reactor power does not exceed 25% RTP (SL 2.1.1.1) when operating at low reactor pressure and low core flow. Therefore, it indirectly prevents fuel damage during significant reactivity increases with THERMAL POWER < 25% RTP.

The Allowable Value is based on preventing significant increases in power when THERMAL POWER is < 25% RTP.

The Average Power Range Monitor Neutron Flux-High (Setdown) Function must be OPERABLE during MODE 2 when control rods may be withdrawn since the potential for criticality exists. In MODE 1, the Average Power Range Monitor Neutron Flux-High Function provides protection against reactivity transients and the RWM and rod block monitor protect against control rod withdrawal error events.

2.b. Average Power Range Monitor Simulated Thermal Power-High

The Average Power Range Monitor Simulated Thermal Power-High Function monitors average neutron flux to approximate the THERMAL POWER being transferred to the reactor coolant. The APRM neutron flux is electronically filtered with a time constant representative of the fuel heat transfer dynamics to generate a signal proportional to the THERMAL POWER in the reactor. The trip level is varied as a function of recirculation drive flow (i.e., at lower core flows, the setpoint is reduced proportional to the reduction in power experienced as core flow is reduced with a fixed control rod pattern) but is clamped at an upper limit that is always lower than the Average Power Range Monitor Neutron Flux-High Function Allowable Value. A note is included, applicable when the plant is in single recirculation loop operation per LCO 3.4.1, which requires the flow value, used in the Allowable Value equation, be reduced by ΔW. The value of ΔW

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Simulated Thermal Power-High (continued)

is established to conservatively bound the inaccuracy created in the core flow/drive flow correlation due to back flow in the jet pumps associated with the inactive recirculation loop. The Allowable Value thus maintains thermal margins essentially unchanged from those for two loop operation. The value of ΔW is plant specific and is defined in plant procedures. The Allowable Value equation for single loop operation is only valid for flows down to $W = \Delta W$; the Allowable Value does not go below 63.7% RTP. This is acceptable because back flow in the inactive recirculation loop is only evident with drive flows of approximately 35% or greater (Reference 19).

The Average Power Range Monitor Simulated Thermal Power-High Function is not specifically credited in the safety analysis but is intended to provide an additional margin of protection from transient induced fuel damage during operation where recirculation flow is reduced to below the minimum required for rated power operation. The Average Power Range Monitor Simulated Thermal Power-High Function provides protection against transients where THERMAL POWER increases slowly (such as the loss of feedwater heating event) and protects the fuel cladding integrity by ensuring that the MCPR SL is not exceeded. During these events, the THERMAL POWER increase does not significantly lag the neutron flux scram. For rapid neutron flux increase events, the THERMAL POWER lags the neutron flux and the Average Power Range Monitor Neutron Flux-High Function will provide a scram signal before the Average Power Range Monitor Simulated Thermal Power-High Function setpoint is exceeded.

Each APRM channel uses one total drive flow signal representative of total core flow. The total drive flow signal is generated by the flow processing logic, part of the APRM channel, by summing up the flow calculated from two flow transmitter signal inputs, one from each of the two recirculation loop flows. The flow processing logic OPERABILITY is part of the APRM channel OPERABILITY requirements for this Function. The APRM flow processing logic is considered inoperable whenever it cannot deliver a flow signal less than or equal to actual Recirculation flow conditions for all steady state and transient reactor conditions while in Mode 1. Reduced or Downscale flow conditions due to planned maintenance or testing activities during derated plant conditions (i.e. end of cycle coast down) will result in conservative setpoints for the APRM Simulated Thermal Power-High function, thus maintaining that function operable.

(continued)

2.d. Average Power Range Monitor—Inop

Three of the four APRM channels are required to be OPERABLE for each of the APRM Functions. This Function (Inop) provides assurance that the minimum number of APRM channels are OPERABLE.

For any APRM channel, any time its mode switch is not in the "Operate" position, an APRM module required to issue a trip is unplugged, or the automatic self-test system detects a critical fault with the APRM channel, an Inop trip is sent to all four voter channels. Inop trips from two or more unbypassed APRM channels result in a trip output from each of the four voter channels to it's associated trip system. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

There is no Allowable Value for this Function.

This Function is required to be OPERABLE in the MODES where the APRM Functions are required.

2.e. 2-Out-Of-4 Voter

The 2-Out-Of-4 Voter Function provides the interface between the APRM Functions, including the OPRM Upscale Function, and the final RPS trip system logic. As such, it is required to be OPERABLE in the MODES where the APRM Functions are required and is necessary to support the safety analysis applicable to each of those Functions. Therefore, the 2-Out-Of-4 Voter Function needs to be OPERABLE in MODES 1 and 2.

All four voter channels are required to be OPERABLE. Each voter channel includes self-diagnostic functions. If any voter channel detects a critical fault in its own processing, a trip is issued from that voter channel to the associated trip system.

The 2-Out-Of-4 Logic Module includes 2-Out-Of-4 Voter hardware and the APRM Interface hardware. The 2-Out-Of-4 Voter Function 2.e votes APRM Functions 2.a, 2.b, 2.c and 2.d independently of Function 2.f. This voting is accomplished by the 2-Out-Of-4 Voter hardware in the 2-Out-Of-4 Logic Module. Each 2-Out-Of-4 Voter includes two redundant sets of outputs to RPS. Each output set contains two independent contacts; one contact for Functions 2.a, 2.b, 2.c and 2.d, and the other contact for Function 2.f. The analysis in Reference 12 took credit for this redundancy in the justification of the 12-hour Completion Time for Condition A, so the voter Function 2.e must be declared inoperable if any of its functionality is inoperable. However, the voter Function 2.e does not need to be declared inoperable due to any failure affecting only the plant interface portions of the 2-Out-Of-4 Logic Module that are not necessary to perform the 2-Out-Of-4 Voter function.

There is no Allowable Value for this Function.

(continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2.f. Oscillation Power Range Monitor (OPRM) Upscale

The OPRM Upscale Function provides compliance with 10 CFR 50, Appendix A, General Design Criteria (GDC) 10 and 12, thereby providing protection from exceeding the fuel MCPR safety limit (SL) due to anticipated thermal-hydraulic power oscillations.

References 14, 15 and 16 describe three algorithms for detecting thermal-hydraulic instability related neutron flux oscillations: the period based detection algorithm (PBDA), the amplitude based algorithm (ABA), and the growth rate algorithm (GRA). All three are implemented in the OPRM Upscale Function, but the safety analysis takes credit only for the PBDA. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. OPRM Upscale Function OPERABILITY for Technical Specifications purposes is based only on the PBDA.

The OPRM Upscale Function receives input signals from the local power range monitors (LPRMs) within the reactor core, which are combined into "cells" for evaluation by the OPRM algorithms. Each channel is capable of detecting thermal-hydraulic instabilities, by detecting the related neutron flux oscillations, and issuing a trip signal before the MCPR SL is exceeded. Three of the four channels are required to be OPERABLE.

The OPRM Upscale trip is automatically enabled (bypass removed) when THERMAL POWER is ≥ 29.5% RTP, as indicated by the APRM Simulated Thermal Power, and reactor core flow is < 60% of rated flow, as indicated by APRM measured recirculation drive flow. This is the operating region where actual thermal-hydraulic instability and related neutron flux oscillations may occur (Reference 18). These setpoints, which are sometimes referred to as the "auto-bypass" setpoints, establish the boundaries of the OPRM Upscale trip enabled region.

The OPRM Upscale Function is required to be OPERABLE when the plant is at ≥ 25% RTP. The 25% RTP level is selected to provide margin in the unlikely event that a reactor power increase transient occurring while the plant is operating below 29.5% RTP causes a power increase to or beyond the 29.5% APRM Simulated Thermal Power OPRM Upscale trip auto-enable setpoint without operator action. This OPERABILITY requirement assures that the OPRM Upscale trip auto-enable function will be OPERABLE when required.

(continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2.f. Oscillation Power Range Monitor (OPRM) Upscale (continued)

An OPRM Upscale trip is issued from an APRM channel when the PBDA in that channel detects oscillatory changes in the neutron flux, indicated by the combined signals of the LPRM detectors in a cell, with period confirmations and relative cell amplitude exceeding specified setpoints. One or more cells in a channel exceeding the trip conditions will result in a channel trip. An OPRM Upscale trip is also issued from the channel if either the GRA or ABA detects oscillatory changes in the neutron flux for one or more cells in that channel.

There are four "sets" of OPRM related setpoints or adjustment parameters: a) OPRM trip auto-enable setpoints for Simulated Thermal Power (29.5%) and drive flow (60%); b) PBDA confirmation count and amplitude setpoints; c) PBDA tuning parameters; and d) GRA and ABA setpoints.

The first set, the OPRM auto-enable region setpoints, as discussed in the SR 3.3.1.1.19 Bases, are treated as nominal setpoints without the application of setpoint methodology per Reference 18. The settings, 29.5% APRM Simulated Thermal Power and 60% drive flow, are defined (limit values) in and confirmed by SR 3.3.1.1.19. The second set, the OPRM PBDA trip setpoints, are established in accordance with methodologies defined in Reference 16, and are documented in the COLR. There are no Technical Specifications allowable values for these setpoints. The third set, the OPRM PBDA "tuning" parameters, are established or adjusted in accordance with and controlled by PBAPS procedures. The fourth set, the GRA and ABA setpoints, in accordance with References 14, 15 and 16, are established as nominal values only, and controlled by PBAPS procedures.

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

Function's inoperable channel is in one trip system and the Function still maintains RPS trip capability (refer to Required Actions B.1, B.2, and C.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel or the associated trip system must be placed in the tripped condition per Required Actions A.1 and A.2. Placing the inoperable channel in trip (or the associated trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternatively, if it is not desired to place the channel (or trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), Condition D must be entered and its Required Action taken.

As noted, Action A.2 is not applicable for APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f. Inoperability of one required APRM channel affects both trip systems. For that condition, Required Action A.1 must be satisfied, and is the only action (other than restoring operability) that will restore capability to accommodate a single failure. Inoperability of more than one required APRM channel of the same trip function results in loss of trip capability and entry into Condition C, as well as entry into Condition A for each channel.

B.1 and B.2

Condition B exists when, for any one or more Functions, at least one required channel is inoperable in each trip system. In this condition, provided at least one channel per trip system is OPERABLE, the RPS still maintains trip capability for that Function, but cannot accommodate a single failure in either trip system.

Required Actions B.1 and B.2 limit the time the RPS scram logic, for any Function, would not accommodate single failure in both trip systems (e.g., one-out-of-one and one-out-of-one arrangement for a typical four channel Function). The reduced reliability of this logic arrangement was not evaluated in References 9, 12 or 13 for the 12 hour Completion Time. Within the 6 hour allowance, the associated Function will have all required channels OPERABLE or in trip (or any combination) in one trip system.

(continued)

ACTIONS

B.1 and B.2 (continued)

Completing one of these Required Actions restores RPS to a reliability level equivalent to that evaluated in References 9, 12 or 13, which justified a 12 hour allowable out of service time as presented in Condition A. The trip system in the more degraded state should be placed in trip or, alternatively, all the inoperable channels in that trip system should be placed in trip (e.g., a trip system with two inoperable channels could be in a more degraded state than a trip system with four inoperable channels if the two inoperable channels are in the same Function while the four inoperable channels are all in different Functions). The decision of which trip system is in the more degraded state should be based on prudent judgment and take into account current plant conditions (i.e., what MODE the plant is in). If this action would result in a scram or RPT, it is permissible to place the other trip system or its inoperable channels in trip.

The 6 hour Completion Time is judged acceptable based on the remaining capability to trip, the diversity of the sensors available to provide the trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of a scram.

Alternately, if it is not desired to place the inoperable channels (or one trip system) in trip (e.g., as in the case where placing the inoperable channel or associated trip system in trip would result in a scram, Condition D must be entered and its Required Action taken.

As noted, Condition B is not applicable for APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f. Inoperability of an APRM channel affects both trip systems and is not associated with a specific trip system as are the APRM 2-Out-Of-4 voter and other non-APRM channels for which Condition B applies. For an inoperable APRM channel, Required Action A.1 must be satisfied, and is the only action (other than restoring operability) that will restore capability to accommodate a single failure. Inoperability of a Function in more than one required APRM channel results in loss of trip capability for that Function and entry into Condition C, as well as entry into Condition A for each channel. Because Condition A and C provide Required Actions that are appropriate for the inoperability of APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f, and these functions are not associated with specific trip systems as are the APRM 2-Out-Of-4 voter and other non-APRM channels, Condition B does not apply.

(continued)

ACTIONS (continued)

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

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

I.1

If OPRM Upscale trip capability is not maintained, Condition I exists. References 12 and 13 justified use of alternate methods to detect and suppress oscillations for a limited period of time. The alternate methods are procedurally established consistent with the guidelines identified in Reference 17 requiring manual operator action to scram the plant if certain predefined events occur. The 12-hour allowed Completion Time for Required Action I.1 is based on engineering judgment to allow orderly transition to the alternate methods while limiting the period of time during which no automatic or alternate detect and suppress trip capability is formally in place. Based on the small probability of an instability event occurring at all, the 12 hour duration is judged to be reasonable.

(continued)

BASES

ACTIONS (continued)

I.2

The alternate method to detect and suppress oscillations implemented in accordance with I.1 was evaluated (References 12 and 13) based on use up to 120 days only. The evaluation, based on engineering judgment, concluded that the likelihood of an instability event that could not be adequately handled by the alternate methods during this 120-day period was negligibly small. The 120-day period is intended to be an outside limit to allow for the case where design changes or extensive analysis might be required to understand or correct some unanticipated characteristic of the instability detection algorithms or equipment. This action is not intended and was not evaluated as a routine alternative to returning failed or inoperable equipment to OPERABLE status. Correction of routine equipment failure or inoperability is expected to normally be accomplished within the completion times allowed for Actions for Condition A.

A note is provided to indicate that LCO 3.0.4 is not applicable. The intent of that note is to allow plant startup while operating within the 120-day completion time for action I.2. The primary purpose of this exclusion is to allow an orderly completion of design and verification activities, in the event of a required design change, without undue impact on plant operation.

SURVEILLANCE REQUIREMENTS

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

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Refs. 9, 12 & 13) 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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.9 and SR 3.3.1.1.14 (continued)

In addition, Function 5 and 7 instruments are not accessible while the unit is operating at power due to high radiation and the installed indication instrumentation does not provide accurate indication of the trip setting. For the Function 9 channels, verification that the trip settings are less than or equal to the specified Allowable Value during the CHANNEL FUNCTIONAL TEST is not required since the instruments are not accessible while the unit is operating at power due to high radiation and the installed indication instrumentation does not provided accurate indication of the trip setting. Waiver of these verifications for the above functions is considered acceptable since the magnitude of drift assumed in the setpoint calculation is based on a 24 month calibration interval. The 92 day Frequency of SR 3.3.1.1.9 is based on the reliability analysis of Reference 9.

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 will pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.10, SR 3.3.1.1.12, SR 3.3.1.1.15, and SR 3.3.1.1.16

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations, consistent with the current plant specific setpoint methodology.

As noted for SR 3.3.1.1.10, radiation detectors are excluded from CHANNEL CALIBRATION due to ALARA reasons (when the plant is operating, the radiation detectors are generally in a high radiation area; the steam tunnel). This exclusion is acceptable because the radiation detectors are passive devices, with minimal drift. To complete the radiation CHANNEL CALIBRATION, SR 3.3.1.1.16 requires that the radiation detectors be calibrated on a once per 24 months Frequency.

The once per 92 days Frequency of SR 3.3.1.1.10 is conservative with respect to the magnitude of equipment drift assumed in the setpoint analysis. The Frequency of SR 3.3.1.1.16 is based upon the assumption of a 24-month calibration interval used in the determination of the equipment drift in the setpoint analysis.

As noted for SR 3.3.1.1.12, neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10, SR 3.3.1.1.12, SR 3.3.1.1.15, and SR 3.3.1.1.16 (continued)

neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.8).

A second note is provided for SR 3.3.1.1.12 that allows the WRNM SR to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 WRNM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads or movable links. This Note allows entry into MODE 2 from MODE 1, if the 24 month Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

A third note is provided for SR 3.3.1.1.12 that includes in the SR the recirculation flow (drive flow) transmitters, which supply the flow signal to the APRMs. The APRM Simulated Thermal Power-High Function (Function 2.b) and the OPRM Upscale Function (Function 2.f), both require a valid drive flow signal. The APRM Simulated Thermal Power-High Function uses drive flow to vary the trip setpoint. The OPRM Upscale Function uses drive flow to automatically enable or bypass the OPRM Upscale trip output to RPS. A CHANNEL CALIBRATION of the APRM drive flow signal requires both calibrating the drive flow transmitters and establishing a valid drive flow / core flow relationship. The drive flow /core flow relationship is established once per refuel cycle, while operating at or near rated power and flow conditions. This method of correlating core flow and drive flow is consistent with GE recommendations. Changes throughout the cycle in the drive flow / core flow relationship due to the changing thermal hydraulic operating conditions of the core are accounted for in the margins included in the bases or analyses used to establish the setpoints for the APRM Simulated Thermal Power-High Function and the OPRM Upscale Function.

The Frequencies of SR 3.3.1.1.12 and SR 3.3.1.1.15 are based upon the assumption of a 24-month calibration interval used in the determination of the equipment drift in the setpoint analysis.

SR 3.3.1.1.11

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.11 (continued)

intended function. For the APRM Functions, this test supplements the automatic self-test functions that operate continuously in the APRM and voter channels. The scope of the APRM CHANNEL FUNCTIONAL TEST is limited to verification of system trip output hardware. Software controlled functions are tested only incidentally. Automatic internal self-test functions check the EPROMs in which the software-controlled logic is defined. Any changes in the EPROMs will be detected by the self-test function resulting in a trip and/or alarm condition. The APRM CHANNEL FUNCTIONAL TEST covers the APRM channels (including recirculation flow processing - applicable to Function 2.b and the auto-enable portion of Function 2.f only), the 2-Out-Of 4 voter channels, and the interface connections into the RPS trip systems from the voter channels. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. The 184 day Frequency of SR 3.3.1.1.11 is based on the reliability analyses of References 12 and 13. (NOTE: The actual voting logic of the 2-Out-Of-4 Voter Function is tested as part of SR 3.3.1.1.17. The actual auto-enable setpoints for the OPRM Upscale trip are confirmed by SR 3.3.1.1.19.)

A Note is provided for Function 2.a that requires this SR to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM Function cannot be performed in MODE 1 without utilizing jumpers or lifted leads. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2.

A second Note is provided for Function 2.b that clarifies that the CHANNEL FUNCTIONAL TEST for Function 2.b includes testing of the recirculation flow processing electronics, excluding the flow transmitters.

SR 3.3.1.1.13

This SR ensures that scrams initiated from the Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions will not be inadvertently bypassed when THERMAL POWER is ≥ 29.5% RTP. This involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodologies are incorporated into the Allowable Value (≤ 28.9% RTP which is equivalent to ≤ 138.4 psig as measured from turbine first stage pressure) and the actual setpoint. Because main turbine bypass flow can affect this setpoint nonconservatively (THERMAL POWER is derived from turbine first stage pressure), the main turbine bypass valves must remain closed during the calibration at THERMAL POWER ≥ 29.5% RTP to ensure that the calibration is valid.

If any bypass channel's setpoint is nonconservative (i.e., the Functions are bypassed at ≥ 29.5% RTP, either due to open main turbine bypass valve(s) or other reasons), then the

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.13 (continued)

affected Turbine Stop Valve—Closure and Turbine Control Valve 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 is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

SR 3.3.1.1.17

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods (LCO 3.1.3), and SDV vent and drain valves (LCO 3.1.8), 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 that these components will pass the Surveillance when performed at the 24 month Frequency.

The LOGIC SYSTEM FUNCTIONAL TEST for APRM Function 2.e simulates APRM and OPRM trip conditions at the 2-Out-Of-4 voter channel inputs to check all combinations of two tripped inputs to the 2-Out-Of-4 logic in the voter channels and APRM related redundant RPS relays.

SR 3.3.1.1.18

This SR ensures that the individual channel response times are maintained less than or equal to the original design value. The RPS RESPONSE TIME acceptance criterion is included in Reference 11.

RPS RESPONSE TIME tests are conducted on a 24 month Frequency. The 24 month Frequency is consistent with the PBAPS refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.19

This surveillance involves confirming the OPRM Upscale trip auto-enable setpoints. The auto-enable setpoint values are considered to be nominal values as discussed in Reference 18. This surveillance ensures that the OPRM Upscale trip is enabled (not bypassed) for the correct values of APRM Simulated Thermal Power and recirculation drive flow. Other surveillances ensure that the APRM Simulated Thermal Power and recirculation drive flow properly correlate with THERMAL POWER (SR 3.3.1.1.2) and core flow (SR 3.3.1.1.12), respectively.

If any auto-enable setpoint is nonconservative (i.e., the OPRM Upscale trip is bypassed when APRM Simulated Thermal Power ≥29.5% and recirculation drive flow < 60%), then the affected channel is considered inoperable for the OPRM Upscale Function. Alternatively, the OPRM Upscale trip auto-enable setpoint(s) may be adjusted to place the channel in a conservative condition (not bypassed). If the OPRM Upscale trip is placed in the not-bypassed condition, this SR is met and the channel is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

REFERENCES

1. UFSAR, Section 7.2.
2. UFSAR, Chapter 14.
3. NEDO-32368, "Nuclear Measurement Analysis and Control Wide Range Neutron Monitoring System Licensing Report for Peach Bottom Atomic Power Station, Units 2 and 3," November 1994.
4. NEDC-32183P, "Power Rerate Safety Analysis Report for Peach Bottom 2 & 3," dated May 1993.
5. UFSAR, Section 14.6.2.
6. UFSAR, Section 14.5.4.
7. UFSAR, Section 14.5.1.
8. P. Check (NRC) letter to G. Lainas (NRC), "BWR Scram Discharge System Safety Evaluation," December 1, 1980.
9. NEDO-30851-P-A , "Technical Specification Improvement Analyses for BWR Reactor Protection System," March 1988.

(continued)

BASES

REFERENCES (continued)

10. MDE-87-0485-1, "Technical Specification Improvement Analysis for the Reactor Protection System for Peach Bottom Atomic Power Station Units 2 and 3," October 1987.
11. UFSAR, Section 7.2.3.9.
12. NEDC-32410P-A, “Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function”, October 1995.
13. NEDC-32410P Supplement 1, “Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function, Supplement 1”, November 1997.
14. NEDO-31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995.
15. NEDO-31960-A, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995.
16. NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications," August 1996.
17. Letter, L. A. England (BWROG) to M. J. Virgilio, "BWR Owners' Group Guidelines for Stability Interim Corrective Action," June 6, 1994.
18. BWROG Letter 96113, K. P. Donovan (BWROG) to L. E. Phillips (NRC), "Guidelines for Stability Option III ‘Enable Region’ (TAC M92882)," September 17, 1996.
19. NEDO-24229-1, "Peach Bottom Atomic Power Station Units 2 and 3 Single-Loop Operation," May 1980.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Plant specific LOCA and average power range monitor/rod block monitor Technical Specification/maximum extended load line limit analyses have been performed assuming only one operating recirculation loop. These analyses demonstrate that, in the event of a LOCA caused by a pipe break in the operating recirculation loop, the Emergency Core Cooling System response will provide adequate core cooling (Refs. 2, 3, and 4).

The transient analyses of Chapter 14 of the UFSAR have also been performed for single recirculation loop operation (Ref. 5) and demonstrate sufficient flow coastdown characteristics to maintain fuel thermal margins during the abnormal operational transients analyzed provided the MCPR requirements are modified. During single recirculation loop operation, modification to the Reactor Protection System (RPS) average power range monitor (APRM) instrument setpoints is also required to account for the different relationships between recirculation drive flow and reactor core flow. The MCPR limits and APLHGR limits (power-dependent APLHGR multipliers, $MAPFAC_p$, and flow-dependent APLHGR multipliers, $MAPFAC_f$) for single loop operation are specified in the COLR. The APRM Simulated Thermal Power-High Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation."

(continued)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

Recirculation loops operating satisfies Criterion 2 of the NRC Policy Statement.

LCO

Two recirculation loops are normally required to be in operation with their flows matched within the limits specified in SR 3.4.1.1 to ensure that during a LOCA caused by a break of the piping of one recirculation loop the

(continued)

LCO (continued)

assumptions of the LOCA analysis are satisfied. Alternatively, with only one recirculation loop in operation, modifications to the required APLHGR limits (power- and flow-dependent APLHGR multipliers, $MAPFAC_p$ and $MAPFAC_f$, respectively of LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)") and APRM Simulated Thermal Power-High Allowable Value (LCO 3.3.1.1) must be applied to allow continued operation consistent with the assumptions of Reference 5.

The LCO is modified by a Note which allows up to 12 hours before having to put in effect the required modifications to required limits after a change in the reactor operating conditions from two recirculation loops operating to single recirculation loop operation. If the required limits are not in compliance with the applicable requirements at the end of this period, the associated equipment must be declared inoperable or the limits "not satisfied," and the ACTIONS required by nonconformance with the applicable specifications implemented. This time is provided due to the need to stabilize operation with one recirculation loop, including the procedural steps necessary to limit flow in the operating loop, and the complexity and detail required to fully implement and confirm the required limit modifications.

APPLICABILITY

In MODES 1 and 2, requirements for operation of the Reactor Coolant Recirculation System are necessary since there is considerable energy in the reactor core and the limiting design basis transients and accidents are assumed to occur.

In MODES 3, 4, and 5, the consequences of an accident are reduced and the coastdown characteristics of the recirculation loops are not important.

(continued)

THIS PAGE LEFT BLANK INTENTIONALLY

(The contents of this page have been deleted)

BASES

ACTIONS
(continued)

A.1

With the requirements of the LCO not met, the recirculation loops must be restored to operation with matched flows within 24 hours. A recirculation loop is considered not in operation when the pump in that loop is idle or when the mismatch between total jet pump flows of the two loops is greater than required limits. The loop with the lower flow must be considered not in operation. Should a LOCA occur with one recirculation loop not in operation, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed to restore the inoperable loop to operating status.

Alternatively, if the single loop requirements of the LCO are applied to operating limits and RPS setpoints, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 24 hour Completion Time is based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

(continued)

BASES

ACTIONS

A.1 (continued)

This Required Action does not require tripping the recirculation pump in the lowest flow loop when the mismatch between total jet pump flows of the two loops is greater than the required limits. However, in cases where large flow mismatches occur, low flow or reverse flow can occur in the low flow loop jet pumps, causing vibration of the jet pumps. If zero or reverse flow is detected, the condition should be alleviated by changing pump speeds to re-establish forward flow or by tripping the pump.

B.1

With no recirculation loops in operation or the Required Action and associated Completion Time of Condition A not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours. In this condition, the recirculation loops are not required to be operating because of the reduced severity of DBAs and minimal dependence on the recirculation loop coastdown characteristics. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This SR ensures the recirculation loops are within the allowable limits for mismatch. At low core flow (i.e., < 71.75 X 10^6 lbm/hr), the MCPR requirements provide larger margins to the fuel cladding integrity Safety Limit such that the potential adverse effect of early boiling transition during a LOCA is reduced. A larger flow mismatch can therefore be allowed when core flow is < 71.75 X 10^6 lbm/hr. The recirculation loop jet pump flow, as used in this Surveillance, is the summation of the flows from all of the jet pumps associated with a single recirculation loop.

The mismatch is measured in terms of core flow. (Rated core flow is 102.5 X 10^6 lbm/hr. The first limit is based on mismatch ≤ 10% of rated core flow when operating at < 70% of rated core flow. The second limit is based on mismatch ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.) If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. The SR is not required when both loops are not in operation since the mismatch limits are meaningless during single loop or natural circulation operation. The Surveillance must be performed within 24 hours after both loops are in operation. The 24 hour Frequency is consistent with the Surveillance Frequency for jet pump OPERABILITY verification and has been shown by operating experience to be adequate to detect off normal jet pump loop flows in a timely manner.

(continued)

BASES

REFERENCES

1. UFSAR, Section 14.6.3.
2. NEDC-32163P, "PBAPS Units 2 and 3 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," January 1993.
3. NEDC-32162P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Unit 2 and 3," Revision 1, February 1993.
4. NEDC-32428P, "Peach Bottom Atomic Power Station Unit 2 Cycle 11 ARTS Thermal Limits Analyses," December 1994.
5. NEDO-24229-1, "PBAPS Units 2 and 3 Single-Loop Operation," May 1980.
6. NEDC-33064P, “Safety Analysis Report For Peach Bottom Atomic Power Station Units 2 & 3 Thermal Power Optimization,” May 2002.

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

   1. The Average Planar Linear Heat Generation Rate for Specification 3.2.1;

   2. The Minimum Critical Power Ratio for Specifications 3.2.2 and 3.3.2.1;

   3. The Linear Heat Generation Rate for Specification 3.2.3;

   4. The Control Rod Block Instrumentation for Specification 3.3.2.1; and

   5. The Oscillation Power Range Monitor (OPRM) Instrumentation for Specification 3.3.1.1.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

   1. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (latest approved version as specified in the COLR);

   2. NEDC-32162P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Units 2 and 3," Revision 2, March, 1995;

   3. PECo-FMS-0001-A, "Steady-State Thermal Hydraulic Analysis of Peach Bottom Units 2 and 3 using the FIBWR Computer Code";

   4. PECo-FMS-0002-A, "Method for Calculating Transient Critical Power Ratios for Boiling Water Reactors (RETRAN-TCPPECo)";

   5. PECo-FMS-0003-A, "Steady-State Fuel Performance Methods Report";

   6. PECo-FMS-0004-A, "Methods for Performing BWR Systems Transient Analysis";

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

7. PECo-FMS-0005-A, "Methods for Performing BWR Steady-State Reactor Physics Analysis";

8. PECo-FMS-0006-A, "Methods for Performing BWR Reload Safety Evaluations"; and

9. NEDO-32465-A, “Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications,” August 1996.

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Post Accident Monitoring (PAM) Instrumentation Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

3.3 INSTRUMENTATION

3.3.1.1 Reactor Protection System (RPS) Instrumentation

LCO 3.3.1.1 The RPS instrumentation for each Function in Table 3.3.1.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.1-1.

ACTIONS

-----------------------------------NOTE-----------------------------------
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required channels inoperable.	A.1	Place channel in trip.	12 hours
	<u>OR</u>		
	A.2	--------NOTE--------- Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2.f. -------------------- Place associated trip system in trip.	12 hours
B. ---------NOTE--------- Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2f. --------------------- One or more Functions with one or more required channels inoperable in both trip systems.	B.1	Place channel in one trip system in trip.	6 hours
	<u>OR</u>		
	B.2	Place one trip system in trip.	6 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
H. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	H.1 Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately
I. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	I.1 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	12 hours
	<u>AND</u>	
	I.2 --------NOTE-------- LCO 3.0.4 is not applicable. -------------------- Restore required channels to OPERABLE.	120 days
J. Required Action and associated Completion Time of Condition I not met.	J.1 Reduce THERMAL POWER to <25% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

------------------------------------NOTES------------------------------------

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.1.2	-----------------NOTE----------------- Not required to be performed until 12 hours after THERMAL POWER ≥ 25% RTP. -------------------------------------- Verify the absolute difference between the average power range monitor (APRM) channels and the calculated power is ≤ 2% RTP while operating at ≥ 25% RTP.	7 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.9	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.1.1.10	------------------NOTE------------------ Radiation detectors are excluded. --- Perform CHANNEL CALIBRATION.	92 days
SR 3.3.1.1.11	-----------------NOTES----------------- 1. For Function 2.a, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. 2. For Functions 2.b and 2.f, the CHANNEL FUNCTIONAL TEST includes the recirculation flow input processing, excluding the flow transmitters. --- Perform CHANNEL FUNCTIONAL TEST.	184 days
SR 3.3.1.1.12	-----------------NOTES----------------- 1. Neutron detectors are excluded. 2. For Function 1, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. 3. For Functions 2.b and 2.f, the recirculation flow transmitters that feed the APRMs are included. --- Perform CHANNEL CALIBRATION.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.13	Verify Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions are not bypassed when THERMAL POWER is ≥ 29.5% RTP.	24 months
SR 3.3.1.1.14	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.1.1.15	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.1.16	Calibrate each radiation detector.	24 months
SR 3.3.1.1.17	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.1.18	Verify the RPS RESPONSE TIME is within limits.	24 months
SR 3.3.1.1.19	Verify OPRM is not bypassed when APRM Simulated Thermal Power is ≥29.5% and recirculation drive flow is <60%.	24 months

Table 3.3.1.1-1 (page 1 of 3)
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. Wide Range Neutron Monitors					
a. Period-Short	2	3	G	SR 3.3.1.1.1 SR 3.3.1.1.5 SR 3.3.1.1.12 SR 3.3.1.1.17 SR 3.3.1.1.18	≥ 13 seconds
	5(a)	3	H	SR 3.3.1.1.1 SR 3.3.1.1.6 SR 3.3.1.1.12 SR 3.3.1.1.17 SR 3.3.1.1.18	≥ 13 seconds
b. Inop	2	3	G	SR 3.3.1.1.5 SR 3.3.1.1.17	NA
	5(a)	3	H	SR 3.3.1.1.6 SR 3.3.1.1.17	NA
2. Average Power Range Monitors					
a. Neutron Flux-High (Setdown)	2	3(c)	G	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 15.0% RTP
b. Simulated Thermal Power-High	1	3(c)	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 0.65 W + 63.7% RTP(b) and ≤ 118.0% RTP
c. Neutron Flux-High	1	3(c)	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12	≤ 119.7% RTP
d. Inop	1,2	3(c)	G	SR 3.3.1.1.11	NA
e. 2-Out-Of-4 Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.11 SR 3.3.1.1.17 SR 3.3.1.1.18	NA
f. OPRM Upscale	≥25% RTP	3(c)	I	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.12 SR 3.3.1.1.19	NA(d)

(continued)

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

(b) 0.65 (W - ΔW) + 63.7% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."

(c) Each APRM channel provides inputs to both trip systems.

(d) See COLR for OPRM period based detection algorithm (PBDA) setpoint limits.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation.

OR

One recirculation loop shall be in operation with the following limits applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR; and

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Simulated Thermal Power-High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.

---------------------------NOTE---------------------------
Required limit modifications for single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

THIS PAGE LEFT BLANK INTENTIONALLY

(The contents of this page have been deleted)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Requirements of the LCO not met.	A.1	Satisfy the requirements of the LCO.	24 hours
B. No recirculation loops in operation. OR Required Action and associated Completion Time of Condition A not met.	B.1	Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	--------------------NOTE------------------ Not required to be performed until 24 hours after both recirculation loops are in operation. -- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is: a. $\leq 10.25 \times 10^6$ lbm/hr when operating at $< 71.75 \times 10^6$ lbm/hr; and b. $\leq 5.125 \times 10^6$ lbm/hr when operating at $\geq 71.75 \times 10^6$ lbm/hr.	24 hours

THIS PAGE LEFT BLANK INTENTIONALLY

(The contents of this page have been deleted)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1.b. Wide Range Neutron Monitor—Inop (continued)

Six channels of the Wide Range Neutron Monitor—Inop Function, with three channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. Since this Function is not assumed in the safety analysis, there is no Allowable Value for this Function.

This Function is required to be OPERABLE when the Wide Range Neutron Monitor Period-Short Function is required.

Average Power Range Monitor (APRM)

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The APRM channels receive input signals from the local power range monitors (LPRMs) within the reactor core to provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP. Each APRM also includes an Oscillation Power Range Monitor (OPRM) Upscale Function which monitors small groups of LPRM signals to detect thermal-hydraulic instabilities.

The APRM System is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. A trip from any one unbypassed APRM will result in a "half-trip" in all four of the voter channels, but no trip inputs to either RPS trip system. APRM trip Functions 2.a, 2.b, 2.c, and 2.d are voted independently from OPRM Upscale Function 2.f. Therefore, any Function 2.a, 2.b, 2.c, or 2.d trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system logic channel (A1, A2, B1, and B2), thus resulting in a full scram signal. Similarly, a Function 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels. Three of the four APRM channels and all four of the voter channels are required to be OPERABLE to ensure that no single failure will preclude a scram on a valid signal. In addition, to provide adequate coverage of the entire core, consistent with the design bases for the APRM Functions 2.a, 2.b, and 2.c, at least 20 LPRM inputs, with at least three LPRM inputs from each of the four axial levels at which the LPRMs are located, must be operable for each APRM channel, and the number of LPRM inputs that have become inoperable (and bypassed) since the last APRM calibration (SR 3.3.1.1.2) must be less than ten for each APRM channel. For the OPRM Upscale, Function 2.f, LPRMs are assigned to “cells” of 3 or 4 detectors. A minimum of 25 cells, each with a minimum of 2 OPERABLE LPRMs, must be OPERABLE for the OPRM Upscale Function 2.f to be OPERABLE.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.a. Average Power Range Monitor Neutron Flux-High (Setdown) (continued)

For operation at low power (i.e., MODE 2), the Average Power Range Monitor Neutron Flux-High (Setdown) Function is capable of generating a trip signal that prevents fuel damage resulting from abnormal operating transients in this power range. For most operation at low power levels, the Average Power Range Monitor Neutron Flux-High (Setdown) Function will provide a secondary scram to the Wide Range Neutron Monitor Period-Short Function because of the relative setpoints. At higher power levels, it is possible that the Average Power Range Monitor Neutron Flux-High (Setdown) Function will provide the primary trip signal for a corewide increase in power.

No specific safety analyses take direct credit for the Average Power Range Monitor Neutron Flux-High (Setdown) Function. However, this Function indirectly ensures that before the reactor mode switch is placed in the run position, reactor power does not exceed 25% RTP (SL 2.1.1.1) when operating at low reactor pressure and low core flow. Therefore, it indirectly prevents fuel damage during significant reactivity increases with THERMAL POWER < 25% RTP.

The Allowable Value is based on preventing significant increases in power when THERMAL POWER is < 25% RTP.

The Average Power Range Monitor Neutron Flux-High (Setdown) Function must be OPERABLE during MODE 2 when control rods may be withdrawn since the potential for criticality exists. In MODE 1, the Average Power Range Monitor Neutron Flux-High Function provides protection against reactivity transients and the RWM and rod block monitor protect against control rod withdrawal error events.

2.b. Average Power Range Monitor Simulated Thermal Power-High

The Average Power Range Monitor Simulated Thermal Power-High Function monitors average neutron flux to approximate the THERMAL POWER being transferred to the reactor coolant. The APRM neutron flux is electronically filtered with a time constant representative of the fuel heat transfer dynamics to generate a signal proportional to the THERMAL POWER in the reactor. The trip level is varied as a function of recirculation drive flow (i.e., at lower core flows, the setpoint is reduced proportional to the reduction in power experienced as core flow is reduced with a fixed control rod pattern) but is clamped at an upper limit that is always lower than the Average Power Range Monitor Neutron Flux-High Function Allowable Value. A note is included, applicable when the plant is in single recirculation loop operation per LCO 3.4.1, which requires the flow value, used in the Allowable Value equation, be reduced by ΔW. The value of ΔW

(continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Simulated Thermal Power-High (continued)

is established to conservatively bound the inaccuracy created in the core flow/drive flow correlation due to back flow in the jet pumps associated with the inactive recirculation loop. The Allowable Value thus maintains thermal margins essentially unchanged from those for two loop operation. The value of ΔW is plant specific and is defined in plant procedures. The Allowable Value equation for single loop operation is only valid for flows down to $W = \Delta W$; the Allowable Value does not go below 63.7% RTP. This is acceptable because back flow in the inactive recirculation loop is only evident with drive flows of approximately 35% or greater (Reference 19).

The Average Power Range Monitor Simulated Thermal Power-High Function is not specifically credited in the safety analysis but is intended to provide an additional margin of protection from transient induced fuel damage during operation where recirculation flow is reduced to below the minimum required for rated power operation. The Average Power Range Monitor Simulated Thermal Power-High Function provides protection against transients where THERMAL POWER increases slowly (such as the loss of feedwater heating event) and protects the fuel cladding integrity by ensuring that the MCPR SL is not exceeded. During these events, the THERMAL POWER increase does not significantly lag the neutron flux scram. For rapid neutron flux increase events, the THERMAL POWER lags the neutron flux and the Average Power Range Monitor Neutron Flux-High Function will provide a scram signal before the Average Power Range Monitor Simulated Thermal Power-High Function setpoint is exceeded.

Each APRM channel uses one total drive flow signal representative of total core flow. The total drive flow signal is generated by the flow processing logic, part of the APRM channel, by summing up the flow calculated from two flow transmitter signal inputs, one from each of the two recirculation loop flows. The flow processing logic OPERABILITY is part of the APRM channel OPERABILITY requirements for this Function. The APRM flow processing logic is considered inoperable whenever it cannot deliver a flow signal less than or equal to actual Recirculation flow conditions for all steady state and transient reactor conditions while in Mode 1. Reduced or Downscale flow conditions due to planned maintenance or testing activities during derated plant conditions (i.e. end of cycle coast down) will result in conservative setpoints for the APRM Simulated Thermal Power-High function, thus maintaining that function operable.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2.d. Average Power Range Monitor—Inop

Three of the four APRM channels are required to be OPERABLE for each of the APRM Functions. This Function (Inop) provides assurance that the minimum number of APRM channels are OPERABLE.

For any APRM channel, any time its mode switch is not in the "Operate" position, an APRM module required to issue a trip is unplugged, or the automatic self-test system detects a critical fault with the APRM channel, an Inop trip is sent to all four voter channels. Inop trips from two or more unbypassed APRM channels result in a trip output from each of the four voter channels to it's associated trip system. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

There is no Allowable Value for this Function.

This Function is required to be OPERABLE in the MODES where the APRM Functions are required.

2.e. 2-Out-Of-4 Voter

The 2-Out-Of-4 Voter Function provides the interface between the APRM Functions, including the OPRM Upscale Function, and the final RPS trip system logic. As such, it is required to be OPERABLE in the MODES where the APRM Functions are required and is necessary to support the safety analysis applicable to each of those Functions. Therefore, the 2-Out-Of-4 Voter Function needs to be OPERABLE in MODES 1 and 2.

All four voter channels are required to be OPERABLE. Each voter channel includes self-diagnostic functions. If any voter channel detects a critical fault in its own processing, a trip is issued from that voter channel to the associated trip system.

The 2-Out-Of-4 Logic Module includes 2-Out-Of-4 Voter hardware and the APRM Interface hardware. The 2-Out-Of-4 Voter Function 2.e votes APRM Functions 2.a, 2.b, 2.c, and 2.d independently of Function 2.f. This voting is accomplished by the 2-Out-Of-4 Voter hardware in the 2-Out-Of-4 Logic Module. Each 2-Out-Of-4 Voter includes two redundant sets of outputs to RPS. Each output set contains two independent contacts; one contact for Functions 2.a, 2.b, 2.c and 2.d, and the other contact for Function 2.f. The analysis in Reference 12 took credit for this redundancy in the justification of the 12-hour Completion Time for Condition A, so the voter Function 2.e must be declared inoperable if any of its functionality is inoperable. However, the voter Function 2.e does not need to be declared inoperable due to any failure affecting only the plant interface portions of the 2-Out-Of-4 Logic Module that are not necessary to perform the 2-Out-Of-4 Voter function.

There is no Allowable Value for this Function.

(continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2.f. Oscillation Power Range Monitor (OPRM) Upscale

The OPRM Upscale Function provides compliance with 10 CFR 50, Appendix A, General Design Criteria (GDC) 10 and 12, thereby providing protection from exceeding the fuel MCPR safety limit (SL) due to anticipated thermal-hydraulic power oscillations.

References 14, 15 and 16 describe three algorithms for detecting thermal-hydraulic instability related neutron flux oscillations: the period based detection algorithm (PBDA), the amplitude based algorithm (ABA), and the growth rate algorithm (GRA). All three are implemented in the OPRM Upscale Function, but the safety analysis takes credit only for the PBDA. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. OPRM Upscale Function OPERABILITY for Technical Specifications purposes is based only on the PBDA.

The OPRM Upscale Function receives input signals from the local power range monitors (LPRMs) within the reactor core, which are combined into "cells" for evaluation by the OPRM algorithms. Each channel is capable of detecting thermal-hydraulic instabilities, by detecting the related neutron flux oscillations, and issuing a trip signal before the MCPR SL is exceeded. Three of the four channels are required to be OPERABLE.

The OPRM Upscale trip is automatically enabled (bypass removed) when THERMAL POWER is ≥ 29.5% RTP, as indicated by the APRM Simulated Thermal Power, and reactor core flow is < 60% of rated flow, as indicated by APRM measured recirculation drive flow. This is the operating region where actual thermal-hydraulic instability and related neutron flux oscillations may occur (Reference 18). These setpoints, which are sometimes referred to as the "auto-bypass" setpoints, establish the boundaries of the OPRM Upscale trip enabled region.

The OPRM Upscale Function is required to be OPERABLE when the plant is at ≥ 25% RTP. The 25% RTP level is selected to provide margin in the unlikely event that a reactor power increase transient occurring while the plant is operating below 29.5% RTP causes a power increase to or beyond the 29.5% APRM Simulated Thermal Power OPRM Upscale trip auto-enable setpoint without operator action. This OPERABILITY requirement assures that the OPRM Upscale trip auto-enable function will be OPERABLE when required.

(continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2.f. Oscillation Power Range Monitor (OPRM) Upscale (continued)

An OPRM Upscale trip is issued from an APRM channel when the PBDA in that channel detects oscillatory changes in the neutron flux, indicated by the combined signals of the LPRM detectors in a cell, with period confirmations and relative cell amplitude exceeding specified setpoints. One or more cells in a channel exceeding the trip conditions will result in a channel trip. An OPRM Upscale trip is also issued from the channel if either the GRA or ABA detects oscillatory changes in the neutron flux for one or more cells in that channel.

There are four "sets" of OPRM related setpoints or adjustment parameters: a) OPRM trip auto-enable setpoints for APRM Simulated Thermal Power (29.5%) and drive flow (60%); b) PBDA confirmation count and amplitude setpoints; c) PBDA tuning parameters; and d) GRA and ABA setpoints.

The first set, the OPRM auto-enable region setpoints, as discussed in the SR 3.3.1.1.19 Bases, are treated as nominal setpoints without the application of setpoint methodology per Reference 18. The settings, 29.5% APRM Simulated Thermal Power and 60% drive flow, are defined (limit values) in and confirmed by SR 3.3.1.1.19. The second set, the OPRM PBDA trip setpoints, are established in accordance with methodologies defined in Reference 16, and are documented in the COLR. There are no allowable values for these setpoints. The third set, the OPRM PBDA "tuning" parameters, are established or adjusted in accordance with and controlled by PBAPS procedures. The fourth set, the GRA and ABA setpoints, in accordance with References 14, 15, and 16, are established as nominal values only, and are controlled by PBAPS procedures.

(continued)

ACTIONS

A.1 and A.2 (continued)

Function's inoperable channel is in one trip system and the Function still maintains RPS trip capability (refer to Required Actions B.1, B.2, and C.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel or the associated trip system must be placed in the tripped condition per Required Actions A.1 and A.2. Placing the inoperable channel in trip (or the associated trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternatively, if it is not desired to place the channel (or trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), Condition D must be entered and its Required Action taken.

As noted, Action A.2 is not applicable for APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f. Inoperability of one required APRM channel affects both trip systems. For that condition, Required Action A.1 must be satisfied, and is the only action (other than restoring operability) that will restore capability to accommodate a single failure. Inoperability of more than one required APRM channel of the same trip function results in loss of trip capability and entry into Condition C, as well as entery into Condition A for each channel.

B.1 and B.2

Condition B exists when, for any one or more Functions, at least one required channel is inoperable in each trip system. In this condition, provided at least one channel per trip system is OPERABLE, the RPS still maintains trip capability for that Function, but cannot accommodate a single failure in either trip system.

Required Actions B.1 and B.2 limit the time the RPS scram logic, for any Function, would not accommodate single failure in both trip systems (e.g., one-out-of-one and one-out-of-one arrangement for a typical four channel Function). The reduced reliability of this logic arrangement was not evaluated in References 9, 12 or 13 for the 12 hour Completion Time. Within the 6 hour allowance, the associated Function will have all required channels OPERABLE or in trip (or any combination) in one trip system.

(continued)

ACTIONS

B.1 and B.2 (continued)

Completing one of these Required Actions restores RPS to a reliability level equivalent to that evaluated in References 9, 12 or 13, which justified a 12 hour allowable out of service time as presented in Condition A. The trip system in the more degraded state should be placed in trip or, alternatively, all the inoperable channels in that trip system should be placed in trip (e.g., a trip system with two inoperable channels could be in a more degraded state than a trip system with four inoperable channels if the two inoperable channels are in the same Function while the four inoperable channels are all in different Functions). The decision of which trip system is in the more degraded state should be based on prudent judgment and take into account current plant conditions (i.e., what MODE the plant is in). If this action would result in a scram or RPT, it is permissible to place the other trip system or its inoperable channels in trip.

The 6 hour Completion Time is judged acceptable based on the remaining capability to trip, the diversity of the sensors available to provide the trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of a scram.

Alternately, if it is not desired to place the inoperable channels (or one trip system) in trip (e.g., as in the case where placing the inoperable channel or associated trip system in trip would result in a scram, Condition D must be entered and its Required Action taken.

As noted, Condition B is not applicable for APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f. Inoperability of an APRM channel affects both trip systems and is not associated with a specific trip system as are the APRM 2-Out-Of-4 voter and other non-APRM channels for which Condition B applies. For an inoperable APRM channel, Required Action A.1 must be satisfied, and is the only action (other than restoring operability) that will restore capability to accommodate a single failure. Inoperability of a Function in more than one required APRM channel results in loss of trip capability for that Function and entry into Condition C, as well as entry into Condition A for each channel. Because Condition A and C provide Required Actions that are appropriate for the inoperability of APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f, and these functions are not associated with specific trip systems as are the APRM 2-Out-Of-4 voter and other non-APRM channels, Condition B does not apply.

(continued)

ACTIONS
(continued)

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

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

I.1

If OPRM Upscale trip capability is not maintained, Condition I exists. References 12 and 13 justified use of alternate methods to detect and suppress oscillations for a limited period of time. The alternate methods are procedurally established consistent with the guidelines identified in Reference 17 requiring manual operator action to scram the plant if certain predefined events occur. The 12-hour allowed Completion Time for Required Action I.1 is based on engineering judgment to allow orderly transition to the alternate methods while limiting the period of time during which no automatic or alternate detect and suppress trip capability is formally in place. Based on the small probability of an instability event occurring at all, the 12 hour duration is judged to be reasonable.

(continued)

BASES

ACTIONS (continued)

I.2

The alternate method to detect and suppress oscillations implemented in accordance with I.1 was evaluated (References 12 and 13) based on use up to 120 days only. The evaluation, based on engineering judgment, concluded that the likelihood of an instability event that could not be adequately handled by the alternate methods during this 120-day period was negligibly small. The 120-day period is intended to be an outside limit to allow for the case where design changes or extensive analysis might be required to understand or correct some unanticipated characteristic of the instability detection algorithms or equipment. This action is not intended and was not evaluated as a routine alternative to returning failed or inoperable equipment to OPERABLE status. Correction of routine equipment failure or inoperability is expected to normally be accomplished within the completion times allowed for Actions for Condition A.

A note is provided to indicate that LCO 3.0.4 is not applicable. The intent of that note is to allow plant start-up while within the 120-day completion time for action I.2. The primary purpose of this exclusion is to allow an orderly completion of design and verification activities, in the event of a required design change, without undue impact on plant operation.

SURVEILLANCE REQUIREMENTS

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

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Refs. 9, 12 & 13) 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.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.9 and SR 3.3.1.1.14 (continued)

In addition, Function 5 and 7 instruments are not accessible while the unit is operating at power due to high radiation and the installed indication instrumentation does not provide accurate indication of the trip setting. For the Function 9 channels, verification that the trip settings are less than or equal to the specified Allowable Value during the CHANNEL FUNCTIONAL TEST is not required since the instruments are not accessible while the unit is operating at power due to high radiation and the installed indication instrumentation does not provided accurate indication of the trip setting. Waiver of these verifications for the above functions is considered acceptable since the magnitude of drift assumed in the setpoint calculation is based on a 24 month calibration interval. The 92 day Frequency of SR 3.3.1.1.9 is based on the reliability analysis of Reference 9.

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 will pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.10, SR 3.3.1.1.12, SR 3.3.1.1.15, and SR 3.3.1.1.16

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations, consistent with the current plant specific setpoint methodology.

As noted for SR 3.3.1.1.10, radiation detectors are excluded from CHANNEL CALIBRATION due to ALARA reasons (when the plant is operating, the radiation detectors are generally in a high radiation area; the steam tunnel). This exclusion is acceptable because the radiation detectors are passive devices, with minimal drift. To complete the radiation CHANNEL CALIBRATION, SR 3.3.1.1.16 requires that the radiation detectors be calibrated on a once per 24 months Frequency.

The once per 92 days Frequency of SR 3.3.1.1.10 is conservative with respect to the magnitude of equipment drift assumed in the setpoint analysis. The Frequency of SR 3.3.1.1.16 is based upon the assumption of a 24-month calibration interval used in the determination of the equipment drift in the setpoint analysis.

As noted for SR 3.3.1.1.12, neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10, SR 3.3.1.1.12, SR 3.3.1.1.15, and SR 3.3.1.1.16 (continued)

neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.8).

A second note is provided for SR 3.3.1.1.12 that allows the WRNM SR to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 WRNM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads or movable links. This Note allows entry into MODE 2 from MODE 1, if the 24 month Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

A third note is provided for SR 3.3.1.1.12 that includes in the SR the recirculation flow (drive flow) transmitters, which supply the flow signal to the APRMs. The APRM Simulated Thermal Power-High Function (Function 2.b) and the OPRM Upscale Function (Function 2.f), both require a valid drive flow signal. The APRM Simulated Thermal Power-High Function uses drive flow to vary the trip setpoint. The OPRM Upscale Function uses drive flow to automatically enable or bypass the OPRM Upscale trip output to RPS. A CHANNEL CALIBRATION of the APRM drive flow signal requires both calibrating the drive flow transmitters and establishing a valid drive flow / core flow relationship. The drive flow /core flow relationship is established once per refuel cycle, while operating at or near rated power and flow conditions. This method of correlating core flow and drive flow is consistent with GE recommendations. Changes throughout the cycle in the drive flow / core flow relationship due to the changing thermal hydraulic operating conditions of the core are accounted for in the margins included in the bases or analyses used to establish the setpoints for the APRM Simulated Thermal Power-High Function and the OPRM Upscale Function.

The Frequencies of SR 3.3.1.1.12 and SR 3.3.1.1.15 are based upon the assumption of a 24-month calibration interval used in the determination of the equipment drift in the setpoint analysis.

SR 3.3.1.1.11

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.11 (continued)

intended function. For the APRM Functions, this test supplements the automatic self-test functions that operate continuously in the APRM and voter channels. The scope of the APRM CHANNEL FUNCTIONAL TEST is limited to verification of system trip output hardware. Software controlled functions are tested only incidentally. Automatic internal self-test functions check the EPROMs in which the software-controlled logic is defined. Any changes in the EPROMs will be detected by the self-test function resulting in a trip and/or alarm condition. The APRM CHANNEL FUNCTIONAL TEST covers the APRM channels (including recirculation flow processing - applicable to Function 2.b and the auto-enable portion of Function 2.f only), the 2-Out-Of-4 voter channels, and the interface connections into the RPS trip systems from the voter channels. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. The 184 day Frequency of SR 3.3.1.1.11 is based on the reliability analyses of References 12 and 13. (NOTE: The actual voting logic of the 2-Out-Of-4 Voter Function is tested as part of SR 3.3.1.1.17. The actual auto-enable setpoints for the OPRM Upscale trip are confirmed by SR 3.3.1.1.19.)

A Note is provided for Function 2.a that requires this SR to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM Function cannot be performed in MODE 1 without utilizing jumpers or lifted leads. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2.

A second Note is provided for Function 2.b that clarifies that the CHANNEL FUNCTIONAL TEST for Function 2.b includes testing of the recirculation flow processing electronics, excluding the flow transmitters.

SR 3.3.1.1.13

This SR ensures that scrams initiated from the Turbine Stop Valve-Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure-Low Functions will not be inadvertently bypassed when THERMAL POWER is ≥ 29.5% RTP. This involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodologies are incorporated into the Allowable Value (≤ 28.9% RTP which is equivalent to ≤ 138.4 psig as measured from turbine first stage pressure) and the actual setpoint. Because main turbine bypass flow can affect this setpoint nonconservatively (THERMAL POWER is derived from turbine first stage pressure), the main turbine bypass valves must remain closed during the calibration at THERMAL POWER ≥ 29.5% RTP to ensure that the calibration is valid.

If any bypass channel's setpoint is nonconservative (i.e., the Functions are bypassed at ≥ 29.5% RTP, either due to open main turbine bypass valve(s) or other reasons), then the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.13 (continued)

affected Turbine Stop Valve—Closure and Turbine Control Valve 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 is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

SR 3.3.1.1.17

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods (LCO 3.1.3), and SDV vent and drain valves (LCO 3.1.8), 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 that these components will pass the Surveillance when performed at the 24 month Frequency.

The LOGIC SYSTEM FUNCTIONAL TEST for APRM Function 2.e simulates APRM and OPRM trip conditions at the 2-Out-Of-4 voter channel inputs to check all combinations of two tripped inputs to the 2-Out-Of-4 logic in the voter channels and APRM related redundant RPS relays.

SR 3.3.1.1.18

This SR ensures that the individual channel response times are maintained less than or equal to the original design value. The RPS RESPONSE TIME acceptance criterion is included in Reference 11.

RPS RESPONSE TIME tests are conducted on a 24 month Frequency. The 24 month Frequency is consistent with the PBAPS refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.19

This surveillance involves confirming the OPRM Upscale trip auto-enable setpoints. The auto-enable setpoint values are considered to be nominal values as discussed in Reference 18. This surveillance ensures that the OPRM Upscale trip is enabled (not bypassed) for the correct values of APRM Simulated Thermal Power and recirculation drive flow. Other surveillances ensure that the APRM Simulated Thermal Power and recirculation drive flow properly correlate with THERMAL POWER (SR 3.3.1.1.2) and core flow (SR 3.3.1.1.12), respectively.

If any auto-enable setpoint is nonconservative (i.e., the OPRM Upscale trip is bypassed when APRM Simulated Thermal Power ≥29.5% and recirculation drive flow < 60%), then the affected channel is considered inoperable for the OPRM Upscale Function. Alternatively, the OPRM Upscale trip auto-enable setpoint(s) may be adjusted to place the channel in a conservative condition (not bypassed). If the OPRM Upscale trip is placed in the not-bypassed condition, this SR is met and the channel is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

REFERENCES

1. UFSAR, Section 7.2.
2. UFSAR, Chapter 14.
3. NEDO-32368, "Nuclear Measurement Analysis and Control Wide Range Neutron Monitoring System Licensing Report for Peach Bottom Atomic Power Station, Units 2 and 3," November 1994.
4. NEDC-32183P, "Power Rerate Safety Analysis Report for Peach Bottom 2 & 3," dated May 1993.
5. UFSAR, Section 14.6.2.
6. UFSAR, Section 14.5.4.
7. UFSAR, Section 14.5.1.
8. P. Check (NRC) letter to G. Lainas (NRC), "BWR Scram Discharge System Safety Evaluation," December 1, 1980.
9. NEDO-30851-P-A , "Technical Specification Improvement Analyses for BWR Reactor Protection System," March 1988.

(continued)

BASES

REFERENCES (continued)

10. MDE-87-0485-1, "Technical Specification Improvement Analysis for the Reactor Protection System for Peach Bottom Atomic Power Station Units 2 and 3," October 1987.

11. UFSAR, Section 7.2.3.9.

12. NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function", October 1995.

13. NEDC-32410P Supplement 1, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function, Supplement 1", November 1997.

14. NEDO-31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995.

15. NEDO-31960-A, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995.

16. NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications," August 1996.

17. Letter, L. A. England (BWROG) to M. J. Virgilio, "BWR Owners' Group Guidelines for Stability Interim Corrective Action," June 6, 1994.

18. BWROG Letter 96113, K. P. Donovan (BWROG) to L. E. Phillips (NRC), "Guidelines for Stability Option III 'Enable Region' (TAC M92882)," September 17, 1996.

19. NEDO-24229-1, "Peach Bottom Atomic Power Station Units 2 and 3 Single-Loop Operation," May 1980.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Plant specific LOCA and average power range monitor/rod block monitor Technical Specification/maximum extended load line limit analyses have been performed assuming only one operating recirculation loop. These analyses demonstrate that, in the event of a LOCA caused by a pipe break in the operating recirculation loop, the Emergency Core Cooling System response will provide adequate core cooling (Refs. 2, 3, and 4).

The transient analyses of Chapter 14 of the UFSAR have also been performed for single recirculation loop operation (Ref. 5) and demonstrate sufficient flow coastdown characteristics to maintain fuel thermal margins during the abnormal operational transients analyzed provided the MCPR requirements are modified. During single recirculation loop operation, modification to the Reactor Protection System (RPS) average power range monitor (APRM) instrument setpoints is also required to account for the different relationships between recirculation drive flow and reactor core flow. The MCPR limits and APLHGR limits (power-dependent APLHGR multipliers, $MAPFAC_p$, and flow-dependent APLHGR multipliers, $MAPFAC_f$) for single loop operation are specified in the COLR. The APRM Simulated Thermal Power-High Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation."

(continued)

APPLICABLE SAFETY ANALYSES (continued)

Recirculation loops operating satisfies Criterion 2 of the NRC Policy Statement.

LCO

Two recirculation loops are normally required to be in operation with their flows matched within the limits specified in SR 3.4.1.1 to ensure that during a LOCA caused by a break of the piping of one recirculation loop the

(continued)

LCO

assumptions of the LOCA analysis are satisfied. Alternatively, with only one recirculation loop in operation, modifications to the required APLHGR limits (power- and flow-dependent APLHGR multipliers, MAPFAC_p and MAPFAC_f, respectively of LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)") and APRM Simulated Thermal Power-High Allowable Value (LCO 3.3.1.1) must be applied to allow continued operation consistent with the assumptions of Reference 5.

The LCO is modified by a Note which allows up to 12 hours before having to put in effect the required modifications to required limits after a change in the reactor operating conditions from two recirculation loops operating to single recirculation loop operation. If the required limits are not in compliance with the applicable requirements at the end of this period, the associated equipment must be declared inoperable or the limits "not satisfied," and the ACTIONS required by nonconformance with the applicable specifications implemented. This time is provided due to the need to stabilize operation with one recirculation loop, including the procedural steps necessary to limit flow in the operating loop, and the complexity and detail required to fully implement and confirm the required limit modifications.

APPLICABILITY

In MODES 1 and 2, requirements for operation of the Reactor Coolant Recirculation System are necessary since there is considerable energy in the reactor core and the limiting design basis transients and accidents are assumed to occur.

In MODES 3, 4, and 5, the consequences of an accident are reduced and the coastdown characteristics of the recirculation loops are not important.

(continued)

THIS PAGE LEFT BLANK INTENTIONALLY

(The contents of this page have been deleted)

BASES

ACTIONS
(continued)

A.1

With the requirements of the LCO not met, the recirculation loops must be restored to operation with matched flows within 24 hours. A recirculation loop is considered not in operation when the pump in that loop is idle or when the mismatch between total jet pump flows of the two loops is greater than required limits. The loop with the lower flow must be considered not in operation. Should a LOCA occur with one recirculation loop not in operation, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed to restore the inoperable loop to operating status.

Alternatively, if the single loop requirements of the LCO are applied to operating limits and RPS setpoints, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 24 hour Completion Time is based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

(continued)

BASES

ACTIONS

A.1 (continued)

This Required Action does not require tripping the recirculation pump in the lowest flow loop when the mismatch between total jet pump flows of the two loops is greater than the required limits. However, in cases where large flow mismatches occur, low flow or reverse flow can occur in the low flow loop jet pumps, causing vibration of the jet pumps. If zero or reverse flow is detected, the condition should be alleviated by changing pump speeds to re-establish forward flow or by tripping the pump.

B.1

With no recirculation loops in operation or the Required Action and associated Completion Time of Condition A not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours. In this condition, the recirculation loops are not required to be operating because of the reduced severity of DBAs and minimal dependence on the recirculation loop coastdown characteristics. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This SR ensures the recirculation loops are within the allowable limits for mismatch. At low core flow (i.e., < 71.75 X 10^6 lbm/hr), the MCPR requirements provide larger margins to the fuel cladding integrity Safety Limit such that the potential adverse effect of early boiling transition during a LOCA is reduced. A larger flow mismatch can therefore be allowed when core flow is < 71.75 X 10^6 lbm/hr. The recirculation loop jet pump flow, as used in this Surveillance, is the summation of the flows from all of the jet pumps associated with a single recirculation loop.

The mismatch is measured in terms of core flow. (Rated core flow is 102.5 X 10^6 lbm/hr. The first limit is based on mismatch ≤ 10% of rated core flow when operating at < 70% of rated core flow. The second limit is based on mismatch ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.) If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. The SR is not required when both loops are not in operation since the mismatch limits are meaningless during single loop or natural circulation operation. The Surveillance must be performed within 24 hours after both loops are in operation. The 24 hour Frequency is consistent with the Surveillance Frequency for jet pump OPERABILITY verification and has been shown by operating experience to be adequate to detect off normal jet pump loop flows in a timely manner.

(continued)

BASES

REFERENCES

1. UFSAR, Section 14.6.3.
2. NEDC-32163P, "PBAPS Units 2 and 3 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," January 1993.
3. NEDC-32162P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Unit 2 and 3," Revision 1, February 1993.
4. NEDC-32427P, "Peach Bottom Atomic Power Station Unit 3 Cycle 10 ARTS Thermal Limits Analyses," December 1994.
5. NEDO-24229-1, "PBAPS Units 2 and 3 Single-Loop Operation," May 1980.
6. NEDC-33064P, “Safety Analysis Report for Peach Bottom Atomic Power Station Units 2 & 3 Thermal Power Optimization,” May 2002.

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. The Average Planar Linear Heat Generation Rate for Specification 3.2.1;
2. The Minimum Critical Power Ratio for Specifications 3.2.2 and 3.3.2.1;
3. The Linear Heat Generation Rate for Specification 3.2.3;
4. The Control Rod Block Instrumentation for Specification 3.3.2.1; and
5. The Oscillation Power Range Monitor (OPRM) Instrumentation for Specification 3.3.1.1.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (latest approved version as specified in the COLR);
2. NEDC-32162P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Units 2 and 3," Revision 2, March, 1995;
3. PECo-FMS-0001-A, "Steady-State Thermal Hydraulic Analysis of Peach Bottom Units 2 and 3 using the FIBWR Computer Code";
4. PECo-FMS-0002-A, "Method for Calculating Transient Critical Power Ratios for Boiling Water Reactors (RETRAN-TCPPECo)";
5. PECo-FMS-0003-A, "Steady-State Fuel Performance Methods Report";
6. PECo-FMS-0004-A, "Methods for Performing BWR Systems Transient Analysis";

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

7. PECo-FMS-0005-A, "Methods for Performing BWR Steady-State Reactor Physics Analysis";

8. PECo-FMS-0006-A, "Methods for Performing BWR Reload Safety Evaluations"; and

9. NEDO-32465-A, “Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications,” August 1996.

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Post Accident Monitoring (PAM) Instrumentation Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

Attachment 4

License Amendment Request

Peach Bottom Atomic Power Station, Units 2 and 3
Docket Nos. 50-277 and 50-278

Activation of the Trip Outputs of the Oscillation Power Range Monitor Portion of the Power Range Neutron Monitoring System

PLANT-SPECIFIC RESPONSES REQUIRED BY NUMAC PRNM RETROFIT PLUS OPTION III STABILITY TRIP FUNCTION TOPICAL REPORT (NEDC-32410P-A) Phase 2 OPRM Trip Activation/Deletion of ICAs

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

This Attachment 4 provides plant-specific responses required by the generic NRC approved General Electric (GE) Nuclear Measurement Analysis and Control (NUMAC) Power Range Neutron Monitor (PRNM) Licensing Topical Report (LTR) NEDC-32410P-A (including Supplement 1), "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," (see Attachment 1, References 2 and 3). The responses below also provide descriptions and justifications for each deviation from the NUMAC PRNM LTRs. The section numbers listed below are the Utility Actions Required from the NUMAC PRNM LTRs. The section numbers shown are only the ones that are unique to the Oscillation Power Range Monitor (OPRM) portion of the PRNM. All other items were addressed in the previous Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, submittal covering the overall PRNM installation (see Attachment 1, Reference 20), as approved by the NRC in Amendment approval letters dated October 14, 1999 (Unit 3) and August 1, 2000 (Unit 2) (see Attachment 1, References 21 and 22, respectively). At that time, the OPRM trip function was not being activated, so OPRM specific responses were deferred.

Section	Utility Action Required	Response
7.6	<u>Impact on UFSAR</u> The plant-specific action required for Final Safety Analysis Report (FSAR) updates will vary between plants. In all cases, however, existing FSAR documents should be reviewed to identify areas that have descriptions specific to the current PRNM using the general guidance of Sections 7.2 through 7.5 of the NUMAC PRNM LTR to identify potential areas impacted. The utility should include in the *plant-specific licensing submittal* a statement of the plans for updating the plant FSAR for the PRNM project.	Applicable sections of the Updated Final Safety Analysis Report (UFSAR) related to PRNM were reviewed and appropriate revisions of those sections prepared and approved as part of the normal design process in support of the PRNM modification (previously reviewed and approved by the NRC). In support of activation of the OPRM functions as part of the normal PBAPS modification process, the UFSAR will be reviewed with appropriate additions and any needed revisions identified. Following implementation of the design modification, the UFSAR revisions will be included in the updated UFSAR and submitted to the NRC as part of the routine UFSAR update submittal.
8.3.6.1	<u>APRM-Related RPS Trip Functions - Setpoints</u> Add to or delete from the appropriate document any changed RPS setpoint information. If ARTS is being implemented concurrently with the PRNM modification, either include the related TS submittal information with the PRNM information in the plant-specific submittal, or reference the ARTS submittal in the PRNM submittal. In the *plant-specific licensing submittal,* identify what changes, if any, are being implemented and identify the basis or method used for the calculation of setpoints and where the setpoint information or changes will be recorded.	The Technical Specification (TS) Table 3.3.1.1-1 and the Bases description for the APRM Simulated Thermal Power -- High function were updated as part of the original TS changes for the PBAPS PRNM implementation. Note (b) to Table 3.3.1.1-1, which shows an offset term of "0.65ΔW" for single loop operation (SLO), was updated to reflect the APRM Simulated Thermal Power setpoints. However, neither the NUMAC PRNM LTR nor the PBAPS specific implementation addressed the flow offset required (ΔW). No change related to SLO is required for the OPRM Upscale Function implementation, but based on experience with the PRNM at PBAPS, the SLO equation in Table 3.3.1.1-1 note (b) has been rearranged to the form "0.65 (W-ΔW) + 63.7%". This arrangement is mathematically equivalent to the current presentation of the equation, but more effectively presents both the intent of the adjustment (offset the flow) and the way the adjustment is actually accomplished in the PRNM equipment.

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

Section	Utility Action Required	Response
		The ΔW offset for SLO is only required for drive flows above about 35% for PBAPS, but for simplicity of implementation, is applied for flows down to W=ΔW. For drive flows below the value of ΔW, the equation is "clamped" at the offset value. Since the TS Bases does not currently address this subject, a short description of the single loop operation adjustment (ΔW) and the limits of application has been added to the Bases discussion for Function 2.b. See the PBAPS TS and Bases markup for the specific changes. See response for Section 8.4.6.1 for a discussion of OPRM setpoints.
8.4.1.4	OPRM-Related RPS Trip Functions - Functions Covered by Tech Specs Add the OPRM Upscale function as an "APRM function" in the RPS Instrumentation "function" table. Also add the related surveillance requirements and, if applicable, the related setpoint, and the related descriptions in the bases sections. Perform analysis necessary to establish setpoints for the OPRM Upscale trip. Add discussions related to the OPRM function in the Bases for the APRM Inop and 2-out-of-4 Voter functions. NOTE: The markups in Appendix H of Supplement 1 to the NUMAC PRNM LTR show the OPRM Upscale as an APRM sub-function. However, individual plants may determine that for their particular situation, addition of the OPRM to the RPS Instrumentation table separate from the APRM, or as a separate Tech Spec, better meets their needs. In those cases, the basis elements of the Tech Spec as shown in this Supplement would remain, but the specific implementation would be different.	An OPRM Upscale trip function has been added to the PBAPS TS as an "APRM function" (Function 2.f) consistent with Appendix H to the NUMAC PRNM LTR. However, a footnote "(d)" has been added to document that the PBDA setpoints are defined in the COLR. Additions to the TS Bases for Function 2.f have also been incorporated consistent with the NUMAC PRNM LTR but with some rewording to more clearly present the information, and with additions to more completely address OPRM related setpoints and adjustable parameters. The NUMAC PRNM LTR Supplement 1 included some additional wording for Function 2.e (voter) to address independent voting of the OPRM and APRM signals. The corresponding PBAPS Bases additions for Function 2.e are modified somewhat from those shown in the LTR, Supplement 1. These modifications are conservative in that they delete any discussion of a "partially OPERABLE" Voter Function. These changes are made for simplicity based on the conclusion that the added alternatives discussed in the LTR are complicated to evaluate, and are very unlikely to ever be applied. The modified Bases text does include some added discussion (not included in the LTR) of the hardware that implements the voter function. The added wording clarifies that operability of parts of the hardware that are not related to the voter function do not need to be considered in determining operability of the voter function. See the PBAPS TS and Bases markup for the specific changes.

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

Section	Utility Action Required	Response
8.4.2.4	OPRM-Related RPS Trip Functions - Minimum Number of Operable OPRM Channels For the OPRM functions added (Section 8.4.1), include in the OPRM Tech Spec a "minimum operable channels" requirement for three OPRM channels, shared by both trip systems. Add the same action statements as for the APRM Neutron Flux - High function for OPRM Upscale function. In addition, add a new action statement for OPRM Upscale function unavailable per Paragraph 8.4.2.2 of the NUMAC PRNM LTR. Revise the Bases section as needed to add descriptions of the 4-OPRM system with 2-out-of-4 output Voter channels (2 per RPS Trip System), and allowed one OPRM bypass total.	A minimum operable channels requirement of three, shared by both trip systems, has been included in the TS for the OPRM Upscale trip function (Function 2.f). This addition, as well as addition of action statements and Bases descriptions, is consistent with the NUMAC PRNM LTR and LTR Supplement 1. However, to make the Required Action statements more consistent with the intent of the LTR, a note has been added to Required Action I.2 stating that LCO 3.0.4 is not applicable. Although the exception to LCO 3.0.4 is not included in the NUMAC PRNM LTR Supplement 1, it is consistent with the intent of Required Action I.2. Inclusion of Action I.2 is intended to allow orderly identification and implementation of a resolution plan for an unanticipated design problem with the OPRM system without undue impact on normal plant operation. The LCO 3.0.4 exception does not eliminate the requirement to restore the OPRM Upscale function to OPERABLE status within a 120-day period. The exception does, however, allow the plant to start up with the alternate detect and suppress provision of Action I.1 in effect during the 120-day period. The Bases discussion of Required Action I.2 has also been modified from the LTR proposed text to reflect the inclusion of the Note regarding LCO 3.0.4 and to cite the NUMAC PRNM LTR Supplement 1 as a reference (Ref. 13). See the PBAPS TS and Bases markup for the specific changes.
8.4.3.4	OPRM-Related RPS Trip Functions - Applicable Modes of Operation Add the requirement for operation of the OPRM Upscale function in Mode 1 (RUN) when Thermal Power is ≥ 25% RTP, and add Bases descriptions as required.	A Modes of Operation requirement of Mode 1 ≥25% RTP, consistent with the NUMAC PRNM LTR Supplement 1, has been included in the TS along with associated Bases descriptions. The specific wording included in the Function 2.f Bases discussion for Modes of Operation has been modified somewhat from the LTR proposed text for improved clarity of the intent. See the PBAPS TS and Bases markup for the specific changes.
8.4.4.1.4	OPRM-Related RPS Trip Functions - Channel Check Add once per 12 hour or once per day Channel Check or Instrument Check requirements for the OPRM Upscale function.	A Channel Check requirement of once per 12 hours has been included for the OPRM Upscale function, consistent with the NUMAC PRNM LTR Supplement 1. See the PBAPS TS markup for the specific changes.
8.4.4.2.4	OPRM-Related RPS Trip Functions - Channel Functional Test Add Channel Functional Test requirements with a requirement for a	A "confirm auto-enable region" surveillance requirement, SR 3.3.1.1.19, has been added to require confirmation that the OPRM Upscale trip output auto-enable (not bypassed) setpoints remain correct. The SR Bases wording is similar to that in the

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

Section	Utility Action Required	Response
	test frequency of every 184 days (6 months), including the 2-out-of-4 Voter function. Add a "confirm auto-enable region" surveillance on a once per outage basis up to 24 month intervals.	LTR, but the wording has been modified and Reference 18 added to clarify that the setpoints are nominal values. References to two related SRs have also been added. The discussion of the use of APRM Simulated Thermal Power and drive flow for the setpoints (vs. Thermal Power and core flow) has been omitted from the SR 3.3.1.1.19 Bases because that same information is presented in the newly added OPRM Upscale (Function 2.f) Bases discussion. Use of the term "rated drive flow" has been omitted from the SR wording to avoid potential confusion at PBAPS where the terminology "rated recirculation drive flow" is not commonly used. These changes have no effect on the actual SR as originally defined in the NUMAC PRNM LTRs since the intent of the SR, to require reconfirmation of the setpoints in the APRM hardware, remains unchanged from the LTR. A Channel Functional Test requirement with a test frequency of every 184 days (SR 3.3.1.1.11) has been added for the OPRM Upscale function consistent with the NUMAC PRNM LTR, Supplement 1. The SR 3.3.1.1.11 is already applied to the 2-Out-Of 4 voter channels. The original PBAPS PRNM modification also included a second note to SR 3.3.1.1.11 (not included in the NUMAC PRNM LTR) to clarify that the SR also applied to the flow input function, except the transmitters. That note has been modified to also include the OPRM Upscale Function 2.f. In addition, the Bases has been expanded to clarify the role of the internal self-test routine in meeting the Channel Functional Test Surveillance Requirements as detailed in the NUMAC PRNM LTR. No change is shown in the NUMAC PRNM LTR Supplement 1 for the Channel Functional Test (SR 3.3.1.1.11) Bases to cover the OPRM Upscale Function. The Bases discussion for SR 3.3.1.1.11 has been modified to clarify that the recirculation flow is used for the auto-enable of the OPRM Upscale trip as well as for the APRM STP Upscale trip. See the PBAPS TS and Bases markup for the specific changes.
8.4.4.3.4	OPRM-Related RPS Trip Functions - Channel Calibration Add calibration interval requirement of every 24 months for the OPRM Upscale function. Revise Bases text as required.	A Channel Calibration requirement for the OPRM Upscale function has been added consistent with the NUMAC PRNM LTR Supplement 1, but also with some additional changes not included in the LTRs as discussed below. The original PRNM modification added a third note to SR 3.3.1.1.12 and revised the SR 3.3.1.1.12 Bases to address APRM, and to clarify that SR 3.3.1.1.12

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

Section	Utility Action Required	Response
		includes calibrating the associated recirculation loop flow channel. The original requirement was intended to assure that the drive flow used by the APRM Simulated Thermal Power flow biased trip was properly calibrated. The NUMAC PRNM LTR, Supplement 1 does not identify any additional changes to the Bases for OPRM Upscale Channel Calibration requirements. However, reviews of the Bases wording as part of the OPRM implementation identified two aspects that should be clarified: 1) the wording should recognize that drive flow is also used as an input to the OPRM Upscale trip auto-enable function, and 2) the "calibrating the recirculation loop flow channel" needed to include the drive flow / core flow correlation. Therefore, as part of the OPRM Upscale Function addition, the SR 3.3.1.1.12 Bases discussion has been modified to include discussion of the OPRM Upscale auto-enable function, and to expand the discussion of the scope of calibrating the drive flow channel. The third note to SR 3.3.1.1.12 has also been modified to include Function 2.f. Since the PBAPS Bases groups discussion of SR 3.3.1.1.12 with other CHANNEL CALIBRATION SRs (SRs 3.3.1.1.10, 15 & 16), some of the text has been rearranged for better flow. These changes do not affect the content or scope of any of the other SRs (SR 3.3.1.1.10, 15 & 16). See the PBAPS TS and Bases markup for the specific changes.
8.4.4.4.4	OPRM-Related RPS Trip Functions - Response <u>Time Testing</u> Modify as necessary the response time testing procedure for the 2-out-of-4 Voter function to include the Voter OPRM output solid-state relays as part of the response time tests, alternating testing of the Voter OPRM output with the Voter APRM output.	The PBAPS response time testing related to the 2-Out-Of-4 Voter Function tests from the PRNM panel terminals to the RPS relays. This interface is unchanged by addition of the OPRM Upscale Function because the OPRM Upscale trip outputs are connected electrically in series with the other APRM trip outputs to the RPS. Therefore, no change is required to the TS or Bases for response time testing. ***NOTE***: Since the response time test (SR 3.3.1.1.18) will be current at the time of the OPRM Upscale Function activation, and since no response time sensitive equipment is affected by the OPRM Upscale Function activation, it is not necessary to re-perform SR 3.3.1.1.18 prior to declaring the OPRM Upscale Function OPERABLE.
8.4.5.4	OPRM-Related RPS Trip Functions - Logic <u>System Functional Testing (LSFT)</u> Add requirement for LSFT every refueling cycle, 18 or 24 months at the utility's option based on which best fits plant scheduling.	The LSFT (SR 3.3.1.1.17) for the OPRM function is, the same as for the APRM, a test of the 2-Out-Of-4 voter only. Consistent with the NUMAC PRNM LTR Supplement 1, the only change required to implement the OPRM "LSFT" is the addition of "and OPRM" in the TS Bases to include testing of the OPRM Upscale trip outputs from the 2-out-of-4 voter.

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

Section	Utility Action Required	Response
		See the PBAPS TS Bases markup for the specific changes. ***Position on Compliance With TS SR 3.3.1.1.17 for the OPRM Function*** It is PBAPS' position that performance of SR 3.3.1.1.17 relative to the initial arming of the OPRM Upscale voting function within the 2-Out-Of-4 Voter channel can be considered met via acceptance testing performed at the factory, in-plant functional testing of the hardware, and internal self testing performed by the hardware. The next subsequent performance of this LSFT for the OPRM Upscale function will be during the first refueling outage following activation of the OPRM Upscale trip output. Justification for this position is included following this table.
8.4.6.1	OPRM-Related RPS Trip Functions - Setpoints Add setpoint information to the appropriate document and identify in the plant-specific submittal the basis or method used for the calculation and where the setpoint information will be recorded.	There are four "sets" of OPRM related setpoints and adjustable parameters: a) OPRM trip auto-enable (not bypassed) setpoints for STP and drive flow; b) period based detection algorithm (PBDA) confirmation count and amplitude setpoints; c) period based detection algorithm tuning parameters; and d) growth rate algorithm (GRA) and amplitude based algorithm (ABA) setpoints. The first set, the setpoints for the "auto-enable" region for OPRM, as discussed in the Bases discussion of the new SR 3.3.1.1.19, will be treated as nominal setpoints with no additional margins added to determine actual setpoints. The settings, 29.5% APRM Simulated Thermal Power and 60% drive flow, are defined in the TS SR 3.3.1.1.19. The second set, the PBDA trip setpoints, will be established in accordance with the BWROG LTR 32465-A methodology (see Attachment 1, Reference 4), previously reviewed and approved by the NRC, and will be documented in the COLR. Table 3.3.1.1 has been modified to add a footnote "(d)" to document that the PBDA setpoints are defined in the COLR. The third set, the PBDA "tuning" parameter values, are established in accordance with and controlled by PBAPS procedures, within the limits established by GE (see Attachment 1; Reference 19) and in the BWROG LTR NEDO-32465-A (see Attachment 1; Reference 4). The fourth set, the GRA and ABA setpoints, consistent with the BWROG LTRs (see Attachment 1; References 4, 5 and 6), are established as nominal

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

Section	Utility Action Required	Response
		values only, and controlled by PBAPS procedures only. See the PBAPS TS Bases markup for the specific changes. To document the handling of OPRM setpoints, the specific wording in the PBAPS TS Bases markup has been expanded and modified somewhat from that shown in the NUMAC PRNM LTR Supplement 1.
None	Recirculation Loops Operating LCO 3.4.1 currently requires operation in the "Unrestricted" Region of the power flow map. This restriction and associated required actions were implemented as part of the Interim Corrective Actions in response to NRC Generic Letter 86-02.	Concurrent with activation of the OPRM Upscale trip function, LCO 3.4.1, its associated actions and surveillance requirements, and the related Bases are being revised to delete requirements related to the restricted region of operation. The implementation of the automatic OPRM Upscale trip function eliminates the need for the ICAs and the related administrative requirements implemented in LCO 3.4.1. The other LCO conditions limiting operation with mismatched flows or in single loop operation are retained. Action statements have been modified to delete Actions required only to support the ICAs. The current action statements related to the "no recirculation loops in operation" condition (current Condition F) are structured to support the ICAs. However, that Condition must still be addressed. Therefore, a new Condition B is established combining the current Condition F and Condition E (required actions not completed) as "OR". The Required Action for both is to be in Mode 3 within the required time. The Completion Time for the new Required Action B.1 will be 12 hours, the same as previously allowed for Required Action E.1, but increased from the previously allowed 6 hours for Required Action F.2. With the added protection of the automatic OPRM Upscale trip to detect potential instabilities, this change is judged reasonable in that it allows more time for an orderly plant shutdown. This change makes the PBAPS TS Completion Time for this Required Action consistent with the Improved Standard Technical Specifications (NUREG-1433) (see Attachment 1, Reference 7). The TS Bases have been modified consistent with these TS changes. See the PBAPS TS and Bases markup for the specific changes.
None	Core Operating Limits Report Reporting requirements 5.6.5 does not currently address the OPRM.	Requirements have been added to Specification 5.6.5.a to include the OPRM PBDA setpoints in the COLR, and in Specification 5.6.5.b to identify the BWROG LTR NEDO-32465-A (see Attachment 1; Reference 4) as the basis. See the PBAPS TS markup for the specific changes.
9.1.3	Utility Quality Assurance Program As part of the *plant-specific licensing*	The activation of the OPRM trip is accomplished by

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

Section	Utility Action Required	Response
	submittal, the utility should document the established program that is applicable to the project modification. The submittal should also document for the project what scope is being performed by the utility and what scope is being supplied by others. For scope supplied by others, document the utility actions taken or planned to define or establish requirements for the project, to assure those requirements are compatible with the plant-specific configuration. Actions taken or planned by the utility to assure compatibility of the GE quality program with the utility program should also be documented. Utility planned level of participation in the overall V&V process for the project should be documented, along with utility plans for software configuration management and provision to support any required changes after delivery should be documented.	removing hardware jumpers in the panel. There are no required firmware changes. This configuration change will be performed in accordance with Exelon's NRC approved Quality Assurance Program.

Plant-Specific Responses Required by Licensing Topical Report NEDC-32410P-A

Justification for considering Surveillance Requirement 3.3.1.1.17 - Logic System Functional Test - as being satisfactorily met for the OPRM Upscale voting function of the 2-Out-Of-4 Voter channel

Surveillance Requirement (SR) 3.3.1.1.17 is normally performed during an outage because the method for performing the SR creates a full RPS trip (scram). PBAPS plans to activate the OPRM Upscale trip output on line during full power operation, so the normal method of performing SR 3.3.1.1.17 can not be used. PBAPS has evaluated alternative methods for performing the SR on-line. One alternative requires careful coordination of actions in multiple channels, with a very limited time available. For this alternative, any minor error or delay in the sequence of actions, which would normally have no adverse consequences, will lead to an unintentional scram. A second alternative has been identified that carries a smaller risk of inadvertent scram, but requires disconnecting multiple fiberoptic cables within the cabinet, an action that would normally not be required, and creates a significantly increased risk of causing equipment damage or equipment inoperability.

Since the only identified alternatives for performing the SR while at power carry significant risk of causing problems, PBAPS has evaluated the overall testing that has been and will be performed for the equipment performing the OPRM Upscale function. Based on that evaluation, PBAPS has determined that the intent of the LSFT for the OPRM Upscale testing will be met and that this SR will not need to be performed until the next refuel outage following trip activation. The basis for this conclusion is as follows.

The primary purpose of the SR is to reconfirm that the 2-out-of-4 voting logic is still functioning correctly. As stated in the NUMAC PRNM LTR, the test of the voting logic in the LSFT SR is redundant to an automatic self-test function that repetitively injects test signals for all combinations of inputs to confirm that the voting logic continues to function correctly. Failures detected by the self-test function are reported via the associated APRM channel to the operator. The NUMAC PRNM LTR states that the LSFT SR provides "overlap" between the automatic self-test of the voting logic and the voter output test provided by the Channel Functional Test SR, which will be performed at the time of OPRM Upscale trip activation. At PBAPS' request, GE has re-evaluated the final hardware design and confirmed that the Channel Functional Test SR and the automatic self-test of the voting logic provide full overlap, so the LSFT is not required for coverage. GE further clarified that the primary reason for the NUMAC PRNM LTR recommended LSFT coverage of the voting logic was to provide "defense-in-depth" due to the lack of operational experience with the new equipment. Since the time the NUMAC PRNM LTR was approved, the same voter hardware used at PBAPS has been installed at more than 10 other BWR units with over 20 plant-years of operation without any identified failures of the voting logic.

PBAPS performed the equivalent of the LSFT for the OPRM Upscale function during the factory acceptance test (FAT) prior to installation for both units. The normal LSFT SR has been performed every refueling outage since installation for the APRM High/Inop voting logic. No voting logic problems have been found.

Based on (1) the determination that the LSFT provides no additional hardware test coverage beyond that provided by the automatic self-test and the Channel Functional test SR to be performed at the time of trip activation, (2) the completion of an equivalent OPRM LSFT test during the FAT and the normal LSFT on the APRM High/Inop voting logic without detected problems, and (3) the extensive operating experience at other BWR plants without voting logic failures, Peach Bottom has concluded that TS SR 3.3.1.1.17, as it applies to the OPRM Upscale function of the 2-Out-Of-4 Voter channel, has already been satisfied and need not be performed until the next refueling outage following OPRM Upscale trip activation.