Britt T. McKinney
Vice President-Nuclear Site Operations

PPL Susquehanna, LLC
769 Salem Boulevard
Berwick, PA 18603
Tel. 570.542.3149 Fax 570.542.1504
btmckinney@pplweb.com

JUN 2 7 2005

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop OP1-17
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED LICENSE AMENDMENT
NUMBERS 272 FOR UNIT 1 OPERATING LICENSE NO. NPF-14
AND 241 FOR UNIT 2 OPERATING LICENSE NO. NPF-22
POWER RANGE NEUTRON MONITOR SYSTEM
DIGITAL UPGRADE
PLA-5880

Docket Nos. 50-387
and 50-388

Pursuant to 10 CFR 50.90, PPL Susquehanna, LLC (PPL), hereby requests approval of the following amendments to the Susquehanna Steam Electric Station (SSES) Unit 1 and Unit 2 Technical Specifications (TS), as described in the enclosure. The proposal would change Technical Specifications for Reactor Protection System and Control Rod Block Instrumentation, Oscillation Power Range Monitor (OPRM) Instrumentation, Recirculation Loops Operating, Shutdown Margin Test - Refueling, and the Core Operating Limits Report (COLR).

The proposed change is needed to allow modification of the existing Power Range Neutron Monitor (PRNM) system by installation of the General Electric (GE) Nuclear Measurement Analysis and Control (NUMAC) PRNM system. The Local Power Range Monitor (LPRM) detectors and signal cables would not be replaced. The existing OPRM system hardware would be replaced. The OPRM trip function would be integrated into the NUMAC PRNM system. The modification of the PRNM system replaces analog technology with a more reliable digital upgrade and simplifies the management and maintenance of the system.

The SSES PRNM system installation is planned in two phases. Phase 1 (this amendment) includes a full PRNM installation that retains the current "non-Average Power Range Monitor/Rod Block Monitor/ Technical Specifications" ["non-ARTS"] version of the Rod Block Monitor (RBM). Phase 2 (separate amendment) includes minor modification to the PRNM equipment to incorporate the "ARTS" logic in the RBM and implement associated setpoint modifications for RBM and Average Power Range Monitor equipment. This change would improve the design function of the Rod Block Monitor in support of Extended Power Uprate. The Technical Specification change request in this letter is specifically to support licensing review of Phase 1 of the PRNM modification with current "non-ARTS." A separate Average Power Range Monitor/Rod Block Monitor/Technical Specifications change request letter with associated Technical Specification mark-ups will be prepared for Phase 2.

As demonstrated in the enclosed evaluation, the proposed amendments do not involve a significant hazard consideration.

A001

Precedent licensing submittals have been approved by NRC for Nine Mile Point Unit 2, Browns Ferry Units 2 and 3, Hatch Units 1 and 2, Fermi Unit 2, Limerick Units 1 and 2, Peach Bottom Units 2 and 3, and Brunswick Units 1 and 2. These precedents are discussed in the Background section of the Licensee Evaluation of proposed changes.

The PRNM system is scheduled for installation on Unit 1 in the Spring of 2006, and installation on Unit 2 in the Spring of 2007. To support this schedule, PPL requests approval of the proposed amendments by February 1, 2006. PPL requests that the approved amendments be issued with the Unit 1 amendment effective upon issuance with implementation prior to startup following the U1-14 refueling outage and the Unit 2 amendment effective upon issuance with implementation prior to startup following the U2-13 refueling outage.

Attachment 1 is the Technical Specifications mark-up. Attachment 2 is the associated Technical Specification Bases mark-up, for information.

There are no regulatory commitments associated with the proposed changes.

The need for the changes has been discussed with the SSES NRC Project Manager.

The proposed changes have been reviewed by the SSES Plant Operations Review Committee and by the Susquehanna Review Committee. In accordance with 10 CFR 50.91(b), PPL Susquehanna, LLC is providing the Commonwealth of Pennsylvania with a copy of this proposed License Amendment request.

If you have any questions or require additional information, please contact Mr. John M. Oddo at (610) 774-7596.

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

Executed on: 6-27-05

B. T. McKinney

B. T. McKinney

Enclosure:
PPL Susquehanna Evaluation of the Proposed Changes

Attachments:
Attachment 1 – Proposed Technical Specification Changes (Mark-up)
Attachment 2 – Changes to Technical Specifications Bases Pages (Mark-up, Provided for Information)

Copy: NRC Region I
Mr. A. J. Blamey, NRC Sr. Resident Inspector
Mr. R. V. Guzman, NRC Project Manager
Mr. R. Janati, DEP/BRP

ENCLOSURE TO PLA-5880

PPL SUSQUEHANNA EVALUATION OF PROPOSED CHANGES TO TECHNICAL SPECIFICATIONS: 3.3.1.1 "REACTOR PROTECTION SYSTEM (RPS) INSTRUMENTATION"; 3.3.1.3 "OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION"; 3.3.2.1 "CONTROL ROD BLOCK INSTRUMENTATION"; 3.4.1 "RECIRCULATION LOOPS OPERATING"; 3.10.8 "SHUTDOWN MARGIN (SDM) TEST-REFUELING"; 5.6.5 "CORE OPERATING LIMITS REPORT (COLR)" FOR INSTALLATION OF UPGRADED POWER RANGE NEUTRON MONITOR SYSTEM AND REVISED THERMAL-HYDRAULIC STABILITY OPTION III

PPL EVALUATION

SUBJECT: PPL SUSQUEHANNA EVALUATION OF PROPOSED CHANGES TO TECHNICAL SPECIFICATIONS: 3.3.1.1 "REACTOR PROTECTION SYSTEM (RPS) INSTRUMENTATION"; 3.3.1.3 "OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION"; 3.3.2.1 "CONTROL ROD BLOCK INSTRUMENTATION"; 3.4.1 "RECIRCULATION LOOPS OPERATING"; 3.10.8 "SHUTDOWN MARGIN (SDM) TEST-REFUELING"; 5.6.5 "CORE OPERATING LIMITS REPORT (COLR)" FOR INSTALLATION OF UPGRADED POWER RANGE NEUTRON MONITOR SYSTEM AND REVISED THERMAL-HYDRAULIC STABILITY OPTION III

1. DESCRIPTION

The proposal would change the PPL Susquehanna Steam Electric Station (PPL) Technical Specifications for Reactor Protection System and Control Rod Block Instrumentation, Oscillation Power Range Monitor Instrumentation (OPRM), Recirculation Loops Operating, Shutdown Margin Test - Refueling, and the Core Operating Limits Report (COLR).

The proposed change is needed to allow modification of the existing Power Range Neutron Monitor (PRNM) system, excluding the Local Power Range Monitor (LPRM) detectors and signal cables, by installation of the General Electric (GE) Nuclear Measurement Analysis and Control (NUMAC) PRNM system. The existing OPRM system hardware would be replaced. The OPRM trip function would be integrated into the NUMAC PRNM system.

The PRNM system is scheduled for installation on Unit 1 in the Spring of 2006, and installation on Unit 2 in the Spring of 2007. To support this schedule, PPL requests approval of the proposed amendments by February 1, 2006. PPL requests that the approved amendments be issued with the Unit 1 amendment effective upon issuance with implementation prior to startup following the U1-14 refueling outage and the Unit 2 amendment effective upon issuance with implementation prior to startup following U2-13 refueling outage.

2. PROPOSED CHANGE

The proposal would change Technical Specifications Sections 3.3.1.1, 3.3.1.3, 3.3.2.1, 3.4.1, 3.10.8, 5.6.5, and their associated Bases, allowing modification of the existing Power Range Neutron Monitoring (PRNM) system and Oscillation Power Range Monitor (OPRM) system by installation of a digital Power Range Neutron Monitor (PRNM) system. These changes are consistent with the NRC approved GE Licensing Topical Report (LTR) NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function" and its Supplement 1 (Here-in both referred to as NUMAC PRNM LTR) (References 1 and 2). A PPL Susquehanna specific evaluation was performed.

The existing PRNM system and OPRM system will be replaced with GE's Nuclear Measurement Analysis and Control (NUMAC) PRNM system, which will perform the same plant-level functions as the currently installed systems, including the OPRM Stability Option III functions. The NUMAC PRNM system incorporates the functions of the current PRNM's Average Power Range Monitor (APRM) system, Rod Block Monitor (RBM) system, Local Power Range Monitor (LPRM) and the current OPRM. The modification of the Power Range Neutron Monitor system replaces analog technology with a more reliable digital upgrade and simplifies the management and maintenance of the system.

The Units 1 and 2 Technical Specification changes (mark-ups) associated with the following proposed changes are included as Attachment 1. These changes are in accordance with the NUMAC PRNM LTRs. Any change, deviating from, or not addressed in the NUMAC PRNM LTRs will be further described and justified in Section 4 Technical Analysis. Attachment 2 is the associated Technical Specification Bases mark-up, for information. The Bases have been revised to reflect the Technical Specification changes and provide supporting information and references. Some reference to the Bases changes is made in Section 2.1 where additional information is deemed appropriate. The proposed significant changes are:

2.1. Technical Specification 3.3.1.1, Reactor Protection System (RPS) Instrumentation - APRM Related RPS Instrumentation Functions

Functions

- The APRM "Neutron Flux – High, Setdown" scram is retained but the name is changed to APRM "Neutron Flux – High (Setdown)".

- The APRM "Flow Biased Simulated Thermal Power – High" scram is retained but the name is changed to APRM "Simulated Thermal Power – High."

- The APRM "Fixed Neutron Flux – High" scram is retained but the name is changed to APRM "Neutron Flux – High."

- The APRM "Inop" trip is retained but is changed somewhat to reflect the new NUMAC PRNM system equipment and to delete the minimum LPRM detector count from this trip. The minimum LPRM detector count will be retained in the APRM "Trouble" alarm function.

- A new APRM "pseudo function" entitled "2-out-of-4 Voter" is added to Technical Specifications to facilitate minimum operable channel definition and associated actions.

- The OPRM Trip Function (called an OPRM Upscale in the NUMAC PRNM LTRs) is added to the Technical Specifications under APRM Functions. This function replaces the function currently covered by LCO 3.3.1.3 at SSES.

Minimum Number of Operable APRM/OPRM Channels

- The required minimum number of operable APRM channels will change from four (2 per RPS trip system) to three channels.

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

- The new 2-out-of-4 Voter Function will have a requirement that all four Voter channels must be operable (2 per RPS trip system).

Note: The following two bullets are Technical Specification Bases information and are provided as additional detail and are described in the NUMAC PRNM LTR. This information was previously moved to the Technical Specification Bases as part of the Improved Standard Technical Specification program which, was reviewed and approved by the NRC.

- The minimum number of operable LPRMs per APRM channel required for APRM channel operability will increase from 14 to 20 per APRM channel and from 2 to 3 for each of the four LPRM axial levels per APRM channel. The number of inoperable LPRMs is managed administratively.

- A new maximum number of LPRMs per APRM channel that may become inoperable (and bypassed) between APRM gain calibrations will be added. The new limit is 9 LPRMs per APRM channel. This is an administrative limit.

- The OPRM setpoints and settings, such as minimum number of LPRMs per OPRM cell, are presently maintained in the TRM section 3.3.9, "OPRM Instrumentation Configuration." OPRM Plant Specific settings information outlined in the NUMAC PRNM LTR section 8.4.2.2 will continue to be maintained in the TRM.

Applicable Modes of Operation

- The new APRM 2-out-of-4 Voter Function will be required to be operable in Modes 1 (RUN) and 2 (STARTUP), the same as the current APRM Inop function.

- The applicable Modes of operation for the remainder of the APRM functions will be unchanged from the current design.

- The OPRM Trip Function will be required to be operable when Reactor Power ≥ 25% RTP and is unchanged from the current OPRM system.

Channel Check Surveillance Requirements

- The Channel Check requirement for the APRM scram functions will be the same except the frequency will be reduced from once per 12 hours to once per 24 hours.

- The new APRM 2-out-of-4 Voter Function will have Channel Check requirements of once per 24 hours.

- A Channel Check requirement for the OPRM Trip Function at a frequency of once per 24 hours will be included. The current OPRM system has no Channel Check requirement.

Channel Functional Test Surveillance Requirements

- <u>APRM Neutron Flux--High (Setdown)</u>

  The requirement will be changed from a frequency of every 7 days to every 184 days (6 months).

- <u>APRM Simulated Thermal Power--High</u>

  The requirement will be changed from a frequency of every 92 days to every 184 days (6 months). The Channel Functional Test includes the flow input function, excluding the flow transmitters.

- <u>APRM Neutron Flux--High</u>

  The requirement will be changed from a frequency of every 92 days to every 184 days (6 months).

- <u>APRM Inop</u>

  The requirement will be changed from a frequency of every 92 days to 184 days (6 months).

- 2-Out-of-Four Voter

  The requirement for a frequency of every 184 days (6 months) is included, the same rate as for the APRM and OPRM functions supported by the Voter.

- OPRM Trip

  The OPRM Trip Function will have a Channel Functional Test requirement with a frequency of every 184 days (6 months) and is the same as the frequency for the current OPRM system. The Channel Functional Test for the OPRM Trip Function includes the flow input function, excluding the flow transmitters.

Channel Calibration Surveillance Requirements

- APRM Neutron Flux--High (Setdown)

  The Channel Calibration frequency will be changed from every 184 days to every 24 months.

- APRM Simulated Thermal Power--High

  The Channel Calibration frequency will be changed from every 184 days to every 24 months. Calibration of the flow hardware will be included in overall Channel Calibration of this function at 24-month intervals. The current requirement (i.e. SR 3.3.1.1.14) to verify the APRM Simulated Thermal Power -- High time constant is $\leq$7 seconds every 24 months is being deleted.

- APRM Neutron Flux--High

  The Channel Calibration frequency will be changed from every 184 days to every 24 months.

- APRM Inop

  No change in requirement (i.e., no calibration applies).

- OPRM Trip

  The OPRM Trip Function will have a Channel Calibration requirement with a frequency of every 24 months and is the same as the frequency for the current OPRM system. The OPRM Trip Function will have a surveillance requirement with a frequency of every 24 months, to confirm that the OPRM auto-enable setpoints are correctly set and is the same as for the current OPRM system.

- Recirculation Drive Flow / Reactor Core Flow Alignment

  A new surveillance, which requires alignment of recirculation drive flow and reactor core flow, is added to better define the frequency of this adjustment. That SR will apply to the APRM Simulated Thermal Power -- High Function and to the new OPRM Trip Function.

Response Time Testing Surveillance Requirements

- The LPRM detectors, APRM channels, OPRM channels, and 2-out-of-4 Voter channels digital electronics are exempt from response time testing. The requirement for response time testing to the RPS logics and RPS contactors (50ms) will be retained by including a response time testing requirement for the new 2-out-of-4 Voter logic.
- The response time testing requirement for existing APRM "High" functions will be deleted.
- A new response time testing requirement for the 2-out-of-4 Voter Function will be added. The Response Time Testing requirement for this new scram function will be $\leq$ 0.05 seconds. Response time will be measured from activation of the 2-out-of-4 Voter output relay.
- Insert NOTE 3 to identify for Function 2.e, "n" equals 8 channels.

Logic System Functional Testing (LSFT) Surveillance Requirements

- The LSFT requirements for all APRM "High" functions will be deleted.
- The 2-out-of-4 Voter Function will have an added LSFT requirement with a frequency of every 24 months.

Setpoints and Allowable Values

No changes have been made to the Technical Specification Setpoints and Allowable Values.

Table 3.3.1.1-1 Notes

- Change Note (b) from "0.58 W + 57% RTP" to "0.58 (W-ΔW) + 62% RTP" when reset for single loop operation per LCO 3.4.1, "Recirculating Loops Operating." The value of ΔW is 5%/0.58.
- Add new Note (c) "Each APRM channel provides inputs to both trip systems."

2.2 OPRM Instrumentation, LCO 3.3.1.3

- The completion time for LCO 3.3.1.3 Condition A, has been changed from 30 days to 12 hours (LCO 3.3.1.1, Condition A).

- LCO 3.3.1.3 is deleted and the OPRM trip function is added to LCO 3.3.1.1 as Function 2.f to remain consistent with the OPRM implementation in the NUMAC PRNM LTR.

- SR 3.3.1.3.2 calibration of the local power range monitors occurs with performance of SR 3.3.1.1.8.

- SR 3.3.1.3.6, "Verify the RPS Response Time is within limits" is deleted for the OPRM.

OPRM LCO Conditions and Required Actions

- LCO 3.3.1.1 Condition A, and the associated Required Actions apply to the added OPRM Trip function (Function 2.f) the same as for the APRM Functions 2.a, 2.b., 2.c and 2.d in the new PRNMS.

- Required Action A.2 and Condition B do not apply to Function 2.f.

- LCO 3.3.1.1 Conditions I and J will be defined with associated Required Actions and Completion Times. These Conditions apply when the OPRM channel LCO 3.3.1.1 Condition A (and associated follow through Actions B, C, and D) Required Actions and associated Completion Times are not met, when the OPRM Trip function is not available due to less than two Operable OPRM Channels, or when the OPRM Trip function is not available due to a design problem that renders all OPRM Channels inoperable. These conditions replace the LCO 3.3.1.3 Conditions B and C.

- 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 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 be less than 25% RTP.

- The alternate method for detection and suppression required by Required Action I.1 replaces the LCO 3.3.1.3 Condition B.1 and is controlled by the Technical Requirements Manual rather than Technical Specifications.

- Required Actions I.1 and I.2 are the same as the present OPRM 3.3.1.3 Required Actions B1 and B2.

- The new LCO 3.3.1.1 Required Actions I.1, I.2 and J.1, applicable only to the OPRM Trip Function and modified Required Actions for Conditions A, B and C, replace the deleted LCO 3.3.1.1 Required Actions B.1, B.2, and

C.1. (Note: Technical Specification section 3.3.1.3 for the current OPRM is being deleted and existing requirements are being incorporated into Technical Specification 3.3.1.1.)

2.3 PRNM Control Rod Block Instrumentation Functions, LCO 3.3.2.1

RBM Functions

- There are no changes to the RBM Functions.
- For recirculation single loop operation, table 3.3.2.1-1 Note (b) has been changed from "$\leq$ 0.58 W + 50%" to "$\leq$ 0.58 (W-ΔW) + 55%." The value of ΔW is 5%/0.58.

RBM Surveillance Requirements, SR 3.3.2.1.1

- The only Surveillance Requirement change for the rod block functions is a change in the required frequency for the Channel Functional test surveillance for the Rod Block Monitor.
- The required frequency will be changed from every 92 days to every 184 days.

2.4 Recirculation Loops Operating, LCO 3.4.1

- The reference to the "APRM Flow Biased Simulated Thermal Power – High" scram will be replaced with "APRM Simulated Thermal Power – High."

2.5 Shutdown Margin Test – Refueling, LCO 3.10.8

- In the LCO statement and one SR, LCO 3.3.1.1 Function "2.e" is added to recognize that the APRM 2-out-of-4 Voter Function needs to be operable. This has no effect on LCO 3.10.8 logic or requirements.

2.6 Reporting Requirements, Core Operating Limits, Section 5.6.5

- The change to Section 5.6.5, COLR, identifies the change for OPRM setpoints for Specifications from Section 3.3.1.3 to Section 3.3.1.1.

3. BACKGROUND

PPL is planning a modification to upgrade the Susquehanna Steam Electric Station (SSES), Units 1 and 2, Power Range Neutron Monitoring (PRNM) system and Oscillation Power Range Monitor (OPRM) system. With the modification, the existing PRNM System, including OPRM, will be replaced with GE's Nuclear Measurement Analysis and Control (NUMAC) PRNM system, which will perform the same plant-level functions as the currently installed systems, including the OPRM Stability Option III functions.

The NUMAC PRNM system incorporates the functions of the current PRNM's Average Power Range Monitor (APRM) system, Rod Block Monitor (RBM) system, Local Power Range Monitor (LPRM) and the current OPRM.

The PRNMS modification is in support of Extended Power Uprate. The digital PRNMS modification replaces analog technology with a more reliable digital upgrade and simplifies management and maintenance of the system.

The digital upgrade, combined with future implementation of the "Average Power Range Monitor/Rod Block Monitor/Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA), provides the capability for re-assignment of LPRM inputs to the Rod Block Monitor (RBM). This would improve RBM responsiveness to a design basis control rod withdrawal error event, resulting in improved fuel operating margins needed for operation at uprated power levels. Future improvements will be addressed, as applicable, in separate licensing submittals.

The planned modification consists of replacing the existing APRM, RBM, LPRM, OPRM, and recirculation flow processing equipment, all part of the existing PRNM system. The modification excludes the LPRM detectors and signal cables, which will be retained with the NUMAC PRNM replacement.

GE Licensing Topical Reports (LTR) NEDC-32410P-A, Volumes 1 & 2, and NEDC-32410P-A Supplement 1 "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC-PRNM) Retrofit Plus Option III Stability Trip Function," (References 1 and 2) describe in detail, the generic NUMAC PRNM design including the OPRM functions (Stability Option III) and several plant-specific variations and plant-specific actions.

The currently installed SSES OPRM system implements the "Reactor Stability Long Term Solution Option III" as described in NEDO-31960-A (including Supplement 1), "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology" (Reference 3). The currently installed OPRM system has some separate hardware, but functions logically with the APRM system and receives inputs from the PRNM system. With the replacement NUMAC PRNM system, the existing OPRM hardware is removed and the function is digitally integrated within the PRNM equipment. The NUMAC PRNM LTRs NEDC-32410P-A and NEDC-32410P-A Supplement 1 discuss implementation of the OPRM functions within the PRNM equipment.

FSAR Sections containing description of the current PRNM system are:

- Section 7.1, Instrumentation and Controls "Introduction"
- Section 7.2, "Reactor Trip System (Reactor Protection System) Instrumentation and Controls"
- Section 7.6, "All Other Instrumentation Systems Required for Safety"
- Section 7.7, "Control Systems Not Required for Safety"

Precedent licensing submittals have been approved by NRC for Nine Mile Point Unit 2, Browns Ferry Units 2 and 3, Hatch Units 1 and 2, Fermi Unit 2, Limerick Units 1 and 2, Peach Bottom Units 2 and 3, and Brunswick Units 1 and 2.

Of these precedents, Nine Mile Point Unit 2, Browns Ferry Units 2 and 3, as well as Fermi Unit 2 have a similar APRM design. Limerick Units 1 and 2 have the same Reactor Vessel and Core Geometry as Susquehanna, as well as a similar NUMAC APRM design.

Section 7 of this evaluation specifies how the NUMAC PRNM LTRs apply to SSES, identifies which configurations discussed in the NUMAC PRNM LTRs apply to SSES, identifies SSES-specific variations from the descriptions in the NUMAC PRNM LTRs, and provides additional justification, where necessary, for differences between the SSES design and the generic design.

3.1 Power Range Neutron Monitoring Functions:

All power range neutron monitoring functions are retained, including LPRM detector signal processing, LPRM averaging, and APRM trips.

In some cases, the existing functions will be improved with additional filtering or modified processing. These include LPRM filtering and, for some functions, APRM filtering. The LPRM signal input filtering is improved using advanced digital processing methods. The digital filtering provides improved noise rejection for AC power related noise and some non-nuclear type transients without affecting the system response to real neutron flux signals. For the APRM, a filtered APRM flux signal called "simulated thermal power (STP)" is generated using a 6-second (nominal value) first order filter. The APRM flow-biased scram trip (and the associated clamp) will continue to operate from STP to provide the same response characteristics as the current system. In the NUMAC PRNM, STP is also used for APRM calibration against core thermal power to provide a better indication of actual average flux and for the APRM upscale rod block trips. APRM unfiltered flux signal supplies reference signal input to the RBM, the same as the current system. If the APRM is indicating less than the low power range setpoint, the RBM is automatically bypassed. The APRM upscale scram trip will continue to operate from unfiltered APRM flux to meet the trip response time assumptions in the safety analyses. Both filtered APRM flux (STP) and unfiltered APRM flux are displayed for the operator. The filtered APRM flux provides the best indication of true average power while the unfiltered flux provides a real-time indication of APRM flux changes.

The current 6-APRM channel configuration is replaced with four APRM channels, each using 1/4 of the total LPRM detectors. The outputs from all 4-APRM channels go to four independent 2-out-of-4 Voter channels. Two of the four Voter channels are assigned to either RPS trip system A or trip system B. The APRM scram trip function will be retained, but four 2-out-of-4 Voter channels are added between the APRM channels and the input to the RPS. The trip outputs from all four APRM channels are sent to each 2-out-of-4 Voter channel, so that each of the inputs to the RPS is a voted result of all four APRM channels.

Recirculation flow signal processing, previously accomplished using separate hardware within the existing PRNM control panels, is integrated into the APRM chassis in the new PRNMS. The existing 4-channel recirculation flow processing system (4 flow transmitters on each recirculation loop) is retained. In the current system, two flow channels provide inputs to the 3 APRM channels in one RPS trip system while the other two flow channels provide inputs to the APRM channels in the second RPS trip system. In the replacement PRNMS, each flow channel provides inputs to one of the 4 APRM channels. Therefore, each APRM channel also provides the signal processing for one flow channel in the replacement PRNM. The APRM hardware also performs the recirculation upscale flow alarm function.

The basic RBM logic will remain the same as in the current system, except that the LPRM signals and recirculation flow signals will be provided digitally from the APRM channels. However, the NUMAC RBM chassis provides some additional surveillance capability that allows testing of functions in all plant conditions. The same hardware, which performs the RBM logic (the RBM chassis), will also perform the recirculation flow comparison alarm function in the replacement system. In the replacement system, this function compares the recirculation flow values from each of the four flow channels.

Low voltage power supply (LVPS) functions are retained except that the post-modification configuration provides additional redundancy against loss of RPS AC power. In the current PRNMS, each APRM and RBM channel is powered by a single channel of RPS AC power busses, either channel A or channel B. In the replacement PRNMS, each APRM channel and each RBM channel is powered from independent (from the other channels), redundant LVPS units, one operating from each of the RPS AC busses. Therefore, if one RPS AC power input is lost, full APRM and RBM signal processing and indication continues to be available. Further, if an individual LVPS power supply fails, the associated channel continues to operate normally on the second LVPS. The final trip outputs from the APRM and RBM to the RPS and reactor manual control systems, however, still operate from one RPS AC input, so loss of one RPS AC input will still result in RPS ½ scram and rod block inputs the same as the current PRNMS.

The existing level of electrical separation, between components and redundant channels, is maintained or improved through extensive use of fiber-optic cables for inter-channel communications and optically coupled relay devices for interface connections to other systems.

Interface functions between the PRNMS and other systems are unchanged from the current design, except for data to the plant computer and data to the plant operator's panel. Most plant computer data is changed to multiplexed form and includes addition of "download" information from the plant computer to the PRNM, but a few direct analog signals are retained. The plant operator's panel will use the digital display outputs for most information displays.

3.2 OPRM Trip Function:

The OPRM Option III Stability Trip Function is digitally incorporated into the PRNM equipment. The OPRM function continues to satisfy the same NRC approved requirements as the currently installed OPRM equipment. Changes in the existing OPRM logic are the assignment of LPRM inputs to new OPRM cell assignments and trip logic from the 2-out-4 Voter module. The current OPRM cell assignments are selected for compatibility with the current PRNM's 6-APRM, 2-LPRM channel configuration. The replacement system's OPRM cell assignments are selected for compatibility with the 4-APRM configuration of the NUMAC PRNM. Both configurations are included in the NRC reviewed and approved BWROG Licensing Topical Reports, applicable to the OPRM Stability Option III.

The existing OPRM trip logic is the 1-out-of-2 taken twice which is being revised to input to the 2-out-of-4 voter logic. This logic is in accordance with and discussed in the reviewed and approved PRNM system NUMAC PRNM LTR.

3.3 Plant Process Computer Impact:

The new PRNM system will modify the means by which the system's data is transmitted to the plant process computer; however all existing information (i.e., LPRM, APRM, trip status, etc.) will be maintained. The present APRM system sends digitized data to Plant Integrated Computer System (PICSY) via the present OPRM module. Some analog data goes through hardwire connection. The new system will transmit PRNM data digitally through a serial fiber-optic link to the new Multi-Vendor Data (acquisition system) (MVD) interface unit. Essentially, the data transmission path has changed from going through hardwire and OPRM module, to all process data going through the MVD module. The MVD will in turn transfer the information on an Ethernet bus to the plant process computer. Similarly, plant computer calculated LPRM gain values and calculated core thermal power (to be used by APRM to adjust the APRM gains) are transmitted via the Ethernet bus to the MVD, and on to the PRNMS. The sequence of events (SOE) data points from the PRNM system will be provided as needed from the MVD.

Minor configuration changes to the plant computer software will allow it to process the PRNM interface data. Plant process computer displays will be modified to reflect the new PRNM system's channel/logic configuration.

The Plant Process Computer provides the interface to the Core Monitoring Computer (Powerplex). Data transfer between the two units will be upgraded as part of the modification.

3.4 Interface function for APRM inputs and outputs to systems other than the RPS:

The APRM interface function of the Logic Module is provided to match the existing plant circuits to the replacement PRNM. It is included in the Logic Module to simplify overall equipment packaging. The following functions are provided:

- Acts as an electrical connector adapter between field cables or panel wiring and compact APRM chassis connectors, and provides electrical isolation.
- Provides a mounting location for solid-state relays that interface between the APRM and the equipment outside the PRNMS panel.
- Implements and maintains the trip, rod block and alarm bypass states independent of the associated APRM chassis.

The APRM interface functions are associated directly with one APRM. Electrical signals are received from or sent to the associated APRM. Local logic in the Logic Module controls the state of outputs to annunciators, RMCS, and other interfaces when an APRM chassis is removed from service.

4. TECHNICAL ANALYSIS

The proposed Technical Specification changes to Unit 1 and Unit 2 are consistent with GE Licensing Topical Report LTR NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," which was approved by the NRC in a letter dated September 5, 1995, and GE LTR NEDC-32410P-A, Supplement 1, which was approved by the NRC in a letter dated August 15, 1997. Section 7 to this enclosure provides an evaluation of the plant-specific actions required by LTR NEDC-32410P-A, and Supplement 1, including descriptions and justifications for deviations from the NUMAC PRNM LTRs, as well as changes that are not addressed in the NUMAC PRNM LTRs.

The methods, standards, data, and results, as described in the NUMAC PRNM LTR for a GE BWR 4 larger core plant, are applicable to the SSES plants. The bases for the Technical Specification changes found in Section 2.0 of this enclosure are documented in Section 8.0 of NEDC-32410P-A, including Supplement 1 with exceptions as follows:

4.1 Technical Specification 3.3.1.1 Functions

Section 8.3.1.4 of the NUMAC PRNM LTR requires deleting the APRM Downscale function if currently used. This function is not currently in SSES Technical Specifications and therefore no change is provided.

4.2 Technical Specification 3.3.1.1 Functions – Minimum Number of Operable APRM Channels

Section 8.3.2.4 of the NUMAC PRNM LTR specifies deleting a note requiring removing shorting links. This note is not used at SSES, and therefore no change is provided.

4.3 Technical Specification SR 3.3.1.1.12 Channel Functional Test

Section 8.3.4.2.4 of the NUMAC PRNM LTR requires adding a notation to the Bases for the APRM Simulated Thermal Power -- High function that the test shall include the recirculation flow input processing, excluding the flow transmitters. For SSES, this notation has been added to the Channel Functional Test SR (3.3.1.1.12) and has been expanded from the NUMAC PRNM LTR to also apply to the OPRM trip function (to cover OPRM Trip enable).

4.4 Technical Specification SR 3.3.1.1.18 Channel Calibration

Section 8.3.4.3.4 of the NUMAC PRNM LTR requires adding notation to the Bases to the Channel Calibration for the APRM simulated Thermal Power -- High and OPRM Trip functions to include requirements for calibration of the recirculation flow transmitters and flow processing function. For SSES this notation has also been included in the Channel Calibration (SR 3.3.1.1.18) and has been expanded from the NUMAC PRNM LTR to also include the OPRM Trip function.

4.5 Technical Specification SR 3.3.1.1.20 Reactor Core Flow/Recirc Drive Flow Alignment

An additional SR (SR 3.3.1.1.20) that addresses reactor core flow/recirculation drive flow alignment has been added. SR 3.3.1.1.20 is not discussed in the NUMAC PRNM LTRs. The NUMAC PRNM LTR assumes that drive flow/core flow alignment is accomplished as a "flow channel" calibration while performing the APRM Simulated Thermal Power and OPRM channel calibrations. However, drive flow/core flow alignment needs to be physically performed when the unit is in 'run' and the system has reached even flow conditions. This requirement cannot be accomplished during a refueling outage, which is the time when the APRM channel calibration would normally be performed. Separating this flow SR from the APRM channel calibration recognizes that the performance of this part of the channel calibration may be performed at a different time than the calibration of the APRM flow processing functions, and eliminates the potential need to maintain administrative control of a "partially completed" surveillance. Addition of the separate SR does not constitute a new surveillance requirement, but rather separates out a part of a currently defined calibration surveillance.

4.6 Technical Specification SR 3.3.1.1.17 Response Time Testing

Consistent with the NUMAC PRNM LTRs, the only APRM Function to which SR 3.3.1.1.17 will apply is Function 2.e (Voter). However, while the NUMAC PRNM LTRs justified reduced response time testing frequency for Function 2.e, no TS mark-ups were included with the NUMAC PRNM LTR to implement an "n" greater than 4 (the total number of Voter channels). Therefore, a note has been added to the SSES SR 3.3.1.1.17 to define that "n=8" for Function 2.e. As described in the expanded Bases, (Insert B13) that rate will result in testing each APRM related RPS relay every 4 cycles, twice the rate justified in the NUMAC PRNM LTR. This testing rate (compared to the justification in the NUMAC PRNM LTR) has been selected to simplify the record keeping for the SR. Without this notation, rigorous interpretation of four voter channels would result in a value of "n=4" for this SR.

The PRNM modification includes redundant APRM trip and redundant OPRM trip outputs from each 2-out-of-4 Voter channel. One of the OPRM outputs and one of the APRM outputs are connected in series to the coil of one RPS interface relay. The second OPRM output and the second APRM output from the 2-out-of-4 Voter channel are connected in series with the coil to a second RPS interface relay. There are 8 total RPS interface relays.

The NUMAC PRNM LTR Supplement 1 justified response time testing at a rate that tested one RPS Interface relay every plant operating cycle, with tests using the APRM output for one cycle and the OPRM output for the next cycle. This yields a testing rate once per 8 operating cycles.

The response time testing proposed in the SSES Technical Specification will test both of the redundant OPRM or both of the redundant APRM trip outputs from each Voter during one application of the SR. This testing is consistent with the sequencing described in NUMAC PRNM LTR Supplement 1, but at twice the rate for all components. In addition, because this sequencing may be confusing, a description of the RPS Response Time Testing requirement for the Voter Function 2.e has been added to the SR 3.3.1.1.17 Bases, including a table showing an acceptable testing sequence. The specific tests will be defined in SSES procedures.

4.7 Technical Specification SR 3.3.1.1.19 OPRM – related RPS Trip Functions - Channel Functional Test

The present OPRM section 3.3.1.3, SR 3.3.1.3.5 requirement, has been transferred to the new section 3.3.1.1, SR 3.3.1.1.19, and is consistent with section 8.4.4.2.4 (Revised per NUMAC PRNM LTR Supplement 1) of the NUMAC PRNM LTR. SR 3.3.1.1.19 is a "confirm auto-enable region" surveillance requirement and requires confirmation that the OPRM Trip output auto-enable (not bypassed) setpoints remain correct.

The SR 3.3.1.1.19 Bases wording is similar to that in the NUMAC PRNM LTR, but the wording has been modified and Reference 5 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 OPRM Trip (Function 2.f) Bases discussion.

The specific OPRM Trip enabled region flow limit is presented slightly differently from that in the NUMAC PRNM LTRs. The upper flow limit is stated as "≤ value equivalent to the core flow value defined in the COLR" vs. < 60% stated in the NUMAC PRNM LTRs. The term "value equivalent to the core value defined in the COLR" shows that this value, 65 Mlb/Hr, is presently maintained in the COLR. In addition, the value 65 Mlb/HR is the value presently found in SR 3.3.1.3.5 which is being replaced with SR 3.3.1.1.19. The value represented in the NUMAC PRNM LTR is not sufficient for the design of the SSES core. The representation of "≤" versus "<" as found in the NUMAC PRNM LTR is conservative, and is being maintained to reflect the present Technical Specification SR 3.3.1.3.5 requirement. The change to replace the drive flow value with a reference to the COLR supports PPL's process of reconfirming the upper limit of the trip-enable region on a cycle-specific basis, and to identify the limit in the COLR in terms of core flow. The actual setpoint will still be entered as the drive flow value nominally equivalent to the core flow limit.

Use of the term "rated drive flow" has been omitted from the SR wording shown in the NUMAC PRNM LTR to avoid potential confusion on performance of the SR. The intent of the SR is to confirm the flow value as indicated on the APRM equipment.

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 NUMAC PRNM LTR.

4.8 Technical Specification SR 3.3.1.1.18 OPRM – Related RPS Trip Functions – Channel Calibration

Consistent with section 8.4.4.3.4, a Channel Calibration requirement, SR 3.3.1.1.18 (corresponds to SR 3.3.1.1.13 in the NUMAC PRNM LTR), for the OPRM Trip Function has been relocated from Technical Specification Section 3.3.1.3 to Section 3.3.1.1 which, is also in accordance with NUMAC PRNM LTR Supplement 1, but with some additional changes not included in the NUMAC PRNM LTR as discussed below:

An additional note is provided for SR 3.3.1.1.18 and to the corresponding Bases, applicable to Functions 2.b and 2.f, to state that SR 3.3.1.1.18 includes calibrating the associated recirculation loop flow channel.

The NUMAC PRNM LTR, Supplement 1 does not identify any additional changes to the Bases for OPRM Trip Channel Calibration requirements (beyond those required for the other APRM Functions). However, reviews of the Bases wording identified two aspects that should be clarified: 1) the wording should recognize that drive flow is also used as an input to the OPRM Trip auto-enable function, and 2) that alignment of reactor core flow with recirculation drive flow was necessary for proper system operation. Therefore, the SR 3.3.1.1.18 Bases discussion has been modified from that shown in the NUMAC PRNM LTRs (SR 3.3.1.1.13 in the NUMAC PRNM LTR) to include discussion of the OPRM Trip auto-enable function and to address the alignment of reactor core flow with recirculation drive flow (including a reference to the added drive flow alignment SR 3.3.1.1.20, which is not included in the NUMAC PRNM LTR).

These changes do not change any of the intent of the NUMAC PRNM LTRs or affect the associated NUMAC PRNM LTR justifications.

4.9 Technical Specification 3.3.1.1 Table 3.3.1.1-1

During recirculation single loop operation, a correction factor is applied to estimate the back flow contribution in the non-operable recirculation loop. The new NUMAC PRNM system has the capability to physically enter this correction value as part of the system operation so that it no longer needs to be maintained manually as is done for the present system.

The Allowable Value has not been revised. Instead the formula has been re-organized as shown below which, allows the value of ΔW to be more apparent. Equating the existing Allowable Value to the reorganized Allowable Value shows:

$$0.58W + 57\% = 0.58\,(W - \Delta W) + 62\%$$

equals:

$$0.58W + 57\% = 0.58W - 0.58\Delta W + 62\%$$

And if ΔW, in terms of flow = 5%/0.58

Then:

$$0.58W + 57\% = 0.58W - 5\% + 0.62\%$$
$$0.58W + 57\% = 0.58W + 57\%$$

The recirculation single loop operating values are presently provided as a Note to the Technical Specifications. The Allowable Values provide a 5% offset between the recirculation two loop (62%) and single loop (57%) operation. For two loop operation, $\Delta W = 0$, and the Allowable Value remains 0.58W + 62% RTP. Therefore, the introduction of ΔW has not changed the Allowable Values.

Note (c) has been added for APRM channel input clarification.

4.10 Technical Specification 3.3.1.3 OPRM Instrumentation

Technical Specification 3.3.1.3 was established to support the implementation of the current OPRM Stability Option III system. With the implementation of the NUMAC PRNM with OPRM, the Option III stability solution is digitally integrated within the APRM functions in LCO 3.3.1.1 and corresponding Bases, so this specification is no longer needed. Specification 3.3.1.3, along with its associated Bases, has been deleted in its entirety in the proposed Technical Specification.

The major change from the existing OPRM LCO 3.3.1.3 to the replacement OPRM LCO 3.3.1.1 is the completion time for Condition A. In the replacement OPRM system, the allowed Completion Time for the Required Action with a Condition of one or more required OPRM channels not operable but with trip capability still maintained is 12 hours (LCO 3.3.1.1, Condition A) compared to the 30 days for the similar Condition for the currently installed OPRM system (LCO 3.3.1.3, Condition A). However, for the replacement OPRM system, one OPRM channel can be bypassed and this condition would not normally occur until a second OPRM channel became inoperable. This change for the current LCO 3.3.1.3 requirement is conservative relative to safety, is judged to have no adverse impact on plant operations, and maintains consistency between the replacement OPRM system Technical Specification requirements and those reviewed and approved by the NRC via the NUMAC PRNM LTRs.

SR 3.3.1.3.6, "Verify the RPS Response Time is within limits," is deleted for the OPRM. The NUMAC PRNM LTR Supplement 1, sections 3.3.2 and 8.4.4.4.3, provide discussion and justification for deleting the response time testing for the OPRM. Essentially, the OPRM is now a digital function of the replacement PRNM. In section 4.6, it is shown that the response time testing has been assigned to the 2-out-of-4 Voter logic including the APRM Flux Trip output relay and the OPRM Trip output relay. The testing of the OPRM output relay will be on an alternating basis also described in section 4.6.

The proposed change will replace the currently installed and NRC approved OPRM Option III long-term stability solution with an NRC approved Option III long-term stability solution digitally integrated into the PRNM equipment. The PRNM hardware incorporates the OPRM Option III detect and suppress solution reviewed and approved by the NRC in the References 1, 2, 3 and 4 Licensing Topical Reports, the same as the currently installed OPRM system. The replacement OPRM meets the GDC 10, "Reactor Design," and 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 NUMAC PRNM LTR, Section 8.4, "OPRM Related RPS Trip Functions, " describes a transition period between installation of an initial OPRM system to when the system is "armed" and operational. This transition period is intended to allow an initial period of operation with the first use of the OPRM function in order to validate its design basis and confirm initial design assumptions. The initial startup period for the current OPRM system demonstrated the algorithm to be robust and not sensitive to system settings within the range of values described in NEDO-32465-A. Based on the data received during the transition period for the currently "armed" and operating digital OPRM system, and review of the design and operating experience of the GE NUMAC OPRM system, the replacement OPRM will be installed and activated without an additional transition period for evaluation.

4.11 Technical Specification 3.3.2.1

The formula in table 3.3.2.1-1 Note (b) has been reorganized, using the same philosophy as Note (b) to table 3.3.1.1-1, to show the recirculation single loop correction with ΔW. The value of ΔW allows adjustment in the replacement NUMAC PRNM.

SR 3.3.2.1.1 Channel Functional Test required frequency will be changed from every 92 days to every 184 days as prescribed in the NUMAC PRNM LTR.

4.12 Technical Specification 3.4.1 Recirculation Loops Operating

The NUMAC PRNM LTR does not include any discussion of the Recirculation changes. This Technical Specification section has been revised to be consistent with the APRM Function noun name Technical Specification changes implemented with PRNM.

4.13 Technical Specification LCO 3.10.8 Shutdown Margin Test – Refueling

An administrative change was made to LCO 3.10.8 to reflect the LCO 3.3.1.1 Functions numbering changes. Function "2.e" is added to recognize the APRM 2-out-of-4 Voter function.

4.14 *Reporting Requirements, Core Operating Limits, Section 5.6.5*

The change to Section 5.6.5, COLR, identifies the requirements of Technical Specification 3.3.1.3 (OPRM) were removed and relocated to Technical Specification 3.3.1.1 (RPS).

4.15 APRM Non-Coincidence Mode Scram (not a Technical Specification function)

The existing system has a neutron monitoring system "non-coincidence trip" function, which is activated when the "shorting links" are removed in the manual scram trip logic into the RPS. The purpose of the removal of the shorting links, when used, is to put the Intermediate Range Monitor (IRM) trips all in non-coincidence mode when the plant is not in the RUN mode, with the net effect that any single channel of IRM trip will cause a scram trip. The trip is activated during some refueling and test conditions only.

Because of the design of the current IRM/APRM RPS interface logic, removal of these shorting links also puts the APRM channels in non-coincidence mode. There is no functional or licensing requirement for this mode for the APRM channels and no functional benefit since each APRM channel already monitors the entire core. It occurs only as a consequence of the specific APRM and IRM interconnections in the RPS interface logic (the output trips are wired in series).

To maintain the APRM/RPS plant interface unchanged for the NUMAC PRNM architecture, the Voter channel trip outputs from the Logic Module will connect to the RPS input circuits in the same way as the current APRM trip outputs. Consequently, with the new PRNM installation, removal of the RPS shorting links will put the 2-out-of-4 Voter channel outputs in non-coincidence mode. The APRM channel outputs will continue to be voted the same as when the shorting links are installed. The replacement of the APRM non-coincidence mode trip in the current PRNM with a 2-out-of-4 Voter channel non-coincidence mode for the new PRNM has no functional significance because there will be either no trip outputs from the Voters or trip outputs from all of the Voters. The IRM non-coincidence mode capability will remain unchanged.

4.16 Conclusion

The proposed Technical Specification changes are consistent with the referenced NRC approved GE NUMAC PRNM LTRs. No exceptions have been taken to the safety bases of the referenced GE NUMAC PRNM LTRs. The NUMAC PRNM system, including replacement of the existing OPRM Stability Option III functions, provides an increase in reliability of the system as a result of new system designed redundancy. The new NUMAC PRNM system is designed and installed so as not to degrade the existing LRPM, APRM, OPRM, or RPS system. The new NUMAC PRNM system retains all of the safety functions of the existing system.

5. REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

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

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

Response: No

The probability (frequency of occurrence) of DBAs occurring is not affected by the PRNM system, as the PRNM system does not interact with equipment whose failure could cause an accident. Compliance with the regulatory criteria established for plant equipment will be maintained with the installation of the upgraded PRNM system. Scram setpoints in the PRNM system will be established so that all analytical limits are met.

The unavailability of the new system will be equal to or less than the existing system and, as a result, the scram reliability will be equal to or better than the existing system. No new challenges to safety-related equipment will result from the PRNM system modification. Therefore, the proposed change does not involve a significant increase in the probability of an accident previously evaluated.

The proposed change will replace the currently installed and NRC approved OPRM Option III long-term stability solution with an NRC approved Option III long-term stability solution digitally integrated into the PRNM equipment. The PRNM hardware incorporates the OPRM Option III detect and suppress solution reviewed and approved by the NRC in the References 1, 2, 3 and 4 Licensing Topical Reports, the same as the currently installed separate OPRM system. The OPRM meets the GDC 10, "Reactor Design," and 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. Therefore, the proposed change does not involve a significant increase in the consequences of an accident previously evaluated.

Based on the above, the operation of the new PRNM system and replacement of the currently installed OPRM Option III stability solution with the Option III OPRM function integrated into the PRNM equipment will not increase 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 components of the PRNM system will be supplied to equivalent or better design and qualification criteria than is currently required for the plant. Equipment that could be affected by PRNM system has been evaluated. No new operating mode, safety-related equipment lineup, accident scenario, or system interaction mode was identified. Therefore, the upgraded PRNM system will not adversely affect plant equipment.

The new PRNM system uses digital equipment that has "control" processing points and software controlled digital processing compared to the existing PRNM system that uses mostly analog and discrete component processing (excluding the existing OPRM). Specific failures of hardware and potential software common cause failures are different from the existing system. The effects of potential software common cause failure are mitigated by specific hardware design and system architecture. Failure(s) on the system level has the same overall effect. No new or different kind of accident is introduced.

Therefore, the PRNM system will not adversely affect plant equipment.

The current OPRM Option III plant design is replaced with an OPRM function digitally integrated into the PRNM. The currently installed Power Range Monitor system is replaced with a PRNM system that performs all of the existing PRNM functions plus OPRM. Failure of neither the APRM nor OPRM functions in the replacement system can cause an accident of a kind not previously evaluated in the SAR.

Based on the above, the proposed change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

Response: No

The upgraded PRNM system will not involve a reduction in a margin of safety, as loads on plant equipment will not increase, and reactions to, or results of transients and hypothetical accidents, will not increase from those presently evaluated.

No change has been made to the Analytical Limits or Technical Specification Allowable Values. The present system characteristics such as drift, calibration setpoint, and accuracy envelop the new system requirements.

The upgraded PRNM system response time and operator information is either maintained or improved over the current Power Range Neutron Monitor system. The upgraded PRNM system has improved channel trip accuracy compared to the current system.

The current safety analyses demonstrate that the existing OPRM Option III related Technical Specification requirements are adequate to detect and suppress an instability event. There is no impact on the MCPR Safety Limit identified for an instability event. The replacement OPRM system integrated into the new PRNM equipment implements the same functions per the same requirements as the currently installed system and has equivalent Technical Specification requirements. Therefore, the margin of safety associated with the MCPR Safety Limit is still maintained.

Based on the above, the proposed change will not involve a significant reduction in the margin of safety.

5.2 Applicable Regulatory Requirements / Criteria

5.2.1 Analysis

SSES FSAR Sections 3.1, "Conformance with NRC General Design Criteria," and 3.13, "Compliance with NRC Regulatory Guides," provide detailed discussion of SSES compliance with the applicable regulatory requirements and guidance. The proposed TS amendment:

(a) Does not alter the design or function of any reactivity control system;
(b) Does not result in any change in the qualifications of any component; and
(c) Does not result in the reclassification of any component's status in the areas of shared, safety related, independent, redundant, and physical or electrical separation.

5.2.2 Conclusion

Based on the analyses provided in Section 4.0 Technical Analysis, the proposed change is consistent with all applicable regulatory requirements and criteria. In conclusion, there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, such activities will be conducted in compliance with the Commission's regulations, and the approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

6. ENVIRONMENTAL CONSIDERATION

10 CFR 51.22(c)(9) identifies certain licensing and regulatory actions that are eligible for categorical exclusion from the requirement to perform an environmental assessment. A proposed amendment to an operating license for a facility does not require an environmental assessment if operation of the facility in accordance with the proposed amendment would not (1) involve a significant hazards consideration; (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite; or (3) result in a significant increase in individual or cumulative occupational radiation exposure. PPL Susquehanna has evaluated the proposed change and has determined that the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Accordingly, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with issuance of the amendment. The basis for this determination, using the above criteria, follows:

1. As demonstrated in the No Significant Hazards Consideration Evaluation, the proposed amendment does not involve a significant hazards consideration.

2. There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite. The NUMAC PRNM modification and associated changes to the Technical Specifications involve equipment that is designed to detect the symptoms of certain events or accidents and mitigating actions. No failure of the system can cause an accident or result in a significant change in the types or a significant increase in the amounts of any effluent that may be released. The NUMAC PRNM system is designed to perform the same operations as the existing PRNM system and as such, does not increase the consequences of any previously evaluated accident.

3. There is no significant increase in individual or cumulative occupational radiation exposure, because the technical specification changes do not result in a new mode of operation that would cause additional occupational exposure.

7. PLANT-SPECIFIC EVALUATION REQUIRED BY NUMAC PRNM RETROFIT PLUS OPTION III STABILITY TRIP FUNCTION TOPICAL REPORT (NEDC-32410P-A).

7.1 Plant Specific Actions Required by NEDC-32410P-A Enclosed Safety Evaluation Report Section 5.0.

The information that follows is the response to the six (6) plant specific actions requested in Section 5.0 of the "Safety Evaluation Report by the Office of Nuclear Reactor Regulation NEDC-32410 Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function."

1) Confirm the applicability of NEDC-32410, including clarifications and reconciled differences between the specific plant design and the topical report design description.

Response: All clarifications and reconciled differences between the plant design and the topical report are included in Section 4.0 and in the table in the following Section 7.2. This table is arranged so the responses for clarifications and/or differences to a specific topical report section are identified with that section.

2) Confirm the applicability of BWROG topical reports that address PRNMS and associated instability functions, set points, and margins.

Response: SSES is a GE BWR/4 Mark-II large containment. The BWROG topical reports that address PRNMS and associated instability functions, setpoints, and margins are applicable as such. The tabular information found in Section 7.2 outlines the specific clarifications or differences to the NEDC-32410P-A NUMAC PRNM LTR and its Supplement. SSES currently has installed an OPRM system covered by LCO 3.3.1.3 that incorporates Stability Option III, the same OPRM function that is described in the NUMAC PRNM LTRs and BWROG LTRs. The NUMAC PRNM modification incorporates the OPRM Option III function into the PRNM equipment as described in the NUMAC PRNM LTRs. Therefore LCO 3.3.1.3 is being deleted and an OPRM Trip Function (same as the "OPRM Upscale Function in the NMAC PRNM LTRs) has been added to the SSES Technical Specification LCO 3.3.1.1 as an "APRM Function" (Function 2.f), consistent with NUMAC PRNM LTR Supplement 1, Appendix H. A footnote for Function 2.f (not shown in the NUMAC PRNM LTR) has been added to document that the period based detection algorithm (PBDA) setpoint limits are defined in the COLR. Additions to the Technical Specification 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 completely address OPRM related setpoints and adjustable parameters.

3) Provide plant-specific revised Technical Specifications (TS) for the PRNMS functions consistent with NEDC-32410, Appendix H.

Response: Attachment 1 to this submittal is the plant-specific Technical Specifications (TS) mark-ups for the PRNMS functions and is consistent with NEDC-32410P-A.

4) Confirm that the plant specific environmental conditions are enveloped by the PRNMS equipment environmental qualification values.

Response: All plant specific environmental conditions enveloped by the PRNMS equipment environmental qualification values are presented in the table in the following Section 7.2. This table is arranged so the responses for clarifications and/or differences to a specific topical report section are identified with that section.

5) Confirm that administrative controls are provided for manually bypassing APRM/OPRM channels or protective functions, and for controlling access to the panel and the APRM/OPRM channel bypass switch.

Response: NEDC-32410P-A, Sections 5.3.13 and 5.3.18, "Security Considerations" and "User Interface and Controls," outline the hardware security measures associated with the new PRNMS. In addition, physical access to the plant control room (APRM Bypass switch) and lower relay room (PRNMS cabinet) are controlled by plant security keycard access. Administrative controls such as those implemented by the Work Control Center during procedural surveillance testing and maintenance access are as presently existing with the current PRNM system and OPRM hardware.

6) Confirm that any changes to the plant operator's panel have received human factors reviews per plant-specific procedures.

Response: Human Factors Engineering is part of the Technical Procurement Specification and will be addressed during the design modification process. Current Plant Information Computer System (PICSY) based OPRM displays will be retained. In addition, regarding OPRM Stability Option III, Operator cycle specific training has been performed that both 1) Reviewed the OPRM system and 2) Performed two different demonstrations of OPRM responses in the control room simulator. It is also planned, starting in the April 2005 Operator cycle specific training, to review the OPRM Technical Specifications Technical Requirements Manual and Operating Events (OE) report outlining Nine Mile Point 2 and Perry plant OPRM events.

7.2 Plant Specific Actions Required by NEDC-32410P-A

The information included in the following table is the SSES-specific response to the "Utility Actions Required" items in the NUMAC PRNM Retrofit Plus Option III Stability Trip Function Topical Report NEDC-32410P-A including Supplement 1. The Utility Action Required identified in the table below is as stated in the Base NUMAC PRNM LTR except where noted as "Modified by Supplement 1." The section numbers and Utility Actions Required listed below are from the Topical Report. In addition to the SSES-specific information, the table also includes additional justification information where the Topical Report does not specifically cover the SSES configuration. Responses apply for both SSES Unit 1 and SSES Unit 2. This information is specifically requested under sections entitled "Utility Action Required" per the indicated NEDC-32410P-A sections.

The SSES PRNM system installation is planned in two phases. Phase 1 includes a full PRNM installation that retains the current "non-Average Power Range Monitor/Rod Block Monitor /Technical Specifications" ["non-ARTS"] version of the Rod Block Monitor (RBM). Phase 2 includes minor modification to the PRNM equipment to incorporate the "ARTS" logic in the RBM and implement associated setpoint modifications for RBM and Average Power Range Monitor equipment. The Technical Specification change request in this letter is specifically to support licensing review of Phase 1 of the PRNM modification with current "non-ARTS." A separate Average Power Range Monitor/Rod Block Monitor /Technical Specifications change request letter with associated Technical Specification mark-ups will be prepared for Phase 2.

For SSES Unit 1, Phase 1 is planned for incorporation during the Spring 2006 outage with Phase 2 to follow at a separate time, while, for SSES Unit 2, Phase 1 and Phase 2 are planned to be incorporated during the Spring 2007 outage.
Note: Phase 1 documentation does not include licensing documentation required for ARTS implementation.

The following Table is additional SSES-specific information included to support the licensing review of the PRNM project. The information includes evaluations and justifications addressing aspects of the SSES PRNM project not otherwise included in the Topical Reports or expansion of information included in the Topical Reports.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
2.1.1.2	<u>OPRM Instability Trip</u> The instability trip function defined by the BWROG as OPRM Option III detect and suppress function is being added for the plant along with applicable plant operator's panel display functions. (NOTE: The first cycle of operation will be used as an evaluation period. During that period, all OPRM functions will be installed, but the final automatic trip will not be connected. Evaluation of performance will be done off line using data automatically collected, This off line evaluation assures no confusion for the operator during the performance assessment period).	An OPRM Option III instability trip system compliant with the BWROG Licensing Topical Reports is currently installed, armed, and operating at SSES. This system was made operable after an extensive pre-operational observation and tuning period, intended to adjust parameters to the characteristics of the SSES operating core. Based on operating experience with the SSES system, the lack of extensive changes to the operating core characteristics, and PPL's review of operating experience of the GE NUMAC OPRM system at other BWRs. PPL plans to implement the OPRM Technical Specification changes and arm the OPRM trips with the initial installation without an additional evaluation period as described in the NUMAC PRNM LTR.
2.3.4	<u>Plant Unique or Plant-Specific Aspects</u> Confirm that the actual plant configuration is included in the variations covered in the Power Range Neutron Monitor (PRNM) Licensing Topical Report (LTR) [NEDC-32410P-A, Volumes 1 & 2 and Supplement 1], and the configuration alternative(s) being applied for the replacement PRNM are covered by the NUMAC PRNM LTR. Document in the *plant-specific licensing submittal* for the PRNM project the actual, current plant configuration of the replacement PRNM, and document confirmation that those are covered by the NUMAC PRNM LTR. For any changes to the plant operator's panel, document in the submittal the human factors review actions that were taken to confirm compatibility with existing plant commitments and procedures.	The actual, current plant configuration and the proposed replacement PRNM are included in the NUMAC PRNM LTR sections listed as follows: <u>Phase 1:</u> <u>Current</u> <u>Proposed</u> APRM 2.3.3.1.1.2 2.3.3.1.2.2 RBM 2.3.3.2.1.1 2.3.3.2.2.1 Flow Unit 2.3.3.3.1.2 2.3.3.3.2.2 Rod Control 2.3.3.4.1.2 2.3.3.4.2.2 ARTS 2.3.3.5.1.4 2.3.3.5.2.2 Panel Interface 2.3.3.6.1.1 2.3.3.6.2.2 GE NUMAC PRNM LTR section 2.3.3 does not specifically identify the OPRM function as a current configuration variation. SSES differs from this section of the NUMAC PRNM LTR in that it presently has an ABB OPRM interface to APRM. This OPRM is being revised as proposed in the GE NUMAC PRNM LTR.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		Human Factors Engineering has been identified as part of the Design Inputs to the Technical Procurement Specification and will be addressed during the design process.
3.4	System Functions As part of the *plant-specific licensing submittal*, the utility should document the following: 1) The pre-modification flow channel configuration, and any changes planned (normally changes will be either adding two channels to reach four or no change planned) NOTE: If transmitters are added, the requirements on the added transmitters should be: • Non-safety related, but qualified environmentally and seismically to operate in the application environment. • Mounted with structures equivalent or better than those for the currently installed channels. • Cabling routed to achieve separation to the extent feasible using existing cableways and routes. 2) Document the APRM trips currently applied at the plant. If different from those documented in the NUMAC PRNM LTR, document plans to change to those in the NUMAC PRNM LTR. 3) Document the current status related to ARTS and the planned post	1) The current flow channel configuration consists of four flow channels, eight transmitters, NUMAC PRNM LTR 3.2.3.2.1. No change in the configuration is planned other than the PRNM implementation described in NUMAC PRNM LTR Section 3.2.3.2.2. However, the present 10-50 mA output transmitters will be replaced with transmitters providing a 4-20 mA output, the more common present day current loop standard. This change is necessary to interface, without special design, with the NUMAC PRNM equipment. The NUMAC PRNM LTRs address the case of adding transmitter channels to bring a 2-channel system up to a 4-channel system, but not the case of replacing existing transmitters solely for the purpose of establishing signal interface compatibility. The replacement transmitters will be classified safety-related, the same as the currently installed transmitters. 2) APRM trips currently applied at the plant are listed below along with changes planned. The "post-modification" trips will be the same as those identified in the NUMAC PRNM LTR:

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	modification status as: • ARTS currently implemented, and retained in the PRNM • ARTS will be implemented concurrently with the PRNM (reference ARTS submittal) • ARTS not implemented and will not be implemented with the PRNM • ARTS not applicable	• "Neutron Flux – High, Setdown": Retained with slightly modified name "Neutron Flux – High (Setdown)" (same as described in NUMAC PRNM LTR) • "Flow Biased Simulated Thermal Power – High": Retained and renamed "Simulated Thermal Power – High" (same as described in NUMAC PRNM LTR). • "Fixed Neutron Flux – High": Retained and renamed "Neutron Flux – High" (same as described in NUMAC PRNM LTR). • "Downscale": Deleted (same as described in NUMAC PRNM LTR paragraph 3.2.6). This function is not discussed in the current Technical Specifications. • "Inop": Retained, except the logic is modified slightly (same as described in NUMAC PRNM LTR paragraph 3.2.10). • APRM "Non-coincidence" trip capability: Deleted (same as described in NUMAC PRNM LTR paragraph 3.2.7). This function is not discussed in the current Technical Specifications. 3) Phase 1: ARTS is not currently implemented and will not be implemented with Phase 1 of the PRNM modification. For Phase 1, the RBM functions in SSES LCO 3.3.2.1 will be unchanged.
4.4.1.11	Regulatory Requirements for the Replacement System - System Design The NUMAC PRNM LTR identifies requirements that are expected to	A review of the SSES requirements confirms that the regulatory requirements addressed in the NUMAC PRNM LTR encompass the related SSES requirements.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	encompass most specific plant commitments relative to the PRNM replacement project, but may not be complete and some may not apply to all plants. Therefore, the utility must confirm that the requirements identified in the NUMAC PRNM LTR address all of those identified in plant commitments. The *plant-specific licensing submittal* should identify the specific requirements applicable for the plant, confirm that any clarifications included in the NUMAC PRNM LTR apply to the plant, and document the specific requirements that the replacement PRNM is intended to meet. The specific requirements applicable to SSES are listed below.	NOTE: The following response reflects applicability to the information provided in NUMAC PRNM LTR section 4.0 Design Bases and Regulatory Requirements. The statement "NUMAC PRNM LTR clarification applies" is intended to acknowledge the information found in this section of the NUMAC PRNM LTR. Each listed requirement has clarification. Some items indicate that SSES is not committed to the indicated requirement. This statement just clarifies that the requirement is not part of SSES's original design and that the requirement has been enveloped by the GE PRNM system design.
	General Functional Requirements (IEEE-279 Paragraph 4.1)	NUMAC PRNM LTR clarification applies.
	Single Failure Criteria (IEEE-279 Paragraph 4.2)	NUMAC PRNM LTR clarification applies except for the discussion of "two flow channels." SSES has four flow channels.
	Quality of Components and Modules (IEEE-279 Paragraph 4.3)	NUMAC PRNM LTR clarification applies.
	Equipment Qualification (IEEE-279 Par. 4.4)	NUMAC PRNM LTR clarification applies.
	Channel Integrity (IEEE-279 Par. 4.5)	NUMAC PRNM LTR clarification applies.
	Channel Independence (IEEE-279 Par. 4.6)	NUMAC PRNM LTR clarification applies.
	Control and Protection System Interaction (IEEE-279 Par. 4.7)	NUMAC PRNM LTR clarification applies.
	Derivation of System Inputs (IEEE-279 Par. 4.8)	NUMAC PRNM LTR clarification applies.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	Capability for Sensor Checks (IEEE-279 Par. 4.9)	NUMAC PRNM LTR clarification applies.
	Capability for Test and Calibration (IEEE-279 Par. 4.10)	NUMAC PRNM LTR clarification applies.
	Channel Bypass or Removal from Operation (IEEE-279 Par. 4.11)	NUMAC PRNM LTR clarification applies.
	Operating Bypasses (IEEE-279 Par. 4.12)	NUMAC PRNM LTR clarification applies.
	Indication of Bypasses (IEEE-279 Par. 4.13)	NUMAC PRNM LTR clarification applies.
	Access to Means for Bypassing (IEEE-279 Par. 4.14)	NUMAC PRNM LTR clarification applies. SSES administrative procedures control access to the bypass controls.
	Multiple Set Points (IEEE-279 Par. 4.15)	NUMAC PRNM LTR clarification applies. SSES administrative procedures control adjustment of Simulated Thermal Power setpoint values for single loop operation and to compensate for peaking factors, in accordance with the applicable Technical Specifications and TRM.
	Completion of Protective Action Once It Is Initiated (IEEE-279 Par. 4.16)	NUMAC PRNM LTR clarification applies.
	Manual Actuation (IEEE-279 Par. 4.17)	NUMAC PRNM LTR clarification applies.
	Access to Setpoint Adjustments, Calibration, and Test Points (IEEE-279 Par. 4.18)	NUMAC PRNM LTR clarification applies. SSES administrative procedures control access to setpoint and calibration controls and test points.
	Identification of Protective Actions (IEEE-279 Par. 4.19)	NUMAC PRNM LTR clarification applies.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	Information Readout (IEEE-279 Par. 4.20)	NUMAC PRNM LTR clarification and discussion of the digital operator's display applies to SSES. The normal design process includes human factors review of any operator's panel changes.
	System Repair (IEEE-279 Par. 4.21)	NUMAC PRNM LTR clarification applies.
	US NRC Reg. Guide 1.97 - 1980	NUMAC PRNM LTR clarification applies.
	US NRC Reg. Guide 1.152 - 1985	SSES is not committed to Reg. Guide 1.152. However, the PRNM modification complies as discussed in Appendix A of the NUMAC PRNM LTR.
	IEEE 7-4.3.2 - 1993	SSES is not committed to IEEE 7-4.3.2 – 1993. However, the PRNM system design complies as discussed in Appendix A of the NUMAC PRNM LTR.
	ANSI NQA 2, Part 2.7	SSES is not committed ANSI NQA 2, Part 2.7. However, the PRNM system design complies as discussed in Appendix A of the NUMAC PRNM LTR.
	US NRC Reg. Guide 1.75, Rev. 2	SSES is committed to Reg. Guide 1.75, Rev. 1, Jan 1975. The clarification in the NUMAC PRNM LTR applies. The replacement system meets SSES commitments.
	Reg. Guide 1.22, Rev 0, Periodic Testing of Protection System Actuation Functions	SSES is committed to Reg. Guide 1.22, February 17, 1972, Rev. 0. The replacement system meets SSES commitments.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	Reg. Guide 1.29, Rev. 3, Seismic Design	SSES is committed to Reg. Guide 1.29, Rev. 2. The replacement system meets SSES commitments.
	Reg. Guide 1.47, Rev. 0, Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems	SSES is committed to Reg. Guide 1.47, Rev. 0. The replacement system meets SSES commitments.
	Reg. Guide 1.53, Rev. 0, Application of Single-Failure Criterion to Nuclear Power Plant Protection Systems	SSES is committed to Reg. Guide 1.53, 6/73, Rev. 0. The replacement system meets SSES commitments.
	Reg. Guide 1.63, Rev. 2, Electrical Penetration Assemblies in Containment Structures for Nuclear Power Plants	SSES is not committed to Reg. Guide 1.63, Rev. 2. The SSES construction permit was issued November 1973, therefore the design of the electric penetration assemblies is in compliance with Reg. Guide 1.63 dated October 1973, Rev. 0 (which implements IEEE 317-1972).
	Reg. Guide 1.68, Rev. 2, Initial Test Programs for Water-Cooled Nuclear Power Plants	SSES is committed to Reg. Guide 1.68, Rev. 1, Jan. 1977. The replacement system meets SSES commitments.
	Reg. Guide 1.70, Rev. 3, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants	Updated Final Safety Analysis Report (UFSAR) changes resulting from this modification will be implemented using the current SSES format, so the current SSES UFSAR commitments for this Regulatory Guide are unaffected.
	Reg. Guide 1.105, Rev. 1, Instrument Setpoints for Safety-Related Systems	The replacement PRNM system meets the SSES commitments for Reg. Guide 1.105, Revision 1.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	Reg. Guide 1.118, Rev. 2, Periodic Testing of Electric Power and Protection Systems	SSES is committed to Reg. Guide 1.118, June 1976, Rev. 0. The replacement system meets SSES commitments.
	IEEE 336-1971, Standard Installation, Inspection, and Testing Requirements for Power, Instrumentation, and Control Equipment at Nuclear Facilities	The replacement PRNM system meets the SSES USFAR commitments for IEEE 336-1971.
	IEEE 338-1971, Standard Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems	The replacement PRNM system meets the SSES USFAR commitments for IEEE 338-1971.
	IEEE 379-1972, Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems	The replacement PRNM system meets the SSES USFAR commitments for IEEE 379-1972.
	IEEE 384-1974, Standard Criteria for Independence of Class 1E Equipment and Circuits	SSES is committed to IEEE 384-1974 only as invoked by and committed for Reg. Guide 1.75.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
4.4.2.2.1.4	Regulatory Requirements for the Replacement System -Equipment Qualification - Temperature and Humidity Plant-specific action will confirm that the maximum control room temperatures plus mounting panel temperature rise, allowing for heat load of the PRNM equipment, does not exceed the temperatures presented in the NUMAC PRNM LTR, and that control room humidity is maintained within the limits stated in the NUMAC PRNM LTR. This evaluation will normally be accomplished by determining the operating temperature of the current equipment, which will be used as a bounding value because the heat load of the replacement system is less than the current system while the panel structure, and thus cooling, remains essentially the same. Documentation of the above action, including the specific method used for the required confirmation should be included in *plant-specific licensing submittals.*	The PRNM electronics are qualified for continuous operation under the following temperature conditions: 5 to 50°C [41 to 122°F]. The SSES heating, ventilation, and air conditioning (HVAC) system is designed to maintain the temperatures in the rooms where the PRNM equipment is mounted at no more than 80°F and no less than 60°F. The heat rise within the PRNM cabinet is expected to be less than 15°F. The resulting 95°F temperature within the cabinet is well below the 122°F qualification level of the electronic equipment. The PRNM electronics is qualified for continuous operation under the following relative humidity conditions: 10 to 90% (non-condensing). The SSES relative humidity requirement for the rooms where the PRNM equipment is mounted 10 - 60%, which is within the range for which the PRNM equipment is qualified.
4.4.2.2.2.4	Regulatory Requirements for the Replacement System - Equipment Qualification – Pressure Plant-specific action will confirm that the maximum control room pressure does not exceed the limits presented in the NUMAC PRNM LTR. Any pressure differential from inside to outside the mounting panel is assumed to be negligible since the panels are not sealed and there is no forced cooling or ventilation. Documentation of this action and the required confirmation should be included in *plant-specific licensing submittals.*	The PRNM electronics are qualified for continuous operation under the following pressure conditions: 13 - 16 psia. The SSES pressure requirements for the equipment, 0 – 0.125" wg, are within these limits.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
4.4.2.2.3.4	Regulatory Requirements for the Replacement System - Equipment Qualification – Radiation Plant-specific action will confirm that the maximum control room radiation levels do not exceed the limits presented in the NUMAC PRNM LTR. Documentation of this action and the required confirmation should be included in *plant-specific licensing submittals.*	The PRNM electronics are qualified for continuous operation under the following conditions: Dose Rate ≤ 0.001 Rads (carbon)/hr and Total Integrated Dose (TID) ≤ 1000 Rads (carbon). The applicable SSES dose rates and TID are within the qualified ranges.
4.4.2.3.4	Regulatory Requirements for the Replacement System - Seismic Qualification Plant-specific action or analysis will confirm that the maximum seismic accelerations at the mounting locations of the equipment (control room floor acceleration plus panel amplification) for both OBE and SSE spectrums do not exceed the limits stated in the NUMAC PRNM LTR. Documentation of this action and the required confirmation should be included in *plant-specific licensing submittals.*	Evaluations to confirm that the maximum seismic accelerations at the mounting locations of the equipment do not exceed qualification limits of the equipment will be completed as part of the normal design change process. The seismic qualification results will be documented in a plant-specific "Qualification Summary."
4.4.2.4.4	Regulatory Requirements for the Replacement System - EMI Qualification The utility should establish or document practices to control emission sources, maintain good grounding practices and maintain equipment and cable separation. 1) Controlling Emissions a) Portable Transceivers (walkie-talkies): Establish practices to prevent operation of portable transceivers in close proximity of equipment sensitive to such	SSES procedures specifically require evaluation of EMI/RFI susceptibility and the impact of the proposed modification on the plant. EPRI TR-102323, Rev. 1, and Reg. Guide 1.180 are used as the basis. Based on the requirements of that process, EMI susceptibility and emissions requirements have been established for the PRNM equipment. Evaluation of equipment qualification levels to confirm compliance with the EMI requirements will be documented in a plant-unique Qualification Summary. EM environment surveys have been completed at SSES within the lower

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	emissions. (NOTE: The qualification levels used for the NUMAC PRNM exceed those expected to result from portable transceivers, even if such transceivers are operated immediately adjacent to the NUMAC equipment.)	relay rooms to support installation of the current OPRM. At that time, the environment at the point of installation was found to be within the EPRI TR-102323-R1 recommended levels. The following factors are considered in the process.
	b) ARC Welding: Establish practices to assure that ARC welding activities do not occur in the vicinity of equipment sensitive to such emissions, particularly during times when the potentially sensitive equipment is required to be operational for plant safety. (NOTE: The qualification levels used for NUMAC PRNM minimize the likelihood of detrimental effects due to ARC welding as long as reasonable ARC welding control and shielding practices are used.)	1) Controlling Emissions The qualification levels used for the NUMAC PRNM system exceed those expected to result from portable transceivers, even if such transceivers are operated immediately adjacent to NUMAC equipment. SSES generally prohibits operation of portable transceivers near sensitive equipment, and if warranted requires positions of warning signs at critical locations throughout the plant. Placement of warning sign will be evaluated as part of the modification process.
	c) Limit Emissions from New Equipment: Establish practices for new equipment and plant modifications to assure that they either do not produce unacceptable levels of emissions, or installation shielding, filters, grounding or other methods prevent such emissions from reaching other potentially sensitive equipment. These practices should address both radiated emissions and conducted emissions, particularly conducted emissions on power lines and power distribution systems. Related to power	The qualification levels used for the NUMAC PRNM system minimize the likelihood of detrimental effects due to ARC welding as long as reasonable ARC welding control and shielding practices are used. ARC welding is only performed at SSES with specific work orders and directions, and is known to have the potential to affect operation of I&C equipment at a number of locations in the plant. Therefore, ARC welding activity is only performed when any potential effect on I&C equipment is tolerable relative to plant operation.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	distribution, both the effects of new equipment injecting noise on the power system and the power system conducting noise to the connected equipment should be addressed. (NOTE: The qualification of the PRNM equipment includes emissions testing.) 2) Grounding Practices a) Existing Grounding System: The specific details and effectiveness of the original grounding system in BWRs varied significantly. As part of the modification process, identify any known or likely problem areas based on previous experience and include in the modification program either an evaluation step to determine if problems actually exist, or include corrective action as part of the modification. (NOTE: The PRNM equipment is being installed in place of existing PRNM electronics which is generally more sensitive to EMI than the NUMAC equipment. As long as the plant has experienced no significant problems with the PRM, no problems are anticipated with the PRNM provided grounding is done in a comparable manner.) b) Grounding Practices for New Modifications: New plant modifications process should include a specific evaluation of grounding methods to be used to	EMI emissions from new equipment installed at SSES are evaluated as part of the normal design modification process described in SSES procedures. 2) Grounding Practices The PRNM system equipment is being installed in place of existing Power Range Monitor Neutron (PRNM) system electronics, which are generally more sensitive to EMI than the NUMAC equipment. The replacement system will interface with the same cables and wiring at the panel interfaces as the current system, including ground bus connections. No problems have been identified with the current PRNM system related to grounding or grounding practices. The original installation included specific grounding practices designed to minimize performance problems. The replacement PRNM system is less sensitive to grounding issues than is the current system and includes specific actions in the wiring inside the panel to maximize shielding and grounding effectiveness. 3) Equipment and Cable Separation The original PRNM system cable installation requirements met this objective. The replacement PRNM system uses the same cable routes and paths at comparable energy levels. Since no specific problem has been identified in the current system, no special action will be necessary for the PRNM modification. The existing system

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	assure both that the new equipment is installed in a way equivalent to the conditions used in the qualification. (NOTE: NUMAC PRNM equipment qualification is performed in a panel assembly comparable to that used in the plant.) 3) <u>Equipment and Cable Separation Cabling</u>: Establish cabling practices to assure that signal cables with the potential to be "receivers" are kept separate from cables that are sources of noise. (NOTE: The original PRM cable installation requirements met this objective. The replacement PRNM uses the same cable routes and paths, so unless some specific problem has been identified in the current system, no special action should be necessary for the PRNM modification.) b) <u>Equipment</u>: Establish equipment separation and shielding practices for the installation of new equipment to simulate that equipment's qualification condition, both relative to susceptibility and emissions. (NOTE: The original PRNM cabinet design met this objective. The replacement PRNM uses the same mounting cabinet, and used an equivalent mounting assembly for qualification. No special action should be necessary for the PRNM modification.) The *plant-specific licensing submittals* should identify the practices that are in place or will be applied for the PRNM modification to address each of the above items.	cabling complies with applicable SSES cable routing and separation requirements. Additionally, the modification process is performed in accordance with the existing separation criteria.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
6.6	System Failure Analysis The utility must confirm applicability of the failure analysis conclusions contained in the NUMAC PRNM LTR by the following actions: 1. Confirm that the events defined in EPRI Report No. NP-2230 or in Appendices F and G of Reference 11 of the NUMAC PRNM LTR, encompass the events that are analyzed for the plant; 2. Confirm that the configuration implemented by the plant is within the limits described in the NUMAC PRNM LTR; and 3. Prepare a plant-specific 10CFR50.59 evaluation of the modification per the applicable plant procedures. These confirmations and conclusions should be documented in the *plant-specific licensing submittals* for the PRNM modification. [Reference 11 of the NUMAC PRNM LTR is NEDC-30851P-A, "Technical Specification Improvement Analysis for BWR Reactor Protection System," Licensing Topical Report, GE Nuclear Energy, Class III (proprietary), dated March 1988.]	1. The analysis in Reference 6 evaluated the effects of surveillance frequency of RPS and RPS inputs on calculated RPS failure frequency. Considered in the evaluation were anticipated transients, based on EPRI Report No. NP-2230, and unanticipated transients (i.e., events of sufficiently low frequency so that they have insignificant contribution to RPS failure frequency). Events are divided in to more severe transients that require immediate scram (i.e., Appendix F), and less severe transients that do not require immediate scram, or may not even reach scram limits (i.e., Appendix G). Appendix G also discusses infrequent events, but these are not specifically listed. The transients evaluated in SSES Chapter 15 are included in the transients identified in Appendix F and G of Reference 6. The transients are encompassed by those considered based on the definitions in EPRI NP-2230 or, are either infrequent events, or do not require scram. Those in the latter two categories (i.e., infrequent events or events that do not require scram) are identified below: • Fuel Assembly Loading Error During Refueling (no scram required) • Control Rod Drop Accident (infrequent event) • Main Steam Line Break in Turbine Building (infrequent event)

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		• Loss of Coolant Accident Inside Containment (infrequent event) • Refueling Accident (no scram required) 2. The proposed PRNM configuration is included among the configurations described in the NUMAC PRNM LTR, as itemized under Section 2.3.4 above. The proposed configuration is being designed by GE and is within the limits described in the NUMAC PRNM LTR. 3. A plant-specific 10CFR50.59 evaluation of the modification will be prepared per the applicable plant procedures.
7.6	<u>Impact on UFSAR</u> The plant-specific action required for 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 UFSAR will be reviewed and appropriate revisions of those sections will be prepared and approved as part of the normal design process. Following implementation of the design modification, and closure of the design package, the UFSAR will be revised as part of the routine UFSAR update.
8.3.1.4	<u>APRM-Related RPS Trip Functions - Functions Covered by Technical Specifications</u> 1. Delete the APRM Downscale function, if currently used, from the RPS Instrumentation "function" table, the related surveillance	1. The current SSES Technical Specification does not include the APRM Downscale function, so no additional action is required. 2. The SSES PRNM currently includes the APRM Simulated Thermal Power - High and the APRM Neutron Flux - High Functions (with

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	requirements, and, if applicable, the related setpoint, and related descriptions in the bases sections. 2. Delete the APRM Flow-biased Neutron Flux Upscale function, if currently used, from the RPS Instrumentation "function" table, the related surveillance requirements, and, if applicable, the related setpoint, and related descriptions in the bases sections. Replace these with the corresponding entries for the APRM Simulated Thermal Power - High and the APRM Neutron Flux - High functions. Perform analysis necessary to establish setpoints for added trips. 3. Add the APRM Neutron Flux - High (Setdown) function, if not currently used, to the RPS Instrumentation "function" table, add the related surveillance requirements, and, if applicable, the related setpoints, and related descriptions in the bases sections. Perform analysis necessary to establish setpoints for added trips.	slightly different names). The PRNM modification retains these Functions unchanged except for minor name changes. 3. The APRM Neutron Flux – High (Setdown) Trip is currently in SSES's Technical Specifications identified as "Neutron Flux – High, Setdown." The PRNM modification retains the Function unchanged, except for the slight name change.
8.3.2.4	<u>APRM-Related RPS Trip Functions - Minimum Number of Operable APRM Channels</u> 1. For the 4-APRM channel replacement configuration, revise the RPS Instrumentation "function" table to show 3 APRM channels, shared by both trip systems for each APRM function shown (after any additions or deletions per NUMAC PRNM LTR Paragraph 8.3.1.4). Add a "2-out-of-4 Voter" function with two channels under the "minimum operable channels". For plants with Technical Specifications	1. The PRNM modification and the proposed Technical Specification and Bases change implement the changes as described in the NUMAC PRNM LTR for a "larger core" plant (i.e., no LPRMs are currently shared between APRM channels). SSES Technical Specifications include no notes related to APRM calling for removal of shorting links, so no related note changes are required. Similarly, SSES does not have any shared LPRM inputs (between APRM channels), so no note changes related to "LPRMs from 'other' APRMs" are necessary.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	that include a footnote calling for removing shorting links, remove the references to the footnote related to APRM (retain references for SRM and IRM) and delete any references to APRM channels in the footnote. For smaller core plants, delete the notes for and references to special conditions related to loss of all LPRMs from the "other" APRM. 2. Review action statements to see if changes are required. If the improvements documented in Reference 11 of the NUMAC PRNM LTR have not been implemented, then changes will likely be required to implement the 12-hour and 6-hour operation times discussed above for fewer than the minimum required channels. If Improved Technical Specifications are applied to the plant, action statements remain unchanged. 3. Revise the Bases section as needed to replace the descriptions of the current 6- or 8-APRM channel systems and bypass capability with a corresponding description of the 4-APRM system, 2-out-of-4 Voter channels (2 per RPS system), and allowed one APRM bypass total.	2. Action statement changes in the proposed Technical Specification change are consistent with the NUMAC PRNM LTR described changes for plants utilizing ISTS. SSES has previously switched to the ISTS format and implemented the "Reference 6" (Reference 11 in the NUMAC PRNM LTR) changes. 3. The proposed Technical Specification Bases changes include revisions to the descriptions of the architecture, consistent with the NUMAC PRNM LTR. In several areas, the specific wording of the Tech Spec Bases changes differs somewhat from that in the NUMAC PRNM LTR for improved clarity and completeness.
8.3.3.4	<u>APRM-Related RPS Trip Functions - Applicable Modes of Operation</u> 1) <u>APRM Neutron Flux - High (Setdown)</u> Change Technical Specification "applicable modes" entry, if required, to be Mode 2 (startup). Delete references to actions and surveillance requirements associated with other modes.	1), 2), 3) 4) The current SSES Technical Specifications and Bases already includes these Functions, with slightly different names for the flux trips, with "Mode of Operation" requirements consistent with the NUMAC PRNM LTR. The PRNM modification changes the names of the Functions only to be consistent with the NUMAC PRNM LTR. The proposed Technical Specification and Bases

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	Delete any references to notes associated with "non-coincidence" mode and correct notes as required. Revise Bases descriptions as required. 2) APRM Simulated Thermal Power – High Retain as is unless this function is being added to replace the APRM Flow-biased Neutron Flux Trip. In that case, add requirement for operation in Mode 1 (RUN) and add or modify Bases descriptions as required. 3) APRM Neutron Flux – High Retain as is unless this function is being added to replace the APRM Flow-biased Neutron Flux Trip. In that case, add requirement for operation in Mode 1 (RUN) and add or modify Bases descriptions as required. 4) APRM Inop Trip Delete any requirements for operation in modes other than Mode 1 and Mode 2 (RUN and STARTUP). Revise the Bases descriptions as needed.	changes are consistent with this name change and the NUMAC PRNM LTR.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
8.3.4.1.4	APRM-Related RPS Trip Functions - Channel Checks/ Instrument Checks a) For plants without Channel Check requirements, add once per 12 hour or once per day Channel Check or Instrument Check requirement for the three APRM flux based functions. No Channel Check requirements are added for APRM Inop function. Plants with once per 12 hour or once per shift requirements may change them to once per day. b) For plants with 4 full recirculation flow channels and with Technical Specifications that call for daily or other channel check requirements for flow comparisons under APRM Flow Biased Simulated Thermal Power Trip, delete those requirements. Move any note reference related to verification of flow signals to Channel Functional Test entry.	a) The SSES Technical Specifications currently include a once-per-12-hour Channel Check requirement for the APRM Functions (except for Inop) and for other RPS Functions. The APRM Function Channel Check requirements will be changed to once per 24 hours, consistent with the NUMAC PRNM LTR. The proposed Technical Specification and Bases changes for the Channel Check SR are consistent with the NUMAC PRNM LTR. b) SSES currently has 4 full recirculation flow channels. Associated surveillances have been included in those for the APRM Simulated Thermal Power – High, and the OPRM Trip Functions (the latter because of the OPRM Trip enable function). The proposed Technical Specification and Bases changes for the recirculation flow related SRs are consistent with the NUMAC PRNM LTR but with some expansion to clarify that the recirculation flow functions also support the OPRM Trip enable.
8.3.4.2.4	APRM-Related RPS Trip Functions - Channel Functional Tests a) Delete existing channel functional test requirements and replace with a requirement for a Channel Functional Test frequency of each 184 days (6 months) [delete any specific requirement related to startup or shutdown except for the APRM Neutron Flux - High (Setdown) function as noted in Paragraph 8.3.4.2.2(1) of the NUMAC PRNM LTR. Add a notation that both the APRM	The current SSES Technical Specification includes implementation of the surveillance improvements in Reference 6 and a weekly surveillance of the scram contactors independent of APRM (SR 3.3.1.1.5) applicable only to the Manual Scram Function, consistent with the SR as shown in the NUMAC PRNM LTR. a) The proposed Technical Specification and Bases changes related to Channel Functional Tests are consistent with the NUMAC PRNM LTR, but with some

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	channels and the 2-out-of-4 Voter channels are to be included in the Channel Functional Test. b) Add a notation for the APRM Simulated Thermal Power - High function that the test shall include the recirculation flow input processing, excluding the flow transmitters. CAUTION: Plants that have not implemented the APRM surveillance improvements of Reference 11 of the NUMAC PRNM LTR, or those that have continued to use a weekly surveillance of scram contactors, may need to implement or modify surveillance actions to continue to provide a once per week functional test of scram contactors. (Prior to changes defined in Reference 11, the weekly APRM functional test also provides a weekly test of all automatic scram contactors.)	expansion of the Bases for clarification. b) The proposed Technical Specification and Bases changes to Channel Functional Tests for the APRM Functions include a notation, applicable to the Simulated Thermal Power – High (Function 2.b) and the OPRM Trip (Function 2.f), consistent with the NUMAC PRNM LTR requirements, that the SR includes the recirculation flow input processing, excluding the flow transmitters. However, the NUMAC PRNM LTR includes this notation only in the Bases. For the SSES Technical Specification, the notation has been included in the Channel Functional Test SR (SR 3.3.1.1.12), and has been expanded from that in the NUMAC PRNM LTR to also apply to the OPRM Trip Function (to cover OPRM Trip enable). The proposed Bases change includes discussion of the scope of the APRM Channel Functional Test to clarify that the test covers primarily hardware rather than firmware. The functional test surveillance procedure tests all of the hardware required to produce the trip functions, but not to directly re-test software-only (firmware-only) logic. The APRM automatic self-test function monitors the integrity of the Erasable Programmable Read Only Memories (EPROMs) storing all of the firmware so that if a hardware fault results in a "change" to the firmware (software), that fault will be detected by the self-test logic. The continued operation of the self-test

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		procedures is monitored by the built-in "watch-dog timer" function, so if for some unforeseen reason the self-test function (lowest priority in the instrument logic) stops running, that failure also will be detected automatically. To provide further assurance that the self-test function continues to operate, the daily APRM Channel Check surveillance confirms that self-test is still running. The APRM Channel Check surveillance will also include a step to confirm that the RBM self-test is still running since the RBM hardware performs the recirculation flow comparison checks. A surveillance finding that the self-test is not operating in both RBMs (meaning the recirculation flow-comparison function may not be available) will not automatically result in any APRM channel being declared inoperable, but will result in an increased rate of "flow comparison" manual surveillance. For this condition, the flow-comparison will be performed as part of the Channel Check SR for APRM Functions 2.b and 2.f, the two functions that depend on flow.
8.3.4.3.4	<u>APRM-Related RPS Trip Functions - Channel Calibrations</u> a) Replace current calibration interval with either 18 or 24 months except for APRM Inop. Retain Inop requirement as is (i.e., no requirement for calibration). b) Delete any requirement for flow calibration and calibration of the 6 second time constant separate from overall calibration of the APRM	a) The proposed Technical Specification and Bases changes related to Channel Calibration for the APRM Functions include an increase in the interval to 24 months, with no calibration required for the Inop Function, consistent with the NUMAC PRNM LTR. b) Prior to the PRNM modification, the SSES Technical Specifications included both an SR for calibration of the recirculation flow functions

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	Simulated Thermal Power Upscale Trip. c) Replace every 3 day frequency for calibration of APRM power against thermal power with a 7 day frequency if applicable. d) Revise Bases text as required.	(SR 3.3.1.1.3) and a requirement for verification of the "7-second" time constant for the Simulated Thermal Power (SR 3.3.1.1.14). (Note: this time constant is the same as the 6-second time constant discussed in b). Consistent with the NUMAC PRNM LTR requirements, the proposed Technical Specification and Bases changes delete both of these surveillances and add a notation applicable to the Channel Calibration for the APRM Simulated Thermal Power – High and OPRM Trip Functions to include requirements for calibration of the recirculation flow transmitter and flow processing function. However, the NUMAC PRNM LTR includes recirculation flow transmitter notation only in the Bases. For the SSES Technical Specification, the notation has been included in the Channel Calibration SR (SR 3.3.1.1.18), and has been expanded from that in the NUMAC PRNM LTR to also apply to the OPRM Trip Function (to cover OPRM Trip enable). In addition, an additional SR (SR 3.3.1.1.20) that addresses reactor core flow/recirculation drive flow alignment has been added. SR 3.3.1.1.20 is not discussed in the NUMAC PRNM LTRs. The NUMAC PRNM LTR assumes that drive flow/core flow alignment is accomplished as part of the "flow channel" calibration, part of the APRM Simulated Thermal Power and OPRM channel calibrations. However, drive flow/core flow alignment cannot reasonably be accomplished during a refueling

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		outage, the time when the APRM channel calibration would normally be performed. Separating this SR from the APRM channel calibration recognizes that the performance of this part of the flow channel calibration may be performed at a different time than the calibration of the APRM flow processing functions, and eliminates the potential need to maintain administrative control of a "partially completed" surveillance. Addition of the separate SR does not constitute a new surveillance requirement, but rather separates out a part of a currently defined surveillance. c) The current SSES Technical Specifications include a "once-per-7-day" frequency for the calibration of APRM power against calculated plant thermal power so no change in that frequency is required to be consistent with the NUMAC PRNM LTR and no change is planned. d) The proposed Technical Specification Bases changes related to Channel Calibrations are consistent with the NUMAC PRNM LTR, with some expanded text to address the use of drive flow for OPRM Trip enable, and to address the alignment of reactor core flow and recirculation drive flow, and in some areas to improve clarity.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
8.3.4.4.4	APRM-Related RPS Trip Functions - Response Time Testing Delete response time testing requirement from Technical Specifications or plant procedures, as applicable, for the APRM functions. Replace it with a response time testing requirement for the 2-out-of-4 Voter "pseudo" function, to include the output solid-state relays of the Voter channel through the final RPS trip channel contactors. Frequency of response time testing shall be determined using four 2-out-of-4 Voter channels, but tests may alternate use of 2-out-of-4 Voter outputs provided each APRM/RPS interfacing relay is tested at least once per eight refueling cycles (based on a maximum 24 month cycle), and each RPS scram contactor is tested at least once per four refueling cycles. Each 2-out-of-4 Voter output shall be tested at no less than half the frequency of the tests of the APRM/RPS interface relays. Tests shall alternate such that one logic train for each RPS trip system is tested every two cycles.	The proposed Technical Specification and Bases changes related to Response Time Testing (SR 3.3.1.1.17) are consistent with the justification in the NUMAC PRNM LTR Supplement 1 except that the RPS relays will be tested at twice the frequency justified. Consistent with the NUMAC PRNM LTRs, the only APRM Function to which SR 3.3.1.1.17 will apply is Function 2.e (Voter). However, while the NUMAC PRNM LTRs justified reduced response time testing frequency for Function 2.e, no TS markups were included to implement an "n" greater than 4 (the total number of Voter channels). Therefore, a note has been added to the SSES SR 3.3.1.1.17 to define that "n=8" for Function 2.e. As described in the expanded Bases, that rate will result in testing each APRM related RPS relay every 4 cycles, twice the rate justified in the NUMAC PRNM LTR. This testing rate (compared to the justification in the NUMAC PRNM LTR) has been selected to simplify the record keeping for the SR. Without this notation, rigorous interpretation of the TS would result in a value of "n=4" for this SR. The PRNM modification includes redundant APRM trip and redundant OPRM trip outputs from each 2-out-of-4 Voter channel. One of the OPRM outputs and one of the APRM outputs are connected in series to the coil of one RPS interface relay. The second OPRM output and the second APRM output from the 2-out-of-4 Voter channel are connected in series with the coil to a second RPS interface relay. There are 8 total RPS interface relays.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		The NUMAC PRNM LTR Supplement 1 justified response time testing at a rate that tested one RPS Interface relay every plant operating cycle, with tests using the APRM output for one cycle and the OPRM output for the next cycle. This yields a testing rate once per 8 operating cycles for each RPS interface relay and once per every 16 operating cycles for the APRM or OPRM output. The response time testing proposed in the SSES Technical Specification will test both of the redundant OPRM or both of the redundant APRM trip outputs from each Voter during one application of the SR. This testing is consistent with the sequencing described in NUMAC PRNM LTR Supplement 1, but at twice the rate for all components. In addition, because this sequencing may be confusing, a description of the RPS Response Time Testing requirement for the Voter Function 2.e has been added to the SR 3.3.1.1.17 Bases, including a table showing an acceptable testing sequence. The specific tests will be defined in SSES procedures.
8.3.5.4	APRM-Related RPS Trip Functions - Logic System Functional Testing (LSFT) Revise Technical Specifications to change the interval for LSFT from 18 months to 24 months unless the utility elects to retain the 18-month interval for plant scheduling purposes. Delete any LSFT requirements associated with the APRM channels and move it to the 2-out-of-4 Voter channel.	Consistent with the NUMAC PRNM LTR, the proposed Technical Specification change deletes the requirement for LSFT surveillances for all APRM Functions except the 2-out-of-4 Voter, Function 2.e. The LSFT requirement for that Function is included at a 24-month interval.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	Include testing of the 2-out-of-4 voting logic and any existing LSFTs covering RPS relays.	
8.3.6.1	APRM-Related RPS Trip Functions - Setpoints 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 Technical Specification 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.	ARTS has not previously been implemented at SSES and will not be implemented with Phase 1 of the PRNM Modification. The PRNM Allowable Values have not been changed in Technical Specifications. The operation efficiency of the replacement system is equal to or better than the existing system. Therefore, the setpoints have not been revised. Any in-house calculation of PRNM setpoints and Allowable Values will be re-calculated or confirmed using SSES's approved calculation program. The Setpoints for the APRM RPS Functions will be included in the Technical Specifications or the COLR, comparable to what is currently in the SSES Technical Specifications and consistent with the NUMAC PRNM LTR. Rod block values will be included in the Technical Specification, the COLR or Technical Requirements Manual equivalent to those in the current SSES documents. The Allowable Value (AV) for the Simulated Thermal Power – High for single recirculation loop operation (in accordance with LCO 3.4.1) in both Technical Specification Table 3.3.1.1-1 and in the COLR is currently shown with an "offset" change. The representation of the expression for the AV for single loop operation has been modified to be in the form of xx.x(W-ΔW) + yy where "yy" is the same value as for two loop operation, similar to the form used in the equivalent ISTS specification. This change does not affect the effective AV, but lines up

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		better with the method used to implement the adjustment in the replacement PRNM. See the SSES Technical Specification and Bases markup for the specific changes.
8.4.1.4	<u>OPRM-Related RPS Trip Functions - Functions Covered by Technical Specifications</u> 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 Technical Specification, better meets their needs. In those cases, the basis elements of the Technical Specification as shown in this Supplement would remain, but the specific implementation would be different.	SSES currently has installed an OPRM system covered by LCO 3.3.1.3 that incorporates Stability Option III, the same OPRM function that is described in the NUMAC PRNM LTRs and BWROG LTRs. The NUMAC PRNM modification incorporates the OPRM Option III function into the PRNM equipment as described in the NUMAC PRNM LTRs. Therefore LCO 3.3.1.3 is being deleted and an OPRM Trip Function (same as the "OPRM Upscale Function in the NUMAC PRNM LTRs) has been added to the SSES Technical Specification LCO 3.3.1.1 as an "APRM Function" (Function 2.f), consistent with NUMAC PRNM LTR, Supplement 1, Appendix H. However, a footnote for Function 2.f (not shown in the NUMAC PRNM LTR) has been added to document that the period based detection algorithm (PBDA) setpoint limits are defined in the COLR. Additions to the Technical Specification 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

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		OPRM and APRM signals. The corresponding SSES Bases additions for Function 2.e are modified somewhat from those shown in the NUMAC PRNM 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 NUMAC PRNM 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 NUMAC PRNM 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 SSES Technical Specification and Bases markup for the specific changes.
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 Technical Specification 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.	A minimum operable channels requirement of three, shared by both trip systems has been included in the Technical Specification for the OPRM Trip Function (LCO 3.3.1.1, Function 2.f). This addition, as well as addition of Required Action statements and Bases descriptions, is consistent with the NUMAC PRNM LTR and NUMAC PRNM LTR Supplement 1. Specific Bases wording has been revised somewhat to improve clarity. See the SSES Technical Specification and Bases markup for the specific changes.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	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.	
8.4.3.4	<u>OPRM-Related RPS Trip Functions - Applicable Modes of Operation</u> 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.	Relocated the Modes of Operation requirement of ≥ 25% RTP, consistent with the NUMAC PRNM LTR Supplement 1 to Table 3.3.1.1.-1. This requirement is presently an operability requirement for SSES's current OPRM function as documented in LCO 3.3.1.3 (which is deleted with the incorporation of the OPRM function in LCO 3.3.1.1). The specific wording included in the Function 2.f Bases discussion for Modes of Operation has been modified somewhat from the NUMAC PRNM LTR proposed text for improved clarity of the intent. See the SSES Technical Specification and Bases markup for the specific changes.
8.4.4.1.4	<u>OPRM-Related RPS Trip Functions - Channel Check</u> 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 24 hours has been included for the OPRM Trip Function, consistent with the NUMAC PRNM LTR Supplement 1. See the SSES Technical Specification markup for the specific changes.
8.4.4.2.4	<u>OPRM-Related RPS Trip Functions - Channel Functional Test</u> Add Channel Functional Test requirements with a requirement for a 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	A "confirm auto-enable region" surveillance requirement, SR 3.3.1.1.19, has been added to require confirmation that the OPRM Trip output auto-enable (not bypassed) setpoints remain correct. The SR 3.3.1.1.19 Bases wording is similar to that in the NUMAC PRNM LTR, but the wording has been modified and Reference 5 added to clarify that the

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	up to 24 month intervals.	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 OPRM Trip (Function 2.f) Bases discussion. The specific OPRM Trip enabled region flow limit is slightly different from that in the NUMAC PRNM LTRs. The upper flow limit is "≤ value equivalent to the core flow value defined in the COLR" vs. < 60% in the NUMAC PRNM LTRs. This minor change from "<" to "≤" reflects the present Technical Specifications and is conservative, and is being made to align the specification with the actual equipment to simplify comparison of surveillance results with the acceptance criteria. The change to replace the drive flow value with a reference to the COLR supports PPL's process of reconfirming the upper limit of the trip-enable region on a cycle-specific basis, and to identify the limit in the COLR in terms of core flow. The actual setpoint will still be entered as the drive flow value nominally equivalent to the core flow limit. Use of the term "rated drive flow" has been omitted from the SR wording shown in the NUMAC PRNM LTR to avoid potential confusion on performance of the SR. The intent of the SR is to confirm the flow value as indicated on the APRM equipment. These changes have no effect on the actual SR as originally defined in the NUMAC PRNM LTRs since the intent

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		of the SR, to require reconfirmation of the setpoints in the APRM hardware, remains unchanged from the NUMAC PRNM LTR. A Channel Functional Test requirement with a test frequency of every 184 days (SR 3.3.1.1.12) has been added for the OPRM Trip and 2-out-of-4 Voter Functions consistent with the NUMAC PRNM LTR, Supplement 1. A note to SR 3.3.1.1.12 (not included in the NUMAC PRNM LTR) has been included to clarify that the SR also applies to the flow input function, except the transmitters. No change is shown in the NUMAC PRNM LTR Supplement 1 for the Channel Functional Test (SR 3.3.1.1.11 in the NUMAC PRNM LTR) Bases (from that for the APRM Functions) to cover the OPRM Trip Function. For the SSES proposed change, the Bases discussion for SR 3.3.1.1.12 has been modified slightly to clarify that the recirculation drive flow is used for the auto-enable of the OPRM Trip as well as for the APRM STP – High trip Allowable Value. See the SSES Technical Specification and Bases markup for the specific changes.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
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, SR 3.3.1.1.18 (corresponds to SR 3.3.1.1.13 in the NUMAC PRNM LTR), for the OPRM Trip Function has been added consistent with the NUMAC PRNM LTR Supplement 1, but also with some additional changes not included in the NUMAC PRNM LTR as discussed below. An additional note is provided for SR 3.3.1.1.18 and to the corresponding Bases, applicable to Functions 2.b and 2.f, to state that SR 3.3.1.1.18 includes calibrating the associated recirculation loop flow channel. The NUMAC PRNM LTR, Supplement 1 does not identify any additional changes to the Bases for OPRM Trip Channel Calibration requirements (beyond those required for the other APRM Functions). However, reviews of the Bases wording identified two aspects that should be clarified: 1) the wording should recognize that drive flow is also used as an input to the OPRM Trip auto-enable function, and 2) that alignment of reactor core flow with recirculation drive flow was necessary for proper system operation. Therefore, the SR 3.3.1.1.18 Bases discussion has been modified from that shown in the NUMAC PRNM LTRs (SR 3.3.1.1.13 in the NUMAC PRNM LTR) to include discussion of the OPRM Trip auto-enable function and to address the alignment of reactor core flow with recirculation drive flow (including a reference to the added drive flow alignment SR 3.3.1.1.20, which is not included in the NUMAC PRNM LTR).

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
8.4.4.4.4	OPRM-Related RPS Trip Functions - Response Time Testing 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.	These changes do not change any of the intent of the NUMAC PRNM LTRs or affect the associated NUMAC PRNM LTR justifications. See the SSES Technical Specification and Bases markup for the specific changes. See response to 8.3.4.4.4. That response also addresses OPRM.
8.4.5.4	OPRM-Related RPS Trip Functions - Logic System Functional Testing (LSFT) 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 3.3.1.1.15) for the OPRM Trip 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 Technical Specification Bases and revision of the related plant procedures to include testing of the OPRM Trip outputs from the 2-out-of-4 Voter. The procedure changes will be made as part of the normal modification process. See the SSES Technical Specification Bases markup for the specific changes.
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 for Function 2.f and the new SR 3.3.1.1.19, will be treated as

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		nominal setpoints with no additional margins added. These setpoints are the entry values for the digital OPRM protective action enabling function. A deadband area is further defined to ensure setpoint stability. The setpoints are based on licensing methodology and are nominal values. The settings are defined (limit values) in the Technical Specification SR 3.3.1.1.19. The SR is the same as shown in the NUMAC PRNM LTRs except that, to provide for cycle specific confirmation or modification, the upper flow limit will be defined in the COLR. The second set, the PBDA trip setpoints, will be established in accordance with the BWROG LTR 32465-A (Reference 4) methodology, previously reviewed and approved by the NRC, and will be documented in the COLR. The third set, the PBDA "tuning" parameter values, are established in accordance with and controlled by the SSES Technical Requirements Manual. The fourth set, the GRA and ABA setpoints, consistent with the BWROG submittals, are established as nominal values only, and controlled by SSES procedures. To document the handling of OPRM setpoints, the SSES Technical Specification Bases markup for Function 2.f has been expanded and modified somewhat from that shown in the NUMAC PRNM LTR Supplement 1.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
8.5.1.4	APRM-Related Control Rod Block Functions - Functions Covered by Technical Specifications If ARTS will be implemented concurrently with the PRNM modification, include or reference those changes in the *plant-specific PRNM submittal.* Implement the applicable portion of the above described changes via modifications to the Technical Specifications and related procedures and documents. In the *plant-specific submittal,* identify functions currently in the plant Technical Specifications and which, if any, changes are being implemented. For any functions deleted from Technical Specifications, identify where setpoint and surveillance requirements will be documented. NOTE: A utility may choose not to delete some or all of the items identified in the NUMAC PRNM LTR from the plant Technical Specifications.	See the SSES Technical Specification Bases markup for the specific changes. SSES Technical Specifications currently do not contain any APRM rod block functions. They have been moved to the SSES TRM. The APRM rod block functions are as discussed in the NUMAC PRNM LTR and unchanged for SSES except that unlike the current SSES PRNM system, the NUMAC PRNM used Simulated Thermal Power for all rod block and APRM downscale trips to reduce nuisance alarms and false rod block trips when the plant is operating near the rod block limits. The margin between rod block setpoints and the associated RPS scram setting is sufficient so that this change does not reduce the effectiveness of the rod block function in avoiding inadvertent scrams. The reduction in nuisance rod block alarms will reduce potential distractions for the operator. ARTS has not previously been implemented at SSES and will not be implemented with Phase 1 of the PRNM Modification. SSES Technical Specification LCO 3.3.2.1 currently has the following RBM rod block functions: 1. Low Power Range - Upscale 2. Inop 3. Downscale For Phase 1, these functions will be retained unchanged. The NUMAC PRNM LTRs do not include specific Technical Specification or Bases changes for ITS plants without

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		ARTS. For SSES, the only change to the LCO 3.3.2.1 Bases is a clarification of the APRM power signal provided by the APRMs to the RBMs for auto-bypass of the function.
8.5.2.4	APRM-Related Control Rod Block Functions - Minimum Number of Operable Control Rod Block Channels Change the minimum number of APRM channels to three, if APRM functions are retained in Technical Specifications. No additional action is required relative to minimum operable channels beyond that required by Paragraph 8.5.1.4 of the NUMAC PRNM LTR.	See 8.5.1.4 above. No additional confirmation of action is required relative to minimum operable channels as shown in the Technical Specifications beyond that required by 8.5.1.4 above. The APRM rod block functions are listed in the TRM. In the TRM, the minimum number of APRM channels will be changed to three.
8.5.3.4	APRM-Related Control Rod Block Functions - Applicable Modes of Operation No action required relative to modes during which the function must be available beyond that required by Paragraph 8.5.1.4 of the NUMAC PRNM LTR unless APRM functions are retained in Technical Specifications and include operability requirements for Mode 5. In that case, delete such requirements.	See 8.5.1.4 above. No additional confirmation of action is required relative to applicable modes of operation as shown in the Technical Specifications beyond that required by 8.5.1.4 above. The APRM rod block functions are listed in the TRM. Current operability requirements in Mode 5 for the APRM rod block functions are being deleted in the TRM, consistent with the NUMAC PRNM LTRs.
8.5.4.1.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Channel Check Delete any requirements for instrument or channel checks related to RBM and, where applicable, recirculation flow rod block functions (non-ARTS plants), and APRM functions. Identify in the plant-specific PRNM submittals if any checks are currently included in Technical Specifications, and confirm that they are being deleted.	SSES Technical Specifications currently do not contain any APRM rod block functions, or any Channel Check requirements for the RBM rod block functions. Therefore, no change to SSES Technical Specifications is required to implement the NUMAC PRNM LTR requirements. The TRM currently includes a once per 12 hour Channel Check requirement for the APRM rod block functions.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
		Consistent with the NUMAC PRNM LTRs, that requirement is being deleted from the TRM for APRM rod block functions.
8.5.4.2.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Channel Functional Test Change Channel Functional Test requirements to identify a frequency of every 184-days (6 months). In the *plant-specific licensing submittal,* identify current Technical Specification test frequencies that will be changed to 184 days (6 months).	The proposed Technical Specification change changes the RBM rod block Channel Functional Test frequency to once per 184 days. SSES Technical Specifications currently do not contain any APRM rod block functions. The Channel Functional Test frequency for the APRM rod block functions will be changed to once per 184 days in the TRM.
8.5.4.3.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Channel Calibrations Change channel calibration requirements to identify a frequency of every 24 months. In the *plant-specific licensing submittal,* identify current Technical Specification test frequencies that will be changed to 24 months.	The current SSES Technical Specification RBM rod block Channel Calibration frequency is once per 24 months, which will be retained. SSES Technical Specifications currently do not contain any APRM rod block functions. The Channel Calibration frequency for the APRM rod block functions is currently once per 24 months in the TRM, which will be retained.
8.5.4.4.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Response Time Testing None.	SSES Technical Specifications currently do not contain any APRM rod block functions. There currently are no response time testing requirements in the TRM and none will be added.
8.5.5.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Logic System Functional Testing (LSFT) None.	SSES Technical Specifications currently do not contain any APRM rod block functions. There currently are no APRM Control Rod Block LSFT requirements in the TRM, and none will be added.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
8.5.6.1	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Setpoints Add to or delete from the appropriate document any changed control rod block setpoint information. If ARTS is being implemented concurrently with the PRNM modification, either include the related Technical Specification submittal information with the PRNM information in the *plant-specific submittal,* or reference the ARTS submittal in the PRNM submittal. In the *plant-specific submittal,* identify what changes, if any, are being implemented and identify the basis or method used for calculation of setpoints and where the setpoint information or changes will be recorded.	ARTS has not previously been implemented at SSES and will not be implemented with Phase 1 PRNM Modification. RBM and APRM rod block setpoints are based on setpoint calculations performed using SSES's calculation program. The actual Allowable Values and setpoints are defined in the Technical Specification (some of the RBM values), COLR, or TRM. For Phase 1, no change in the method of documenting the rod block setpoints is planned.
8.6.2	Shutdown Margin Testing - Refueling As applicable, revise the Shutdown Margin Testing - Refueling (or equivalent Technical Specification) LCO(s), action statements, surveillance requirements and Bases as required to be consistent with the APRM Technical Specification changes implemented for PRNM.	The proposed Technical Specification and Bases change includes changes to Specification 3.10.8, Shutdown Margin Test – Refuel, to be consistent with the post-modification PRNM architecture and functions.
None	Specification 3.3.1.3, OPRM Instrumentation No action identified in the NUMAC PRNM LTR.	Specification 3.3.1.3 was established to support the implementation of the current " OPRM Stability Option III" system. With the implementation of the NUMAC PRNM with OPRM, the Option III stability solution is integrated within the APRM functions in LCO 3.3.1.1, so this specification is no longer needed. Specification 3.3.1.3, along with its associated Bases, has been deleted in its entirety in the proposed Technical Specification.

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
None	Specification 3.4.1, Recirculation Loops Operating No action identified in the NUMAC PRNM LTR.	The only change to LCO 3.4.1 is a change in the name of the APRM Simulated Thermal Power – High Function to agree with the PRNM modification. The Bases for LCO 3.4.1 is similarly changed and also slightly modified to replace a reference to LCO 3.3.1.3 for OPRM with a reference to LCO 3.3.1.1. See the SSES Technical Specification and Bases markup for the specific changes.
None	Core Operating Limits Report No action identified in the NUMAC PRNM LTR.	Requirements for OPRM setpoints in 5.6.5a have been modified to replace reference to LCO 3.3.1.3 with reference to LCO 3.3.1.1. See the SSES Technical Specification markup for the specific changes.
None	Technical Requirements Manual 3.3.9, OPRM Instrumentation No action identified in the NUMAC PRNM LTR.	TRM Requirement 3.3.9 was established to support the implementation of the OPRM Stability Option III. The TRM controls the OPRM-related setpoints and parameter settings and defines the actions required for the "alternate procedures" to be implemented when the OPRM function is not available (as required by the current LCO 3.3.1.3). TRM 3.3.9 will be modified slightly to reference LCO 3.3.1.1 and, where necessary, to correctly reflect the OPRM Stability Option III function integrated into the APRM system, but will otherwise be retained unchanged.
9.1.3	Utility Quality Assurance Program As part of the *plant-specific licensing 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	Quality assurance requirements for work performed at SSES are defined and described in PPL Quality Assurance Plans. For the PRNM modification, PPL has contracted with GE to include the following PRNM scope: 1) design,

NEDC-32410P-A Section No.	Utility Action Required per NEDC-32410P-A	Utility Response
	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.	2) hardware/software, 3) licensing support, 4) training, 5) O&M manuals and design documentation, 6) EMI/RFI qualification of equipment, and 7) NMS setpoint calculation inputs. On-site engineering work to incorporate the GE-provided design information into an Engineering Change Request (ECR) or to provide any supporting, interface design changes will be performed per requirements of applicable PPL/SSES procedures. Modification work to implement the design change will be performed per PPL/SSES procedures or PPL /SSES-approved contractor procedures. PPL has participated and will continue to participate in appropriate reviews of GE's design and V&V program for the PRNM modification. For software delivered in the form of hardware Erasable Programmable Read Only Memories (EPROMs), PPL will have GE maintain post delivery configuration control of the actual source code and handle any changes. PPL will then handle any changes in the EPROMs as hardware changes under its applicable hardware modification procedures. Phase 2, ARTS implementation, of the planned modification, will be as a post-installation (of Phase 1, for Unit 1 only) change. All changes required to implement Phase 2 will undergo the same level of V&V as the Phase 1 design.

7.3 Additional SSES-Specific Information Regarding OPRM Replacement

As part of the NUMAC PRNM modification, SSES will be replacing the currently installed OPRM system with an equivalent OPRM system integrated into the PRNM equipment. The replacement OPRM system implements the same OPRM algorithms as currently installed, but due to the 4-channel design of the NUMAC PRNM, the replacement system will implement an alternate OPRM "cell assignment" compared to that implemented in the current system. Both the currently installed OPRM system and the replacement system satisfy the requirements in LTR NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications" (Reference 4), including OPRM cell assignment, as clarified in the discussion below. With the potential exception of some of the tuning parameters, the settings and setpoints planned for the OPRM algorithms in the replacement system will be the same as those in the currently installed system. Adequacy of the setpoints for the modified OPRM cell assignments will be confirmed in accordance with the requirements of LTR NEDO-32465-A.

LTR NEDO-32465-A describes the licensing basis methodology for the Option III long-term stability solution. The licensing basis for this solution is the period based detection algorithm (PBDA), which relies on the fact that OPRM "cells", composed of closely spaced local power range monitors (LPRMs), can be used to distinguish between thermal-hydraulic instabilities and stable reactor operation. During normal, steady state reactor operation, LPRM signals are comprised of a broad range of frequencies that are typically present in a boiling water reactor (BWR). These LPRM signals become more coherent displaying a characteristic frequency in the 0.3 to 0.7 Hertz (Hz) range with the onset of thermal-hydraulic instability. The PBDA uses the difference in LPRM signal coherence to detect instabilities. The coherence persists when signals from closely spaced LPRMs are combined in OPRM cells.

Specifically, the OPRM combines signals from LPRMs assigned to the OPRM cell and determines each successive pair of OPRM cell maxima and minima. If the maxima/minima occur at a frequency in the range of 0.3 to 0.7 Hz, the base period is set. If the subsequent maxima/minima occur within a specified tolerance band of the base period, the oscillation is considered to be a single period confirmation. Subsequent maxima/minima that fall within the specified base period tolerance range cause the PBDA continuous period confirmation (CPC) counter to be incremented by one. This process continues until a maxima/minima is found to be outside the specified base period tolerance range, at which time the CPC counter is reset to zero. The last CPC count prior to resetting is termed the maximum continuous period confirmation (MCPC) count.

The CPC for each OPRM cell is evaluated simultaneously. During normal plant operation with large stability margin, non-zero CPC count values are expected due to the random nature of normal core neutron-flux noise. Based on basic principles and confirmed by the results of OPRM "tuning" studies at plants that have previously installed the OPRM function, the largest frequency of occurrence is a MCPC of 1, with rapidly decreasing frequency of occurrence of higher MCPC counts. The OPRM tuning process is intended to optimize the setting values of various OPRM tuning parameters so that the PBDA is sufficiently sensitive to detect actual core oscillations while not unnecessarily tripping on normal core neutron-flux noise.

The OPRM instrumentation configuration, setpoints, and settings are presently outlined in TRM section 3.3.9 and Table 3.3.9-1 respectively. Any changes as a result of the continued design process to these requirements will be processed in accordance with standard requirements to TRM changes. Both the current OPRM system and the planned replacement OPRM system satisfy the requirements in LTR NEDO-32465-A.

To help maintain operability assurance and preclude human factors related events, regarding OPRM Stability Option III, Operator cycle specific training has been performed. An OPRM system lecture was presented during Licensed Operator Re-qualification (LOR) Cycle 04-05. A simulator demonstration was performed during cycles 04-05 and 04-06. In addition, the OPRM system technical specifications and technical requirements will be covered in LOR Cycle 05-04. Operating experience involving Nine Mile Point Unit 2 and Perry's scrams will also be covered in LOR Cycle 05-04.

8. REFERENCES

1. Licensing Topical Report NEDC-32410P-A Volumes 1 and 2, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC-PRNM) Retrofit Plus Option III Stability Trip Function," dated October 1995.

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

3. Licensing Topical Report NEDO-31960-A including Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," dated November 1995.

4. Licensing Topical Report NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Application," dated August 1996.

5. BWROG Letter 96113, K. P. Donovan (BWROG) to L.E. Phillips (NRC), "Guidelines for Stability Option III 'Enable Region' (TAC M92882)," dated September 17, 1996. (Also see "Bases Reference 21")

6. NEDC-30851P-A, "Technical Specification Improvement Analysis for BWR Reactor Protection System," Licensing Topical Report, GE Nuclear Energy, Class III (proprietary,), dated March 1988. (Referred to as 'Reference 11 of the NUMAC PRNM LTR')

Attachment 1 to PLA-5880

Changes To Technical Specification

Unit 1

Technical Specification Mark-ups

Attachment 2 to PLA-5880

Changes To Technical Specification Bases For Information

Unit 1

Technical Specification Bases Mark-ups

For Information

Unit 2

Technical Specification Mark-ups

Unit 2

Technical Specification Bases Mark-ups

For Information

Attachment 1 to PLA-5880

Changes To Technical Specification

Unit 1

Technical Specification Mark-ups

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	
INSERT 1	A.2 Place associated trip system in trip	12 hours
B. One or more Functions with one or more required channels inoperable in both trip systems. INSERT 2	B.1 Place channel in one trip system in trip.	6 hours
	OR	
	B.2 Place one trip system in trip	6 hours
C. One or more Functions with RPS trip capability not maintained.	C.1 Restore RPS trip capability.	1 hour

(continued)

INSERT 1:

A.2 ------- NOTE -------
Not applicable for
Functions 2.a, 2.b,
2.c, 2.d, or 2.f.

Place associated trip
system in trip.

INSERT 2:

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.

ACTIONS (continued)

CONDITION		REQUIRED ACTION		COMPLETION TIME
D.	Required Action and associated Completion Time of Condition A, B, or C not met.	D.1	Enter the Condition referenced in Table 3.3.1.1-1 for the channels.	Immediately
E.	As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	E.1	Reduce THERMAL POWER to < 30% RTP.	4 hours
F.	As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	F.1	Be in MODE 2.	6 hours
G.	As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	G.1	Be in MODE 3.	12 hours
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 3

INSERT 3:

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 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

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 3 INSERT 3A	---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 plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Setpoints" while operating at ≥ 25% RTP.	7 days
~~SR 3.3.1.1.3~~	~~Adjust the channel to conform to a calibrated flow signal.~~	~~7 days~~
SR 3.3.1.1.4	---NOTE--- Not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. --- Perform CHANNEL FUNCTIONAL TEST.	7 days

(continued)

INSERT 3A:

SR 3.3.1.1.2.	Perform CHANNEL CHECK	24 hours

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.11	---NOTES--- 1. Neutron detectors are excluded. 2. For Function 1.a ~~and 2.a~~ not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. ---	
INSERT 4	Perform CHANNEL CALIBRATION.	184 days
SR 3.3.1.1.~~12~~ 14	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.1.1.13	Perform CHANNEL CALIBRATION.	24 months
~~SR 3.3.1.1.14~~	~~Verify the APRM Flow Biased Simulated Thermal Power—High time constant is ≤ 7 seconds.~~	~~24 months~~
SR 3.3.1.1.15	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.1.16	Verify Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions are not bypassed when THERMAL POWER is ≥ 30% RTP.	24 months

(continued)

INSERT 4:

SR 3.3.1.1.12.	---------------------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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.17	-----NOTES----- 1. Neutron detectors are excluded. 2. For Function 5 "n" equals 4 channels for the purpose of determining the STAGGERED TEST BASIS Frequency --------------- Verify the RPS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

INSERT 5

INSERT 6

INSERT 5:

3. For Function 2.e, "n" equals 8 channels for the purpose of determining the STAGGERED TEST BASIS Frequency. Testing of APRM and OPRM outputs shall alternate.

INSERT 6:

SR 3.3.1.1.18.	-------------------NOTES ------------- 1. Neutron detectors are excluded. 2. For Functions 2.b and 2.f, the recirculation flow transmitters that feed the APRMs are included. --- Perform CHANNEL CALIBRATION	24 months
SR 3.3.1.1.19	Verify OPRM is not bypassed when APRM Simulated Thermal Power is ≥ 30% and recirculation drive flow is ≤ value equivalent to the core flow value defined in the COLR.	24 months
SR 3.3.1.1.20	Adjust recirculation drive flow to conform to reactor core flow.	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. Intermediate Range Monitors					
a. Neutron Flux—High	2	3	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.11 SR 3.3.1.1.15	≤ 122/125 divisions of full scale
	5[a]	3	H	SR 3.3.1.1.1 SR 3.3.1.1.5 SR 3.3.1.1.11 SR 3.3.1.1.15	≤ 122/125 divisions of full scale
b. Inop	2	3	G	SR 3.3.1.1.4 SR 3.3.1.1.15	NA
	5[a]	3	H	SR 3.3.1.1.5 SR 3.3.2.2.15	NA
2. Average Power Range Monitors					
a. Neutron Flux—High (Setdown)	2	~~2~~ 3[c]	G	SR 3.3.1.1.~~1~~ 2 ~~SR 3.3.1.1.4~~ SR 3.3.1.1.7 SR 3.3.1.1.8 ~~SR 3.3.1.1.11~~ ~~SR 3.3.1.1.15~~ SR 3.3.1.1.12 SR 3.3.1.1.18	≤ 20% RTP
b. ~~Flow Biased~~ Simulated Thermal Power—High	1	~~2~~ 3[c]	F	~~SR 3.3.1.1.1~~ SR 3.3.1.1.2 SR 3.3.1.1.3 SR 3.3.1.1.8 ~~SR 3.3.1.1.9~~ ~~SR 3.3.1.1.11~~ ~~SR 3.3.1.1.14~~ ~~SR 3.3.1.1.15~~ ~~SR 3.3.1.1.17~~ SR 3.3.1.1.12 SR 3.3.1.1.18 SR 3.3.1.1.20	≤ 0.58 W + 62% RTP[b] and ≤ 115.5% RTP

(continued)

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

~~(b) 0.58 W + 57% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."~~ insert 7

(c) insert 7

INSERT 7:

(b) $0.58(W-\Delta W) + 62\%$ RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating." For single loop operation the value of $\Delta W = 5\%/0.58$. For two loop operation, the value of $\Delta W = 0$.

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

Table 3.3.1.1-1 (page 2 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
2. Average Power Range Monitors (continued)					
c. ~~Fixed~~ Neutron Flux—High	1	~~2~~ 3 (c)	F	SR 3.3.1.1.~~1~~ 2 SR 3.3.1.1.~~2~~ 3 SR 3.3.1.1.8 ~~SR 3.3.1.1.9~~ ~~SR 3.3.1.1.11~~ ~~SR 3.3.1.1.15~~ ~~SR 3.3.1.1.17~~ SR 3.3.1.1.12 SR 3.3.1.1.18	≤ 120% RTP
INSERT 8					
d. Inop	1,2	~~2~~ 3 (c)	G	~~SR 3.3.1.1.8~~ ~~SR 3.3.1.1.9~~ ~~SR 3.3.1.1.15~~ SR 3.3.1.1.12	NA
3. Reactor Vessel Steam Dome Pressure—High	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.10 SR 3.3.1.1.15	≤ 1093 psig
4. Reactor Vessel Water Level—Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.10 SR 3.3.1.1.15	≥ 11.5 inches
5. Main Steam Isolation Valve—Closure	1	8	F	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.17	≤ 11% closed
6. Drywell Pressure—High	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.10 SR 3.3.1.1.15	≤ 1.88 psig

(continued)

INSERT 9

INSERT 8:

e. 2-Out-Of-4 Voter	1,2	2	G	SR 3.3.1.1.2 SR 3.3.1.1.12 SR 3.3.1.1.15 SR 3.3.1.1.17	NA
f. OPRM Trip	≥ 25% RTP	3(c)	I	SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.12 SR 3.3.1.1.18 SR 3.3.1.1.19 SR 3.3.1.1.20	(d)

INSERT 9:

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

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

Table 3.3.1.1-1 (page 3 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
7. Scram Discharge Volume Water Level—High					
a. Level Transmitter	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 66 gallons
	5(a)	2	H	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 66 gallons
b. Float Switch	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 62 gallons
	5(a)	2	H	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 62 gallons
8. Turbine Stop Valve—Closure	≥ 30% RTP	4	E	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16 SR 3.3.1.1.17	≤ 7% closed
9. Turbine Control Valve Fast Closure, Trip Oil Pressure—Low	≥ 30% RTP	2	E	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16 SR 3.3.1.1.17	≥ 460 psig
10 Reactor Mode Switch— Shutdown Position	1,2	2	G	SR 3.3.1.1.~~12~~ 14 SR 3.3.1.1.15	NA
	5(a)	2	H	SR 3.3.1.1.~~12~~ 14 SR 3.3.1.1.15	NA
11. Manual Scram	1,2	2	G	SR 3.3.1.1.5 SR 3.3.1.1.15	NA
	5(a)	2	H	SR 3.3.1.1.5 SR 3.3.1.1.15	NA

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

3.3 INSTRUMENTATION

3.3.1.3 Oscillation Power Range Monitor (OPRM) Instrumentation

LCO 3.3.1.3 Four channels of the OPRM instrumentation shall be OPERABLE within the limits as specified in the COLR.

APPLICABILITY: THERMAL POWER ≥ 25% RTP.

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.	30 days
	<u>OR</u>	
	A.2 Place associated RPS trip system in trip	30 days
	<u>OR</u>	
	A.3 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	30 days
B. OPRM trip capability not maintained.	B.1 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	12 hours
	<u>AND</u>	
	B.2 Restore OPRM trip capability	120 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. Required Action and associated Completion Time not met.	C.1	Reduce THERMAL POWER to < 25% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

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

SURVEILLANCE		FREQUENCY
SR 3.3.1.3.1	Perform CHANNEL FUNCTIONAL TEST.	184 days
SR 3.3.1.3.2	Calibrate the local power range monitors.	1000 MWD / MT average core exposure
SR 3.3.1.3.3	-----NOTE----- Neutron detectors are excluded. ---------- Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.3.4	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.3.5	Verify OPRM is not bypassed when THERMAL POWER is ≥ 30% RTP and core flow ≤ 65 MLb/Hr.	24 months
SR 3.3.1.3.6	-----NOTE----- Neutron detectors are excluded. --------------- Verify the RPS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

SURVEILLANCE REQUIREMENTS

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

1. Refer to Table 3.3.2.1-1 to determine which SRs apply for each Control Rod Block Function.

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

	SURVEILLANCE	FREQUENCY
SR 3.3.2.1.1	Perform CHANNEL FUNCTIONAL TEST.	~~92~~ days 184
SR 3.3.2.1.2	------------NOTE------------ Not required to be performed until 1 hour after any control rod is withdrawn at ≤ 10% RTP in MODE 2. ---------------------------- Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.2.1.3	------------NOTE------------ Not required to be performed until 1 hour after THERMAL POWER is ≤ 10% RTP in MODE 1. ---------------------------- Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.2.1.4	------------NOTE------------ Neutron detectors are excluded. ---------------------------- Verify the RBM Trip Functions are not bypassed when THERMAL POWER is ≥ 30% RTP.	24 months
SR 3.3.2.1.5	Verify the RWM is not bypassed when THERMAL POWER is ≤ 10% RTP.	24 months

(continued)

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1.	Rod Block Monitor				
	a. Low Power Range-Upscale	1(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 0.58W+55%(b)
	b. Inop	1(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4	NA
	c. Downscale	1(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≥ 3/125 divisions of full scale
2.	Rod Worth Minimizer	1(c), 2(c)	1	SR 3.3.2.1.2 SR 3.3.2.1.3 SR 3.3.2.1.5 SR 3.3.2.1.8	NA
3.	Reactor Mode Switch—Shutdown Position	(d)	2	SR 3.3.2.1.6	NA

(a) When THERMAL POWER is ≥ 30% RPT

(b) ≤ 0.58W + 50% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating"

(c) With THERMAL POWER ≤ 10% RTP.

(d) Reactor mode switch in the shutdown position.

INSERT 10

INSERT 10:

(b) 0.58(W-ΔW) + 55% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating." For single loop operation the value of ΔW = 5%/0.58. For two loop operation, the value of $\Delta W = 0$.

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 may be in operation provided the following limits are 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;

c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR, and

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

e. Recirculation pump speed is ≤ 80%.

---Note---

Required limit and setpoint resets 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.

3.10 SPECIAL OPERATIONS

3.10.8 SHUTDOWN MARGIN (SDM) Test - Refueling

LCO 3.10.8 The reactor mode switch position specified in Table 1.1-1 for MODE 5 may be changed to include the startup/hot standby position, and operation considered not to be in MODE 2, to allow SDM testing, provided the following requirements are met:

a. LCO 3.3.1.1, "Reactor Protection System Instrumentation," MODE 2 requirements for Functions 2.a and 2.d of Table 3.3.1.1-1; (e) ,2.d

b. 1. LCO 3.3.2.1, "Control Rod Block Instrumentation," MODE 2 requirements for Function 2 of Table 3.3.2.1-1, with the banked position withdrawal sequence requirements of SR 3.3.2.1.8 changed to require the control rod sequence to conform to the SDM test sequence.

<u>OR</u>

2. Conformance to the approved control rod sequence for the SDM test is verified by a second licensed operator or other qualified member of the technical staff;

c. Each withdrawn control rod shall be coupled to the associated CRD;

d. All control rod withdrawals that are not in conformance with the BPWS shall be made in notch out mode;

e. No other CORE ALTERATIONS are in progress; and

f. CFD charging water header pressure ≥940 psig.

APPLICABILITY: MODE 5 with the reactor mode switch in startup/hot standby position.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ------------NOTE------------ Separate Condition entry is allowed for each control rod. ------------ One or more control rods not coupled to its associated CRD.	------------NOTE------------ Rod worth minimizer may be bypassed as allowed by LCO 3.3.2.1, "Control Rod Block Instrumentation," if required, to allow insertion of inoperable control rod and continued operation. ------------	
	A.1 Fully insert inoperable control rod.	3 hours
	AND	
	A.2 Disarm the associated CRD.	4 hours
B. One or more of the above requirements not met for reasons other than Condition A.	B.1 Place the reactor mode switch in the shutdown or refuel position.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.10.8.1 Perform the MODE 2 applicable SRs for LCO 3.3.1.1, Functions 2.a and 2.d of Table 3.3.1.1-1.	According to the applicable SRs

(continued)

5.6 Reporting Requirements (continued)

5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the main steam safety/relief valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

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 Specification 3.2.2;

3. The Linear Heat Generation Rate for Specification 3.2.3;

4. The Average Power Range Monitor (APRM) Gain and Setpoints for Specification 3.2.4; ~~and~~

INSERT 11

5. The Shutdown Margin for Specification 3.1.1 ; and

~~6. The OPRM setpoints for Specification 3.3.1.3.~~

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC.

When an initial assumed power level of 102 percent of rated power is specified in a previously approved method, this refers to the power level associated with the design basis analyses, or 3510 MWt. The power level of 3510 MWt is 100.6% of the rated thermal power level of 3489 MWt. The RTP of 3489 MWt may only be used when feedwater flow measurement (used as input to the reactor thermal power measurement) is provided by the Leading Edge Flow Meter (LEFM✓™) as described in the LEFM✓™ Topical Report and supplement referenced below. When feedwater flow measurements from the LEFM✓™ system are not available, the core thermal power level may not exceed the originally approved RTP of 3441 MWt, but the value of 3510 MWt

(continued)

INSERT 11:

6. Oscillation Power Range Monitor (OPRM) Trip setpoints, for Specification 3.3.1.1.

Unit 2

Technical Specification Mark-ups

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	
Insert 1	A.2 ~~Place associated trip system in trip.~~	12 hours
B. ~~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
C. One or more Functions with RPS trip capability not maintained.	C.1 Restore RPS trip capability.	1 hour

(continued)

Insert 2

INSERT 1:

A.2 ------- NOTE -------
Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2.f.

Place associated trip system in trip.

INSERT 2:

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.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Enter the Condition referenced in Table 3.3.1.1-1 for the channels.	Immediately
E. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	E.1 Reduce THERMAL POWER to < 30% RTP.	4 hours
F. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	F.1 Be in MODE 2.	6 hours
G. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	G.1 Be in MODE 3.	12 hours
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 3

INSERT 3:

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 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 3 Insert 3A	------------------------------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 plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Setpoints" while operating at ≥ 25% RTP.	7 days
SR 3.3.1.1.3	Adjust the channel to conform to a calibrated flow signal.	7 days
SR 3.3.1.1.4	------------------------------NOTE------------------------------ Not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. -- Perform CHANNEL FUNCTIONAL TEST.	7 days

(continued)

INSERT 3A:

SR 3.3.1.1.2. Perform CHANNEL CHECK	24 hours

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.1.5	Perform CHANNEL FUNCTIONAL TEST.	7 days
SR 3.3.1.1.6	Verify the source range monitor (SRM) and intermediate range monitor (IRM) channels overlap.	Prior to fully withdrawing SRMs from the core.
SR 3.3.1.1.7	-----NOTE----- Only required to be met during entry into MODE 2 from MODE 1. ----- Verify the IRM and APRM channels overlap.	7 days
SR 3.3.1.1.8	Calibrate the local power range monitors.	1000 MWD/MT average core exposure
SR 3.3.1.1.9	-----NOTE----- A test of all required contacts does not have to be performed. ----- Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.1.1.10	Perform CHANNEL CALIBRATION.	92 days

(continued)

No Change

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.11	----------NOTES---------- 1. Neutron detectors are excluded. 2. For Function 1.a and 2.a, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. --------------------------------- Perform CHANNEL CALIBRATION.	184 days
SR 3.3.1.1.12	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.1.1.13	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.1.14	Verify the APRM Flow Biased Simulated Thermal Power—High time constant is ≤ 7 seconds.	24 months
SR 3.3.1.1.15	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.1.16	Verify Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions are not bypassed when THERMAL POWER is ≥ 30% RTP.	24 months

(continued)

INSERT 4

INSERT 4:

SR 3.3.1.1.12.	--------------------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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.17	-----NOTES----- 1. Neutron detectors are excluded. 2. For Function 5 "n" equals 4 channels for the purpose of determining the STAGGERED TEST BASIS Frequency Insert 5 ---------- Verify the RPS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

Insert 6

INSERT 5:

3. For Function 2.e, "n" equals 8 channels for the purpose of determining the STAGGERED TEST BASIS Frequency. Testing of APRM and OPRM outputs shall alternate.

INSERT 6:

SR 3.3.1.1.18.	---------------------NOTES-------------- 1. Neutron detectors are excluded. 2. For Functions 2.b and 2.f, the recirculation flow transmitters that feed the APRMs are included. --- Perform CHANNEL CALIBRATION	24 months
SR 3.3.1.1.19	Verify OPRM is not bypassed when APRM Simulated Thermal Power is ≥ 30% and recirculation drive flow is ≤ value equivalent to the core flow value defined in the COLR.	24 months
SR 3.3.1.1.20	Adjust recirculation drive flow to conform to reactor core flow.	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. Intermediate Range Monitors					
a. Neutron Flux—High	2	3	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.6 SR 3.3.1.1.7 SR 3.3.1.1.11 SR 3.3.1.1.15	≤ 122/125 divisions of full scale
	5[(a)]	3	H	SR 3.3.1.1.1 SR 3.3.1.1.5 SR 3.3.1.1.11 SR 3.3.1.1.15	≤ 122/125 divisions of full scale
b. Inop	2	3	G	SR 3.3.1.1.4 SR 3.3.1.1.15	NA
	5[(a)]	3	H	SR 3.3.1.1.5 SR 3.3.2.2.15	NA
2. Average Power Range Monitors					
a. Neutron Flux—High, (Setdown)	2	~~2~~ 3[(c)]	G	SR 3.3.1.1.~~1~~2 ~~SR 3.3.1.1.4~~ SR 3.3.1.1.7 SR 3.3.1.1.8 ~~SR 3.3.1.1.11~~ ~~SR 3.3.1.1.15~~ SR 3.3.1.1.12 SR 3.3.1.1.18	≤ 20% RTP
b. ~~Flow Biased~~ Simulated Thermal Power—High	1	~~2~~ 3[(c)]	F	~~SR 3.3.1.1.1~~ SR 3.3.1.1.2 SR 3.3.1.1.3 SR 3.3.1.1.8 ~~SR 3.3.1.1.9~~ ~~SR 3.3.1.1.11~~ ~~SR 3.3.1.1.14~~ ~~SR 3.3.1.1.15~~ ~~SR 3.3.1.1.17~~ SR 3.3.1.1.12 SR 3.3.1.1.18 SR 3.3.1.1.20	≤ 0.58 W + 62% RTP[(b)] and ≤ 115.5% RTP

(continued)

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

(b) ~~0.58 W + 57% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."~~ INSERT 7

(c) Insert 7

INSERT 7:

(b) $0.58(W-\Delta W) + 62\%$ RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating." For single loop operation the value of $\Delta W = 5\%/0.58$. For two loop operation, the value of $\Delta W = 0$.

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

Table 3.3.1.1-1 (page 2 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
2. Average Power Range Monitors (continued)					
c. ~~Fixed~~ Neutron Flux—High	1	~~2~~ 3(c)	F	SR 3.3.1.1.~~1~~2 SR 3.3.1.1.~~2~~ 3 SR 3.3.1.1.8 ~~SR 3.3.1.1.9~~ ~~SR 3.3.1.1.11~~ ~~SR 3.3.1.1.15~~ ~~SR 3.3.1.1.17~~ SR 3.3.1.1.12 SR 3.3.1.1.18	≤ 120% RTP
Insert 8					
d. Inop	1,2	~~2~~ 3(c)	G	~~SR 3.3.1.1.8~~ ~~SR 3.3.1.1.9~~ ~~SR 3.3.1.1.15~~ SR 3.3.1.1.12	NA
3. Reactor Vessel Steam Dome Pressure—High	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.10 SR 3.3.1.1.15	≤ 1093 psig
4. Reactor Vessel Water Level—Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.10 SR 3.3.1.1.15	≥ 11.5 inches
5. Main Steam Isolation Valve—Closure	1	8	F	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.17	≤ 11% closed
6. Drywell Pressure—High	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.10 SR 3.3.1.1.15	≤ 1.88 psig

(continued)

Insert 9

INSERT 8:

e. 2-Out-Of-4 Voter	1,2	2	G	SR 3.3.1.1.2 SR 3.3.1.1.12 SR 3.3.1.1.15 SR 3.3.1.1.17	NA
f. OPRM Trip	≥ 25% RTP	3(c)	I	SR 3.3.1.1.2 SR 3.3.1.1.8 SR 3.3.1.1.12 SR 3.3.1.1.18 SR 3.3.1.1.19 SR 3.3.1.1.20	(d)

INSERT 9:

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

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

Table 3.3.1.1-1 (page 3 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
7. Scram Discharge Volume Water Level—High					
a. Level Transmitter	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 66 gallons
	5[(a)]	2	H	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 66 gallons
b. Float Switch	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 62 gallons
	5[(a)]	2	H	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 62 gallons
8. Turbine Stop Valve—Closure	≥ 30% RTP	4	E	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16 SR 3.3.1.1.17	≤ 7% closed
9. Turbine Control Valve Fast Closure, Trip Oil Pressure—Low	≥ 30% RTP	2	E	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16 SR 3.3.1.1.17	≥ 460 psig
10. Reactor Mode Switch—Shutdown Position	1,2	2	G	SR 3.3.1.1.~~12~~ 14 SR 3.3.1.1.15	NA
	5[(a)]	2	H	SR 3.3.1.1.~~12~~ 14 SR 3.3.1.1.15	NA
11. Manual Scram	1,2	2	G	SR 3.3.1.1.5 SR 3.3.1.1.15	NA
	5[(a)]	2	H	SR 3.3.1.1.5 SR 3.3.1.1.15	NA

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

3.3 INSTRUMENTATION

3.3.1.3 Oscillation Power Range Monitor (OPRM) Instrumentation

LCO 3.3.1.3 Four channels of the OPRM instrumentation shall be OPERABLE within the limits as specified in the COLR.

APPLICABILITY: THERMAL POWER ≥ 25% RTP.

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.	30 days
	OR	
	A.2 Place associated RPS trip system in trip	30 days
	OR	
	A.3 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	30 days
B. OPRM trip capability not maintained.	B.1 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	12 hours
	AND	
	B.2 Restore OPRM trip capability	120 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time not met.	C.1 Reduce THERMAL POWER to < 25% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

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

SURVEILLANCE		FREQUENCY
SR 3.3.1.3.1	Perform CHANNEL FUNCTIONAL TEST.	184 days
SR 3.3.1.3.2	Calibrate the local power range monitors.	1000 MWD / MT average core exposure
SR 3.3.1.3.3	----------NOTE---------- Neutron detectors are excluded. ------------------------ Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.3.4	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.3.5	Verify OPRM is not bypassed when THERMAL POWER is ≥ 30% RTP and core flow ≤ 65 MLb/Hr.	24 months
SR 3.3.1.3.6	-----NOTE----- Neutron detectors are excluded. ----- Verify the RPS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

SURVEILLANCE REQUIREMENTS

---

1. Refer to Table 3.3.2.1-1 to determine which SRs apply for each Control Rod Block Function.

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

	SURVEILLANCE	FREQUENCY
SR 3.3.2.1.1	Perform CHANNEL FUNCTIONAL TEST.	92 days 184
SR 3.3.2.1.2	------NOTE------ Not required to be performed until 1 hour after any control rod is withdrawn at ≤ 10% RTP in MODE 2. ------ Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.2.1.3	------NOTE------ Not required to be performed until 1 hour after THERMAL POWER is ≤ 10% RTP in MODE 1. ------ Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.2.1.4	------NOTE------ Neutron detectors are excluded. ------ Verify the RBM trip functions are not bypassed when THERMAL POWER is ≥ 30%.	24 months
SR 3.3.2.1.5	Verify the RWM is not bypassed when THERMAL POWER is ≤ 10% RTP.	24 months

Table 3.3.2.1-1 (page 1 of 1)

Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range-Upscale	1[(a)]	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 0.58W+55%[(b)]
b. Inop	1[(a)]	2	SR 3.3.2.1.1 SR 3.3.2.1.4	NA
c. Downscale	1[(a)]	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≥ 3/125 divisions of full scale
2. Rod Worth Minimizer	1[(c)], 2[(c)]	1	SR 3.3.2.1.2 SR 3.3.2.1.3 SR 3.3.2.1.5 SR 3.3.2.1.8	NA
3. Reactor Mode Switch—Shutdown Position	(d)	2	SR 3.3.2.1.6	NA

(a) When THERMAL POWER is ≥ 30% RPT

(b) ≤ 0.58W + 50% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating"

INSERT 10

(c) With THERMAL POWER ≤ 10% RTP.

(d) Reactor mode switch in the shutdown position.

INSERT 10:

(b) 0.58(W-ΔW) + 55% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating." For single loop operation the value of ΔW = 5%/0.58. For two loop operation, the value of $\Delta W = 0$.

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 may be in operation provided the following limits are 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;

c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR, and

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

e. Recirculation pump speed is ≤ 80%.

--------------------Note--------------------

Required limit and setpoint resets 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.

3.10 SPECIAL OPERATIONS

3.10.8 SHUTDOWN MARGIN (SDM) Test - Refueling

LCO 3.10.8 The reactor mode switch position specified in Table 1.1-1 for MODE 5 may be changed to include the startup/hot standby position, and operation considered not to be in MODE 2, to allow SDM testing, provided the following requirements are met:

a. LCO 3.3.1.1, "Reactor Protection System Instrumentation," MODE 2 requirements for Functions 2.a and 2.d of Table 3.3.1.1-1;

e

, 2.d

b. 1. LCO 3.3.2.1, "Control Rod Block Instrumentation," MODE 2 requirements for Function 2 of Table 3.3.2.1-1, with the banked position withdrawal sequence requirements of SR 3.3.2.1.8 changed to require the control rod sequence to conform to the SDM test sequence.

<u>OR</u>

2. Conformance to the approved rod sequence for the SDM test is verified by a second licensed operator or other qualified member of the technical staff;

c. Each withdrawn control rod shall be coupled to the associated CRD;

d. All control rod withdrawals that are not in conformance with the BPWS shall be made in notch out mode;

e. No other CORE ALTERATIONS are in progress; and

f. CFD charging water header pressure ≥940 psig.

APPLICABILITY: MODE 5 with the reactor mode switch in startup/hot standby position.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ------------NOTE------------ Separate Condition entry is allowed for each control rod. ------------------------------ One or more control rods not coupled to its associated CRD.	---------------NOTE--------------- Rod worth minimizer may be bypassed as allowed by LCO 3.3.2.1, "Control Rod Block Instrumentation," if required, to allow insertion of inoperable control rod and continued operation. ------------------------------------	
	A.1 Fully insert inoperable control rod.	3 hours
	AND	
	A.2 Disarm the associated CRD.	4 hours
B. One or more of the above requirements not met for reasons other than Condition A.	B.1 Place the reactor mode switch in the shutdown or refuel position.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.10.8.1 Perform the MODE 2 applicable SRs for LCO 3.3.1.1, Functions 2.a and 2.d of Table 3.3.1.1-1.	According to the applicable SRs

(continued)

5.6 Reporting Requirements (continued)

5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the main steam safety/relief valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

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 Specification 3.2.2;

3. The Linear Heat Generation Rate for Specification 3.2.3;

4 The Average Power Range Monitor (APRM) Gain and Setpoints for Specification 3.2.4; ~~and~~

5. The Shutdown Margin for Specification 3.1.1. ; and

Insert 11

6. ~~The OPRM setpoints for Specification 3.3.1.3~~

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC.

When an initial assumed power level of 102 percent of rated power is specified in a previously approved method, this refers to the power level associated with the design basis analyses, or 3510 MWt. The power level of 3510 MWt is 100.6% of the rated thermal power level of 3489 MWt. The RTP of 3489 MWt may only be used when feedwater flow measurement (used as input to the reactor thermal power measurement) is provided by the Leading Edge Flow Meter (LEFM✓™) as described in the LEFM✓™ Topical Report and supplement referenced below. When feedwater flow measurements from the LEFM✓™ system are not available, the

(continued)

INSERT 11:

6. Oscillation Power Range Monitor (OPRM) Trip setpoints, for Specification 3.3.1.1.

Attachment 2 to PLA-5880

Changes To Technical Specification Bases For Information

Unit 1

Technical Specification Bases Mark-ups

For Information

BASES

APPLICABILITY (continued)

sufficient margin to these limits exists below 25% RTP and, therefore, these requirements are only necessary when the reactor is operating at ≥ 25% RTP.

ACTIONS

A.1

If the APRM gain or setpoints are not within limits while the MFLPD has exceeded FRTP, the margin to the fuel transient mechanical design limit (PAPT) may be reduced. Therefore, prompt action should be taken to restore the MFLPD to within its required limit or make acceptable APRM adjustments such that the plant is operating within the assumed margin of the safety analyses.

The 6 hour Completion Time is normally sufficient to restore either the MFLPD to within limits or the APRM gain or setpoints to within limits and is acceptable based on the low probability of a transient or Design Basis Accident occurring simultaneously with the LCO not met.

INSERT B1

~~The APRM setpoints include the APRM Rod Block Flow Bias Neutron Flux Upscale Setpoint which is controlled in Technical Requirement Manual (TRM) 3.1.3 "Control Rod Block Instrumentation."~~

B.1

If MFLPD cannot be restored to within its required limits within the associated Completion Time, the plant must be brought to a MODE or other specified condition in which the LCO does not apply. To achieve this status, THERMAL POWER is reduced to < 25% RTP within 4 hours. The allowed Completion Time is reasonable, based on operating experience, to reduce THERMAL POWER to < 25% RTP in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.2.4.1 and SR 3.2.4.2

The MFLPD is required to be calculated and compared to FRTP or APRM gain or setpoints to ensure that the reactor

(continued)

TECH SPEC BASES MARKUP

INSERT B1:

The APRM setpoints include the APRM Simulated Thermal Power – High RPS scram setpoint, LCO 3.3.1.1 "RPS Instrumentation," Function 2.b, and APRM Simulated Thermal Power – High rod block setpoint, Technical Requirements Manual (TRM) TRO 3.1.3 "Control Rod Block Instrumentation", Function 1.b.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.2.4.1 and SR 3.2.4.2 (continued)

is operating within the assumptions of the safety analysis. These SRs are only required to determine the MFLPD and, assuming MFLPD is greater than FRTP, the appropriate gain or setpoint, and is not intended to be a CHANNEL FUNCTIONAL TEST for the APRM gain or flow biased neutron flux scram circuitry. The 24 hour Frequency of SR 3.2.4.1 is chosen to coincide with the determination of other thermal limits, specifically those for the APLHGR (LCO 3.2.1). The 24 hour Frequency is based on both engineering judgment and recognition of the slowness of changes in power distribution during normal operation. The 24 hour allowance after THERMAL POWER ≥ 25% RTP is achieved is acceptable given the large inherent margin to operating limits at low power levels and because the MFLPD must be calculated prior to exceeding 50% RTP unless performed in the previous 24 hours. When MFLPD is greater than FRTP, SR 3.2.4.2 must be performed. The 12 hour Frequency of SR 3.2.4.2 requires a more frequent verification when MFLPD is greater than the fraction of rated thermal power (FRTP) because more rapid changes in power distribution are typically expected.

functions

REFERENCES

1. 10 CFR 50, Appendix A, GDC 10, GDC 13, GDC 20, and GDC 23.
2. FSAR, Section 4.
3. FSAR, Section 15.
4. ANF-89-98(P)(A) Revision 1 and Revision 1 Supplement 1, "Generic Mechanical Design Criteria for BWR Fuel Designs," Advanced Nuclear Fuels Corporation, May 1995.
5. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).

INSERT B2

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Average Power Range Monitor (APRM)

2.a. Average Power Range Monitor Neutron Flux—High, (Setdown)

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. 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 Intermediate Range Monitor Neutron Flux—High Function because of the relative setpoints. With the IRMs at Range 9 or 10, 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.

remove, comma after High

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 APRM System is divided into two trip systems with three APRM channel inputs to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Neutron Flux—High, Setdown with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 14 LPRM inputs are required for each APRM channel, with at least two

(continued)

INSERT B2:

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

The APRM trip 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 Trip 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, with no more than [9], LPRM detectors declared inoperable since the most recent APRM gain calibration. Per Reference 23, the minimum input requirement for an APRM channel with 43 LPRM inputs is determined given that the total number of LPRM outputs used as inputs to an APRM channel that may be bypassed shall not exceed twenty-three (23). Hence, (20) LPRM inputs needed to be operable. For the OPRM Trip Function 2.f, each LPRM in an APRM channel is further associated in a pattern of OPRM "cells," as described in References 17 and 18. Each OPRM cell is capable of producing a channel trip signal.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

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

LPRM inputs from each of the four axial levels at which the LPRMs are located.

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 protects against control rod withdrawal error events.

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function monitors 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 Fixed Neutron Flux—High Function Allowable Value. The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function is not credited in any plant Safety Analyses. The Average Power Range Monitor Flow Biased Simulated Thermal Power – High Function is set above the APRM Rod Block to provide defense in depth to the APRM fixed Neutron Flux – High for transients where THERMAL POWER increases slowly (such as loss of feedwater heating event). During these events, the THERMAL POWER increase does not significantly lag the neutron flux response and, because of a lower trip setpoint, will initiate a scram before the high neutron flux scram. For rapid neutron flux increase events, the THERMAL POWER lags the neutron flux and the Average Power Range Monitor Fixed Neutron Flux—High Function will provide a scram signal before the Average

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High (continued)

Power Range Monitor Flow Biased Simulated Thermal Power—High Function setpoint is exceeded.

INSERT B3

The APRM System is divided into two trip systems with three APRM inputs to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Flow Biased Simulated Thermal Power—High with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 14 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located. Each APRM channel receives two total drive flow signals representative of total core flow. The total drive flow signals are generated by four flow units, two of which supply signals to the trip system A APRMs, while the other two supply signals to the trip system B APRMs. Each flow unit signal is provided by summing up the flow signals from the two recirculation loops. To obtain the most conservative reference signals, the total flow signals from the two flow units (associated with a trip system as described above) are routed to a low auction circuit associated with each APRM. Each APRM's auction circuit selects the lower of the two flow unit signals for use as the scram trip reference for that particular APRM. Each required Average Power Range Monitor Flow Biased Simulated Thermal Power—High channel only requires an input from one OPERABLE flow unit, because the function is not credited in the Safety Analyses and the individual APRM channel will perform the intended function with only one OPERABLE flow unit input. Industry standards (e.g., IEEE-279-1971) require that a system be single failure proof if it performs a protective function (e.g., mitigate an accident described in the SAR). A review of the Safety Analyses described in the FSAR demonstrate that the APRM Flow Biased Simulated Thermal Power – High scram is not credited. Since the flow-biased scram is not credited it does not need to meet single failure criteria. Therefore, an inoperable flow unit does not require that the associated trip system be declared inoperable. However, if both flow units in a given trip system become inoperable, then one of the two required Average Power Range Monitor Flow Biased Simulated Thermal Power – High channels in the associated trip system must be considered inoperable.

(continued)

TECH SPEC BASES MARKUP

INSERT B3:

The Average Power Range Monitor Simulated Thermal Power - High Function uses a trip level generated based on recirculation loop drive flow (W) representative of total core flow. Each APRM channel uses one total recirculation drive flow signal. The total recirculation drive flow signal is generated by the flow processing logic, part of the APRM channel, by summing the flow calculated from two flow transmitter signal inputs, one from each of the two recirculation drive flow loops. The flow processing logic OPERABILITY is part of the APRM channel OPERABILITY requirements for this Function.

The adequacy of drive flow as a representation of core flow is ensured through drive flow alignment, accomplished by SR 3.3.1.1.20.

A note is included, applicable when the plant is in single recirculation loop operation per LCO 3.4.1, which requires reducing by ΔW the recirculation flow value used in the APRM Simulated Thermal Power - High Allowable Value equation. The Average Power Range Monitor Scram Function varies as a function of recirculation loop drive flow (W). ΔW is defined as the difference in indicated drive flow (in percent of drive flow, which produces rated core flow) between two loop and single loop operation at the same core flow. 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. This adjusted Allowable Value thus maintains thermal margins essentially unchanged from those for two-loop operation.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High (continued)

The THERMAL POWER time constant of < 7 seconds is based on the fuel heat transfer dynamics and provides a signal proportional to the THERMAL POWER. The simulated thermal time constant is part of the filter circuit that simulates the relationship between neutron flux and core thermal power.

filtering logic in the APRM

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function and at least one flow unit per division are required to be OPERABLE in MODE 1 when there is the possibility of generating excessive THERMAL POWER and potentially exceeding the SL applicable to high pressure and core flow conditions (MCPR SL). During MODES 2 and 5, other IRM and APRM Functions provide protection for fuel cladding integrity.

is

2.c. Average Power Range Monitor Fixed Neutron Flux—High

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The Average Power Range Monitor Fixed Neutron Flux—High Function is capable of generating a trip signal to prevent fuel damage or excessive RCS pressure. For the overpressurization protection analysis of Reference 4, the Average Power Range Monitor Fixed Neutron Flux—High Function is assumed to terminate the main steam isolation valve (MSIV) closure event and, along with the safety/relief valves (S/RVs), limits the peak reactor pressure vessel (RPV) pressure to less than the ASME Code limits. The control rod drop accident (CRDA) analysis (Ref. 5) takes credit for the Average Power Range Monitor Fixed Neutron Flux—High Function to terminate the CRDA.

The APRM System is divided into two trip systems with three APRM channels inputting to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.c. Average Power Range Monitor Fixed Neutron Flux—High (continued)

Average Power Range Monitor Fixed Neutron Flux—High with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 14 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located.

The CRDA analysis assume that reactor scram occurs on Average Power Range Monitor Fixed Neutron Flux - High Function.

The Average Power Range Monitor Fixed Neutron Flux—High Function is required to be OPERABLE in MODE 1 where the potential consequences of the analyzed transients could result in the SLs (e.g., MCPR and RCS pressure) being exceeded. Although the Average Power Range Monitor Fixed Neutron Flux—High Function is assumed in the CRDA analysis, which is applicable in MODE 2, the Average Power Range Monitor Neutron Flux—High, Setdown Function conservatively bounds the assumed trip and, together with the assumed IRM trips, provides adequate protection. Therefore, the Average Power Range Monitor Fixed Neutron Flux—High Function is not required in MODE 2.

2.d. Average Power Range Monitor—Inop

INSERT B4

This signal provides assurance that a minimum number of APRMs are OPERABLE. Anytime an APRM mode switch is moved to any position other than "Operate" or the APRM has too few LPRM inputs (< 14), an inoperative trip signal will be received by the RPS, unless the APRM is bypassed. Since only one APRM in each trip system may be bypassed, only one APRM in each trip system may be inoperable without resulting in an RPS trip signal. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

(continued)

TECH SPEC BASES MARKUP

INSERT B4:

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 its associated trip system.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.d. Average Power Range Monitor—Inop (continued)

Four channels of Average Power Range Monitor—Inop with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal.

There is no Allowable Value for this Function.

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

INSERT B5

3. Reactor Vessel Steam Dome Pressure—High

An increase in the RPV pressure during reactor operation compresses the steam voids and results in a positive reactivity insertion. This causes the neutron flux and THERMAL POWER transferred to the reactor coolant to increase, which could challenge the integrity of the fuel cladding and the RCPB. This trip Function is assumed in the low power generator load rejection without bypass and the recirculation flow controller failure (increasing) event. However, the Reactor Vessel Steam Dome Pressure—High Function initiates a scram for transients that result in a pressure increase, counteracting the pressure increase by rapidly reducing core power. For the overpressurization protection analysis of Reference 4, reactor scram (the analyses conservatively assume scram on the Average Power Range Monitor Fixed Neutron Flux—High signal, not the Reactor Vessel Steam Dome Pressure—High signal), along with the S/RVs, limits the peak RPV pressure to less than the ASME Section III Code limits.

High reactor pressure signals are initiated from four pressure instruments that sense reactor pressure. The Reactor Vessel Steam Dome Pressure—High Allowable Value is chosen to provide a sufficient margin to the ASME Section III Code limits during the event.

Four channels of Reactor Vessel Steam Dome Pressure—High Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. The Function is

(continued)

INSERT B5:

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

The 2-out-of-4 Voter Function provides the interface between the APRM Functions, including the OPRM Trip 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 is required 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 RPS trip system.

The Two-Out-Of-Four Logic Module includes both the 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 Two-Out-Of-Four Logic Module. The voter includes separate outputs to RPS for the two independently voted sets of Functions, each of which is redundant (four total outputs). The analysis in Reference 15 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. The voter Function 2.e does not need to be declared inoperable due to any failure affecting only the APRM Interface hardware portion of the Two-Out-Of-Four Logic Module.

There is no Allowable Value for this Function.

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

The OPRM Trip Function provides compliance with GDC 10, "Reactor Design," and GDC 12, "Suppression of Reactor Power Oscillaitons" thereby providing protection from exceeding the fuel MCPR safety limit (SL) due to anticipated thermal-hydraulic power oscillations.

References 17, 18 and 19 describe three algorithms for detecting thermal-hydraulic instability related neutron flux oscillations: the period based detection algorithm (confirmation count and cell amplitude), the amplitude based algorithm, and the growth rate algorithm. All three are implemented in the OPRM Trip Function, but the safety analysis takes credit only for the period based detection algorithm. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. OPRM Trip Function OPERABILITY for Technical Specification purposes is based only on the period based detection algorithm.

The OPRM Trip 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.

(continued next sheet)

INSERT B5 (continued):

The OPRM Trip is automatically enabled (bypass removed) when THERMAL POWER is ≥ 30% RTP, as indicated by the APRM Simulated Thermal Power, and reactor core flow is ≤ the value defined in the COLR, as indicated by APRM measured recirculation drive flow. This is the operating region where actual thermal-hydraulic instability and related neutron flux oscillations are expected to occur. Reference 21 includes additional discussion of OPRM Trip enable region limits.

These setpoints, which are sometimes referred to as the "auto-bypass" setpoints, establish the boundaries of the OPRM Trip enabled region. The APRM Simulated Thermal Power auto-enable setpoint has 1% deadband while the drive flow setpoint has a 2% deadband. The deadband for these setpoints is established so that it increases the enabled region once the region is entered.

The OPRM Trip 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 without operator action while the plant is operating below 30% RTP causes a power increase to or beyond the 30% APRM Simulated Thermal Power OPRM Trip auto-enable setpoint. This OPERABILITY requirement assures that the OPRM Trip auto-enable function will be OPERABLE when required.

An APRM channel is also required to have a minimum number of OPRM cells OPERABLE for the Upscale Function 2.f to be OPERABLE. The OPRM cell operability requirements are documented in the Technical Requirements Manual, TRO 3.3.9, and are established as necessary to support the trip setpoint calculations performed in accordance with methodologies in Reference 19.

An OPRM Trip is issued from an APRM channel when the period based detection algorithm 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 OPRM Trip from that channel. An OPRM Trip is also issued from the channel if either the growth rate or amplitude based algorithms detect oscillatory changes in the neutron flux for one or more cells in that channel. (Note: To facilitate placing the OPRM Trip Function 2.f in one APRM channel in a "tripped" state, if necessary to satisfy a Required Action, the APRM equipment is conservatively designed to force an OPRM Trip output from the APRM channel if an APRM Inop condition occurs, such as when the APRM chassis keylock switch is placed in the Inop position.)

There are three "sets" of OPRM related setpoints or adjustment parameters: a) OPRM Trip auto-enable region setpoints for STP and drive flow; b) period based detection algorithm (PBDA) confirmation count and amplitude setpoints; and c) period based detection algorithm tuning parameters.

The first set, the OPRM Trip auto-enable setpoints, as discussed in the SR 3.3.1.1.19 Bases, are treated as nominal setpoints with no additional margins added. The settings are defined in the Technical Requirements Manual, TRO 3.3.9, 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 19, 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 requirements in the Technical Requirements Manual, TRO 3.3.9.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

4. Reactor Vessel Water Level—Low, Level 3 (continued)

Level 1 provide sufficient protection for level transients in all other MODES.

5. Main Steam Isolation Valve—Closure

MSIV closure results in loss of the main turbine and the condenser as a heat sink for the nuclear steam supply system and indicates a need to shut down the reactor to reduce heat generation. Therefore, a reactor scram is initiated on a Main Steam Isolation Valve—Closure signal before the MSIVs are completely closed in anticipation of the complete loss of the normal heat sink and subsequent overpressurization transient. However, for the overpressurization protection analysis of Reference 4, the Average Power Range Monitor Fixed Neutron Flux—High Function, along with the S/RVs, limits the peak RPV pressure to less than the ASME Code limits. That is, the direct scram on position switches for MSIV closure events is not assumed in the overpressurization analysis. Additionally, MSIV closure is assumed in the transients analyzed in Reference 7 (e.g., low steam line pressure, manual closure of MSIVs, high steam line flow). The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the ECCS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

MSIV closure signals are initiated from position switches located on each of the eight MSIVs. Each MSIV has two position switches; one inputs to RPS trip system A while the other inputs to RPS trip system B. Thus, each RPS trip system receives an input from eight Main Steam Isolation Valve—Closure channels, each consisting of one position switch. The logic for the Main Steam Isolation Valve—Closure Function is arranged such that either the inboard or outboard valve on three or more of the main steam lines must close in order for a scram to occur.

The Main Steam Isolation Valve—Closure Allowable Value is specified to ensure that a scram occurs prior to a significant reduction in steam flow, thereby reducing the severity of the subsequent pressure transient.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

8. Turbine Stop Valve—Closure (continued)

the transients that would result from the closure of these valves. The Turbine Stop Valve—Closure Function is the primary scram signal for the turbine trip event analyzed in Reference 7. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the End of Cycle Recirculation Pump Trip (EOC-RPT) System, ensures that the MCPR SL is not exceeded. Turbine Stop Valve—Closure signals are initiated from position switches located on each of the four TSVs. Two independent position switches are associated with each stop valve. One of the two switches provides input to RPS trip system A; the other, to RPS trip system B. Thus, each RPS trip system receives an input from four Turbine Stop Valve—Closure channels, each consisting of one position switch. The logic for the Turbine Stop Valve — Closure Function is such that three or more TSVs must be closed to produce a scram. This Function must be enabled at THERMAL POWER ≥ 30% RTP. This is accomplished automatically by pressure instruments sensing turbine first stage pressure. Because an increase in the main turbine bypass flow can affect this function non-conservatively, THERMAL POWER is derived from first stage pressure. The main turbine bypass valves must not cause the trip Function to be bypassed when THERMAL POWER is ≥ 30% RTP.

The Turbine Stop Valve—Closure Allowable Value is selected to be high enough to detect imminent TSV closure, thereby reducing the severity of the subsequent pressure transient.

Eight channels (arranged in pairs) of Turbine Stop Valve—Closure Function, with four channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function if any three TSVs should close. This Function is required, consistent with analysis assumptions, whenever THERMAL POWER is ≥ 30% RTP. This Function is not required when THERMAL POWER is < 30% RTP since the Reactor Vessel Steam Dome Pressure—High and the Average Power Range Monitor (Fixed) Neutron Flux—High Functions are adequate to maintain the necessary safety margins.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

9. Turbine Control Valve Fast Closure, Trip Oil Pressure—Low

Fast closure of the TCVs results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated on TCV fast closure in anticipation of the transients that would result from the closure of these valves. The Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Function is the primary scram signal for the generator load rejection event analyzed in Reference 7. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the EOC-RPT System, ensures that the MCPR SL is not exceeded.

Turbine Control Valve Fast Closure, Trip Oil Pressure—Low signals are initiated by the electrohydraulic control (EHC) fluid pressure at each control valve. One pressure instrument is associated with each control valve, and the signal from each transmitter is assigned to a separate RPS logic channel. This Function must be enabled at THERMAL POWER ≥ 30% RTP. This is accomplished automatically by pressure instruments sensing turbine first stage pressure. Because an increase in the main turbine bypass flow can affect this function non-conservatively, THERMAL POWER is derived from first stage pressure. The main turbine bypass valves must not cause the trip Function to be bypassed when THERMAL POWER is ≥ 30% RTP.

The Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Allowable Value is selected high enough to detect imminent TCV fast closure.

Four channels of Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Function with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. This Function is required, consistent with the analysis assumptions, whenever THERMAL POWER is ≥ 30% RTP. This Function is not required when THERMAL POWER is < 30% RTP, since the Reactor Vessel Steam Dome Pressure—High and the Average Power Range Monitor Fixed Neutron Flux—High Functions are adequate to maintain the necessary safety margins.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

11. Manual Scram (continued)

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

Four channels of Manual Scram with two channels in each trip system arranged in a one-out-of-two logic are available and required to be OPERABLE in MODES 1 and 2, and in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies, since these are the MODES and other specified conditions when control rods are withdrawn.

ACTIONS

A Note has been provided to modify the ACTIONS related to RPS instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPS instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RPS instrumentation channel.

A.1 and A.2

(Refs. 9,15 and 16)

Because of the diversity of sensors available to provide trip signals and the redundancy of the RPS design, an allowable out of service time of 12 hours has been shown to be acceptable (Ref. 9) to permit restoration of any inoperable channel to OPERABLE status. However, this out of service time is only acceptable provided the associated 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

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

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.

INSERT B6

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 Reference 9 [References 9, 15 or 16] 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.

Completing one of these Required Actions restores RPS to a reliability level equivalent to that evaluated in Reference 9 [References 9, 15 and 16], 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).

(continued)

TECH SPEC BASES MARKUP

INSERT B6:

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.

BASES

ACTIONS

B.1 and B.2 (continued)

If this action would result in a scram, 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.

INSERT B7

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same trip system for the same Function result in the Function not maintaining RPS trip capability. A Function is considered to be maintaining RPS trip capability when sufficient channels are OPERABLE or in trip (or the associated trip system is in trip), such that both trip systems will generate a trip signal from the given Function on a valid signal. For the typical Function with one-out-of-two taken twice logic, this would require both trip systems to have one channel OPERABLE or in trip (or the associated trip system in trip). For Function 5 (Main Steam Isolation Valve—Closure), this would require both trip systems to have each channel associated with the MSIVs in three main steam lines (not necessarily the same main steam lines for both trip systems) OPERABLE or in trip (or the associated trip system in trip).

For Function 8 (Turbine Stop Valve—Closure), this would require both trip systems to have three channels, each OPERABLE or in trip (or the associated trip system in trip).

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The

(continued)

INSERT B7:

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 (Function 2.e) 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 Conditions 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 because 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.

BASES

ACTIONS

C.1 (continued)

1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

D.1

Required Action D.1 directs entry into the appropriate Condition referenced in Table 3.3.1.1-1. The applicable Condition specified in the Table is Function and MODE or other specified condition dependent and may change as the Required Action of a previous Condition is completed. Each time an inoperable channel has not met any Required Action of Condition A, B, or C and the associated Completion Time has expired, Condition D will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1, F.1, and G.1 , 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 consistent with the Completion Time provided in LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)."

Actions E.1 and J.1 are

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

(continued)

BASES

ACTIONS

H.1 (continued)

INSERT B8

the reactivity of the core and are, therefore, not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

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

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis ~~(Ref. 9)~~ Refs. 9, 15 and 16 assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RPS will trip when necessary.

SR 3.3.1.1.1 and SR 3.3.1.1.2

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

(continued)

TECH SPEC BASES MARKUP

INSERT B8:

I.1 and I.2

Required Actions I.1 and I.2 are intended to ensure that appropriate actions are taken if more than two inoperable or bypassed OPRM channels result in not maintaining OPRM trip capability.

In the 4-OPRM channel configuration, any 'two' of the OPRM channels out of the total of four and one 2-out-of-4 voter channels in each RPS trip system are required to function for the OPRM safety trip function to be accomplished. Therefore, three OPRM channels assures at least two OPRM channels can provide trip inputs to the 2-out-of-4 voter channels even in the event of a single OPRM channel failure, and the minimum of two 2-out-of-4 voter channels per RPS trip system assures at least one voter channel will be operable per RPS trip system even in the event of a single voter channel failure.

References 15 and 16 justified use of alternate methods to detect and suppress oscillations under limited conditions. The alternate methods are consistent with the guidelines identified in Reference 20. The alternate-methods procedures require increased operator awareness and monitoring for neutron flux oscillations when operating in the region where oscillations are possible. If operator observes indications of oscillation, as described in Reference 20, the operator will take the actions described by procedures, which include manual scram of the reactor. The power/flow map regions where oscillations are possible are developed based on the methodology in Reference 22. The applicable regions are contained in the COLR.

The alternate methods would adequately address detection and mitigation in the event of thermal hydraulic instability oscillations. Based on industry operating experience with actual instability oscillations, the operator would be able to recognize instabilities during this time and take action to suppress them through a manual scram. In addition, the OPRM system may still be available to provide alarms to the operator if the onset of oscillations were to 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 hours is judged to be reasonable.

The 120-day allowed Completion Time, the time that was evaluated in References 15 and 16, is considered adequate because with operation minimized in regions where oscillations may occur and implementation of the alternate methods, 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 primary purpose of Required Actions I.1 and I.2 is to allow an orderly completion, without undue impact on plant operation, of design and verification activities required to correct unanticipated equipment design or functional problems that cause OPRM Trip Function INOPERABILITY in all APRM channels that cannot reasonably be corrected by normal maintenance or repair actions. These Required Actions are not intended and were not evaluated as a routine alternative to returning failed or inoperable equipment to OPERABLE status.

and SR 3.3.1.1.2

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.1 (continued)

Agreement criteria which are determined by the plant staff based on an investigation of a combination of the channel instrument uncertainties, may be used to support this parameter comparison and include indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit, and does not necessarily indicate the channel is inoperable.

INSERT B8A

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

SR 3.3.1.1.~~2~~ 3

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are calibrated to the reactor power calculated from a heat balance. LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within 2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated MFLPD times 100. The Frequency of once per 7 days is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.8.

A restriction to satisfying this SR when < 25% RTP is provided that requires the SR to be met only at ≥ 25% RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when < 25% RTP. At low power levels, a high degree of accuracy is unnecessary because of the large, inherent margin to thermal limits (MCPR, LHGR and APLHGR). At ≥ 25% RTP, the Surveillance is required to have been satisfactorily performed within the last 7 days, in accordance with SR 3.0.2. A Note is provided which allows an increase in THERMAL POWER above 25% if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after reaching or exceeding 25% RTP. Twelve hours is based on operating experience and in

(continued)

TECH SPEC BASES MARKUP

INSERT B8A:

The Frequency of once every 12 hours for SR 3.3.1.1.1 is based upon operating experience that demonstrates that channel failure is rare. The Frequency of once every 24 hours for SR 3.3.1.1.2 is based upon operating experience that demonstrates that channel failure is rare and the evaluation in References 15 and 16.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.2 (continued)

consideration of providing a reasonable time in which to complete the SR.

SR 3.3.1.1.3

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function uses the recirculation loop drive flows to vary the trip setpoint. This SR verifies proper operation of the total loop drive flow signals from the drive flow units used to vary the setpoint of the APRM. The components operation is verified in two steps. The first step is a CHANNEL CHECK performed by reading the output of the four drive flow units. This gross check ensures that all drive flow units are within a tolerance defined by station staff. The second step is a verification that the flow signal from the APRM readout (which is the lowest flow signal from two associated drive flow units) is conservative with respect to the total core flow/drive flow relationship. This two step process ensures that the drive flow signal is consistent with the actual total core flow. If the flow unit signal is not within the limit, one required APRM that receives an input from the inoperable flow unit must be declared inoperable. If instruments are found within tolerance, adjustments are not required.

The Frequency of 7 days is based on engineering judgment, operating experience, and the reliability of this instrumentation.

SR 3.3.1.1.4

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

As noted, SR 3.3.1.1.4 is not required to be performed when entering MODE 2 from MODE 1, since testing of the MODE 2 required IRM and APRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This allows entry into MODE 2 if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.6 and SR 3.3.1.1.7 (continued)

between SRMs and IRMs similarly exists when, prior to fully withdrawing the SRMs from the core, IRMs are above mid-scale on range 1 before SRMs have reached the upscale rod block.

As noted, SR 3.3.1.1.7 is only required to be met during entry into MODE 2 from MODE 1. That is, after the overlap requirement has been met and indication has transitioned to the IRMs, maintaining overlap is not required (APRMs may be reading downscale once in MODE 2).

If overlap for a group of channels is not demonstrated (e.g., IRM/APRM overlap), the reason for the failure of the Surveillance should be determined and the appropriate channel(s) declared inoperable. Only those appropriate channels that are required in the current MODE or condition should be declared inoperable.

A Frequency of 7 days is reasonable based on engineering judgment and the reliability of the IRMs and APRMs.

SR 3.3.1.1.8

LPRM gain settings are determined from the local flux profiles that are either measured by the Traversing Incore Probe (TIP) System at all functional locations or calculated for TIP locations that are not functional. The methodology used to develop the power distribution limits considers the uncertainty for both measured and calculated local flux profiles. This methodology assumes that all the TIP locations are functional for the first LPRM calibration following a refueling outage, and a minimum of 25 functional TIP locations for subsequent LPRM calibrations. The calibrated LPRMs establish the relative local flux profile for appropriate representative input to the APRM System. The 1000 MWD/MT Frequency is based on operating experience with LPRM sensitivity changes.

SR 3.3.1.1.9 and SR 3.3.1.1.~~12~~ 14

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

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.9 and SR 3.3.1.1.12 14 (continued)

intended function. The 92 day Frequency of SR 3.3.1.1.9 is based on the reliability analysis of Reference 9.

SR 3.3.1.1.9 is modified by a Note that provides a general exception to the definition of CHANNEL FUNCTIONAL TEST. This exception is necessary because the design of instrumentation does not facilitate functional testing of all required contacts of the relay which input into the combinational logic. (Reference 10) Performance of such a test could result in a plant transient or place the plant in an undo risk situation. Therefore, for this SR, the CHANNEL FUNCTIONAL TEST verifies acceptable response by verifying the change of state of the relay which inputs into the combinational logic. The required contacts not tested during the CHANNEL FUNCTIONAL TEST are tested under the LOGIC SYSTEM FUNCTIONAL TEST, SR 3.3.1.1.15. This is acceptable because operating experience shows that the contacts not tested during the CHANNEL FUNCTIONAL TEST normally pass the LOGIC SYSTEM FUNCTIONAL TEST, and the testing methodology minimizes the risk of unplanned transients.

The 24 month Frequency of SR 3.3.1.1.12 14 is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.10, SR 3.3.1.1.11 and SR 3.3.1.1.13 , and SR 3.3.1.1.18

A CHANNEL CALIBRATION 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 plant specific setpoint methodology.

for SR 3.3.1.1.18

Note 1 states that neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2 3) and the 1000 MWD/MT LPRM

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10, SR 3.3.1.1.11 and SR 3.3.1.1.13 (continued)

calibration against the TIPs (SR 3.3.1.1.8). A second Note is provided that requires the APRM and IRM SRs to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM and IRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2.

Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

The Frequency of SR 3.3.1.1.11 is based upon the assumption of a 184 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of 92 days for SR 3.3.1.1.12 and 24 months for SR 3.3.1.1.13 is based upon the assumptions in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.1.1.14

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function uses an electronic filter circuit to generate a signal proportional to the core THERMAL POWER from the APRM neutron flux signal. This filter circuit is representative of the fuel heat transfer dynamics that produce the relationship between the neutron flux and the core THERMAL POWER. The Surveillance filter time constant must be verified to be ≤ 7 seconds to ensure that the channel is accurately reflecting the desired parameter.

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

SR 3.3.1.1.15

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

(continued)

TECH SPEC BASES MARKUP

INSERT B9:

A second note is provided for SR 3.3.1.1.18 that requires that the recirculation flow (drive flow) transmitters, which supply the flow signal to the APRMs, be included in the SR for Functions 2.b and 2.f. The APRM Simulated Thermal Power-High Function (Function 2.b) and the OPRM Trip 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 Trip Function uses drive flow to automatically enable or bypass the OPRM Trip output to the RPS. A CHANNEL CALIBRATION of the APRM drive flow signal requires both calibrating the drive flow transmitters and the processing hardware in the APRM equipment. SR 3.3.1.1.20 establishes a valid drive flow / core flow relationship. 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 Trip Function.

INSERT B10:

SR 3.3.1.1.12

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the 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 that which is necessary to test the hardware. Software controlled functions are tested as part of the initial verification and validation and are only incidentally tested as part of the surveillance testing. Automatic self-test functions check the EPROMs in which the software-controlled logic is defined. Changes in the EPROMs will be detected by the self-test function and alarmed via the APRM trouble alarm. SR 3.3.1.1.1 for the APRM functions includes a step to confirm that the automatic self-test function is still operating.

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 3.3.1.1.12 is based on the reliability analyses of References 15 & 16. (NOTE: The actual voting logic of the 2-out-of-4 Voter Function is tested as part of SR 3.3.1.1.15. The auto-enable setpoints for the OPRM 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 Functions 2.b and 2.f that clarifies that the CHANNEL FUNCTIONAL TEST for Functions 2.b and 2.f includes testing of the recirculation flow processing electronics, excluding the flow transmitters.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.15 (continued)

and drain valves (LCO 3.1.8), overlaps this Surveillance to provide complete testing of the assumed safety function.

INSERT B11

The 24 month Frequency is based on the need to perform portions of this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.16

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 ≥ 30% RTP. This is performed by a Functional check that ensures the scram feature is not bypassed at ≥ 30% RTP. Because main turbine bypass flow can affect this function nonconservatively (THERMAL POWER is derived from turbine first stage pressure), the opening of the main turbine bypass valves must not cause the trip Function to be bypassed when Thermal Power is ≥ 30% RTP.

If any bypass channel's trip function is nonconservative (i.e., the Functions are bypassed at ≥ 30% RTP, either due to open main turbine bypass valve(s) or other reasons), then the 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

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis. This test may be performed in one

(continued)

TECH SPEC BASES MARKUP

INSERT B11:

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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.17 (continued)

measurement or in overlapping segments, with verification that all components are tested. The RPS RESPONSE TIME acceptance criteria are included in Reference 11.

INSERT B12

RPS RESPONSE TIME tests are conducted on an 24 month STAGGERED TEST BASIS. Note 3 requires STAGGERED TEST BASIS Frequency to be determined based on 4 channels per trip system, in lieu of the 8 channels specified in

Table 3.3.1.1-1 for the MSIV Closure Function because channels are arranged in pairs. This Frequency is based on the logic interrelationships of the various channels required to produce an RPS scram signal. The 24 month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

SR 3.3.1.1.17 for Function 2.e confirms the response time of that function, and also confirms the response time of components to Function 2.e and other RPS functions. (Reference 14)

INSERT B13

REFERENCES

INSERT B14

1. FSAR, Figure 7.2-1.

2. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).

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

4. FSAR, Section 5.2.2.

5. FSAR, Section 15.4.9.

6. FSAR, Section 6.3.3.

(continued)

INSERT B12:

RPS RESPONSE TIME for the APRM 2-out-of-4 Voter Function (2.e) includes the APRM Flux Trip output relays and the OPRM Trip output relays of the voter and the associated RPS relays and contactors. (Note: The digital portion of the APRM, OPRM and 2-out-of-4 Voter channels are excluded from RPS RESPONSE TIME testing because self-testing and calibration checks the time base of the digital electronics. Confirmation of the time base is adequate to assure required response times are met. Neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time. See Reference 12 and 13)

INSERT B13:

Note 3 allows the STAGGERED TEST BASIS Frequency for Function 2.e to be determined based on 8 channels rather than the 4 actual 2-Out-Of-4 Voter channels. The redundant outputs from the 2-Out-Of-4 Voter channel (2 for APRM trips and 2 for OPRM trips) are considered part of the same channel, but the OPRM and APRM outputs are considered to be separate channels for application of SR 3.3.1.1.17, so N = 8. The note further requires that testing of OPRM and APRM outputs from a 2-out-of-4 Voter be alternated. In addition to these commitments, References 15 & 16 require that the testing of inputs to each RPS Trip System alternate.

Combining these frequency requirements, an acceptable test sequence is one that:

a. Tests each RPS Trip System interface every other cycle,
b. Alternates the testing of APRM and OPRM outputs from any specific 2-Out-Of-4 Voter Channel
c. Alternates between divisions at least every other test cycle.

The testing sequence shown in the table below is one sequence that satisfies these requirements.

Function 2.e Testing Sequence for SR 3.3.1.1.17

24-Month Cycle	Voter output tested	"Staggering"					
		Voter A1 output	Voter A2 output	Voter B1 output	Voter B2 output	RPS Trip System	Division
1st	OPRM A1	OPRM				A	1
2nd	APRM B1			APRM		B	1
3rd	OPRM A2		OPRM			A	2
4th	APRM B2				APRM	B	2
5th	APRM A1	APRM				A	1
6th	OPRM B1			OPRM		B	1
7th	APRM A2		APRM			A	2
8th	OPRM B2				OPRM	B	2

After 8 cycles, the sequence repeats.

Each test of an OPRM or APRM output tests each of the redundant outputs from the 2-Out-Of-4 Voter channel for that Function and each of the corresponding relays in the RPS. Consequently, each of the RPS relays is tested every fourth cycle. The RPS relay testing frequency is twice the frequency justified by References 15 and 16.

INSERT B14:

SR 3.3.1.1.19

This surveillance involves confirming the OPRM Trip auto-enable setpoints. The auto-enable setpoint values are considered to be nominal values as discussed in Reference 21. This surveillance ensures that the OPRM 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 3.3.1.1.20), respectively.

If any auto-enable setpoint is nonconservative (i.e., the OPRM Trip is bypassed when APRM Simulated Thermal Power ≥ 30% and recirculation drive flow ≤ value equivalent to the core flow value defined in the COLR, then the affected channel is considered inoperable for the OPRM Trip Function. Alternatively, the OPRM Trip auto-enable setpoint(s) may be adjusted to place the channel in a conservative condition (not bypassed). If the OPRM Trip is placed in the not-bypassed condition, this SR is met and the channel is considered OPERABLE.

For purposes of this surveillance, consistent with Reference 21, the conversion from core flow values defined in the COLR to drive flow values used for this SR can be conservatively determined by a linear scaling assuming that 100% drive flow corresponds to 100 Mlb/hr core flow, with no adjustment made for expected deviations between core flow and drive flow below 100%.

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

SR 3.3.1.1.20

The APRM Simulated Thermal Power-High Function (Function 2.b) uses drive flow to vary the trip setpoint. The OPRM Trip Function (Function 2.f) uses drive flow to automatically enable or bypass the OPRM Trip output to RPS. Both of these Functions use drive flow as a representation of reactor core flow. SR 3.3.1.1.18 ensures that the drive flow transmitters and processing electronics are calibrated. This SR adjusts the recirculation drive flow scaling factors in each APRM channel to provide the appropriate drive flow/core flow alignment.

The Frequency of 24 months considers that any change in the core flow to drive flow functional relationship during power operation would be gradual and the maintenance of the Recirculation System and core components that may impact the relationship is expected to be performed during refueling outages. This frequency also considers the period after reaching plant equilibrium conditions necessary to perform the test, engineering judgment of the time required to collect and analyze the necessary flow data, and engineering judgment of the time required to enter and check the applicable scaling factors in each of the APRM channels. This timeframe is acceptable based on the relatively small alignment errors expected, and the margins already included in the APRM Simulated Thermal Power - High and OPRM Trip Function trip-enable setpoints.

BASES

REFERENCES (continued)

7. FSAR, Chapter 15.

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. NRC Inspection and Enforcement Manual, Part 9900: Technical Guidance, Standard Technical Specification 1.0 Definitions, Issue date 12/08/86.

11. FSAR, Table 7.3-28.

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

13. NRC Safety Evaluation Report related to Amendment No. 171 for License No. NPF 14 and Amendment No. 144 for License No. NPF 22.

14. NEDO-32291-A Supplement 1 "System Analyses for the Elimination of Selected Response Time Testing Requirements," October 1999.

INSERT B15

TECH SPEC BASES MARKUP

INSERT B15:

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

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

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

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

19. NEDO-32465-A, "BWR Owners' Group Long-Term Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications," August 1996.

20. BWROG Letter BWROG 9479, L. A. England (BWROG) to M. J. Virgilio, "BWR Owners' Group Guidelines for Stability Interim Corrective Action", June 6, 1994.

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

22. EMF-CC-074(P)(A), Volume 4, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2."

23. GE Letter to PPL, GE-2005-EMC426, "Susquehanna 1 & 2 Minimum LPRM Input Requirement for NUMAC APRM 4-Channel Design," April 26, 2005.

B 3.3 INSTRUMENTATION

B 3.3.1.2 Source Range Monitor (SRM) Instrumentation

BASES

BACKGROUND

The SRMs provide the operator with information relative to the neutron flux level at startup and low flux levels in the core. As such, the SRM indication is used by the operator to monitor the approach to criticality and determine when criticality is achieved. The SRMs are not fully withdrawn from the core until the SRM to intermediate range monitor (IRM) overlap is demonstrated (as required by SR 3.3.1.1.6), when the SRMs are normally fully withdrawn from the core.

The SRM subsystem of the Neutron Monitoring System (NMS) consists of four channels. Each of the SRM channels can be bypassed, but only one at any given time, by the operation of a bypass switch. Each channel includes one detector that can be physically positioned in the core. Each detector assembly consists of a miniature fission chamber with associated cabling, signal conditioning equipment, and electronics associated with the various SRM functions. The signal conditioning equipment converts the current pulses from the fission chamber to analog DC currents that correspond to the count rate. Each channel also includes indication, alarm, and control rod blocks. However, this LCO specifies OPERABILITY requirements only for the monitoring and indication functions of the SRMs.

During refueling, shutdown, and low power operations, the primary indication of neutron flux levels is provided by the SRMs or special movable detectors connected to the normal SRM circuits. The SRMs provide monitoring of reactivity changes during fuel or control rod movement and give the control room operator early indication of unexpected subcritical multiplication that could be indicative of an approach to criticality.

APPLICABLE SAFETY ANALYSES

Prevention and mitigation of prompt reactivity excursions during refueling and low power operation is provided by LCO 3.9.1, "Refueling Equipment Interlocks"; LCO 3.1.1, "SHUTDOWN MARGIN (SDM)"; LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation"; IRM Neutron Flux—High and Average Power Range Monitor (APRM) Neutron Flux—High,

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

Setdown Functions; and LCO 3.3.2.1, "Control Rod Block Instrumentation."

The SRMs have no safety function and are not assumed to function during any FSAR design basis accident or transient analysis. However, the SRMs provide the only on-scale monitoring of neutron flux levels during startup and refueling. Therefore, they are being retained in Technical Specifications.

LCO

During startup in MODE 2, three of the four SRM channels are required to be OPERABLE to monitor the reactor flux level prior to and during control rod withdrawal, subcritical multiplication and reactor criticality, and neutron flux level and reactor period until the flux level is sufficient to maintain the IRMs on Range 3 or above. All but one of the channels are required in order to provide a representation of the overall core response during those periods when reactivity changes are occurring throughout the core.

In MODES 3 and 4, with the reactor shut down, two SRM channels provide redundant monitoring of flux levels in the core.

In MODE 5, during a spiral offload or reload, an SRM outside the fueled region will no longer be required to be OPERABLE, since it is not capable of monitoring neutron flux in the fueled region of the core. Fueled region is a continuous area with fuel. Thus, CORE ALTERATIONS are allowed in a quadrant with no OPERABLE SRM in an adjacent quadrant provided the Table 3.3.1.2-1, footnote (b), requirement that the bundles being spiral reloaded or spiral offloaded are all in a single fueled region containing at least one OPERABLE SRM is met. Spiral reloading and offloading encompass reloading or offloading a cell on the edge of a continuous fueled region (the cell can be reloaded or offloaded in any sequence).

In nonspiral routine operations, two SRMs are required to be OPERABLE to provide redundant monitoring of reactivity changes occurring in the reactor core. Because of the local nature of reactivity changes during refueling, adequate coverage is provided by requiring one SRM to be OPERABLE in

(continued)

B 3.3 INSTRUMENTATION

B 3.3.1.3 Oscillation Power Range Monitor (OPRM)

BASES

BACKGROUND

General Design Criterion 10 (GDC 10) requires the reactor core and associated coolant, control, and protection systems to be designed with appropriate margin to assure that acceptable fuel design limits are not exceeded during any condition of normal operation including the affects of anticipated operational occurrences. Additionally, GDC 12 requires the reactor core and associated coolant control and protection systems to be designed to assure that power oscillations which can result in conditions exceeding acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed. The OPRM System provides compliance with GDC 10 and GDC 12 thereby providing protection from exceeding the fuel MCPR safety limit.

References 1, 2, and 3 describe three separate algorithms for detecting stability related oscillations: the period based detection algorithm, the amplitude based algorithm, and the growth rate algorithm. The OPRM System hardware implements these algorithms in microprocessor based modules. These modules execute the algorithms based on LPRM inputs and generate alarms and trips based on these calculations. These trips result in tripping the Reactor Protection System (RPS) when the appropriate RPS trip logic is satisfied, as described in the Bases for LCO 3.3.1.1, "RPS Instrumentation." Only the period based detection algorithm is used in the safety analysis (Ref. 1, 2, 6, & 7). The remaining algorithms provide defense-in-depth and additional protection against unanticipated oscillations.

The period based detection algorithm detects a stability-related oscillation based on the occurrence of a fixed number of consecutive LPRM signal period confirmations followed by the LPRM signal amplitude exceeding a specified setpoint. Upon detection of a stability related oscillation a trip is generated for that OPRM channel.

(continued)

BASES

BACKGROUND (continued)	The OPRM System consists of 4 OPRM trip channels, each channel consisting of two OPRM modules. Each OPRM module receives input from LPRMs. Each OPRM module also receives input from the NMS average power range monitor (APRM) power and flow signals to automatically enable the trip function of the OPRM module. Each OPRM module is continuously tested by a self-test function. On detection of any OPRM module failure, either a Trouble alarm or INOP alarm is activated. The OPRM module provides an INOP alarm when the self-test feature indicates that the OPRM module may not be capable of meeting its functional requirements.
APPLICABLE SAFETY ANALYSES	It has been shown that BWR cores may exhibit thermal-hydraulic reactor instabilities in high power and low flow portions of the core power to flow operating domain. GDC 10 requires the reactor core and associated coolant control and protection systems to be designed with appropriate margin to assure that acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. GDC 12 requires assurance that power oscillations which can result in conditions exceeding acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed. The OPRM System provides compliance with GDC 10 and GDC 12 by detecting the onset of oscillations and suppressing them by initiating a reactor scram. This assures that the MCPR safety limit will not be violated for anticipated oscillations. The OPRM Instrumentation satisfies Criteria 3 of the NRC Policy Statement.
LCO	Four channels of the OPRM System are required to be OPERABLE to ensure that stability related oscillations are detected and suppressed prior to exceeding the MCPR safety limit. Only one of the two OPRM modules is required for OPRM channel OPERABILITY. The minimum number of LPRMs required OPERABLE to maintain an OPRM channel OPERABLE is consistent with the minimum number of LPRMs required to maintain the APRM system OPERABLE per LCO 3.3.1.1.

(continued)

BASES

LCO (continued)

The OPRM setpoints are determined based on the NRC approved methodology described in NEDO-32465-A (Ref 6). The Allowable Value for the OPRM Period Based Algorithm setpoint (SP) is derived from the analytic limit corrected for instrument and calibration errors as contained in the COLR.

The OPRM bypass flow setpoint (SR 3.3.1.3.5) is conservatively established based on the greater of 60 MLb/Hr. (NEDO-32465-A) and the value obtained based on the NRC approved methodology described in EMF-CC-074(P)(A), Volume 4, (Ref 11).

APPLICABILITY

The OPRM instrumentation is required to be OPERABLE in order to detect and suppress neutron flux oscillations in the event of thermal-hydraulic instability. As described in References 1, 2, and 3, the power/core flow region protected against anticipated oscillations is defined by THERMAL POWER ≥ 30% RTP and core flow ≤ 65 MLb/Hr. The OPRM trip is required to be enabled in this region, and the OPRM must be capable of enabling the trip function as a result of anticipated transients that place the core in that power/flow condition. Therefore, the OPRM is required to be OPERABLE with THERMAL POWER ≥ 25% RTP and at all core flows while above that THERMAL POWER. It is not necessary for the OPRM to be operable with THERMAL POWER ≤ 25% RTP because transients from below this THERMAL POWER are not anticipated to result in power that exceeds 30% RTP.

ACTIONS

A Note has been provided to modify the ACTIONS related to the OPRM instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable OPRM instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable OPRM instrumentation channel.

(continued)

BASES

ACTIONS (continued)

A.1, A.2 and A.3

Because of the reliability and on-line self-testing of the OPRM instrumentation and the redundancy of the RPS design, an allowable out of service time of 30 days has been shown to be acceptable (Ref. 7) to permit restoration of any inoperable channel to OPERABLE status. However, this out of service time is only acceptable provided the OPRM instrumentation still maintains OPRM trip capability (refer to Required Actions B.1 and B.2). The remaining OPERABLE OPRM channels continue to provide trip capability (see Condition B) and provide operator information relative to stability activity. The remaining OPRM modules have high reliability. With this high reliability, there is a low probability of a subsequent channel failure within the allowable out of service time. In addition, the OPRM modules continue to perform on-line self-testing and alert the operator if any further system degradation occurs.

If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the OPRM channel or associated RPS trip system must be placed in the tripped condition per Required actions A.1 and A.2. Placing the inoperable OPRM channel in trip (or the associated RPS trip system in trip) would conservatively compensate for the inoperability, provide the capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the OPRM channel (or RPS trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), the alternate method of detecting and suppressing thermal hydraulic instability oscillations is required (Required Action A.3). This alternate method is described in Reference 5. It consists of increased operator awareness and monitoring for neutron flux oscillations when operating in the region where oscillations are possible. If indications of oscillation, as described in Reference 5 are observed by the operator, the operator will take the actions described by procedures which include initiating a manual scram of the reactor. The power/flow map regions are developed based on methodology in Reference 11. The applicable regions are contained in the COLR.

(continued)

BASES

ACTIONS (continued)

B.1 and B.2

Required action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped OPRM channels within the same RPS trip system result in not maintaining OPRM trip capability. OPRM trip capability is considered to be maintained when sufficient OPRM channels are OPERABLE or in trip (or the associated RPS trip system is in trip), such that a valid OPRM signal will generate a trip signal in both RPS trip systems (this would require both RPS trip systems to have at least one OPRM channel OPERABLE or the associated RPS trip system in trip).

Because of the low probability of the occurrence of an instability, 12 hours is an acceptable time to initiate the alternate method of detecting and suppressing thermal hydraulic instability oscillations described in Action A.3 above. The alternate method of detecting and suppressing thermal hydraulic instability oscillations would adequately address detection and mitigation in the event of instability oscillations. Based on industry operating experience with actual instability oscillation, the operator would be able to recognize instabilities during this time and take action to suppress them through a manual scram. In addition, the OPRM System may still be available to provide alarms to the operator if the onset of oscillations were to occur. Since plant operation is minimized in areas where oscillations may occur, operation for 120 days without OPRM trip capability is considered acceptable with implementation of the alternate method of detecting and suppressing thermal hydraulic instability oscillations.

C.1

With any Required Action and associated Completion Time not met, THERMAL POWER must be reduced to < 25% RTP within 4 hours. Reducing THERMAL POWER to < 25% RTP places the plant in a condition where instabilities are not likely to occur. The 4 hours is reasonable, based on operating experience, to reduce THERMAL POWER < 25% RTP from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.3.1

A CHANNEL FUNCTIONAL TEST is performed to ensure that the entire channel will perform the intended function. A Frequency of 184 days provides an acceptable level of system average availability over the Frequency and is based on the reliability of the channel (Ref. 7).

SR 3.3.1.3.2

LPRM gain settings are determined from the local flux profiles measured by the Traversing Incore Probe (TIP) System. This establishes the relative local flux profile for appropriate representative input to the OPRM System. The 1000 MWD/MT Frequency is based on operating experience with LPRM sensitivity changes.

SR 3.3.1.3.3

A CHANNEL CALIBRATION 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. Calibration of the channel provides a check of the internal reference voltage and the internal processor clock frequency. It also compares the desired trip setpoints with those in processor memory. Since the OPRM is a digital system, the internal reference voltage and processor clock frequency are, in turn, used to automatically calibrate the internal analog to digital converters. As noted, neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 1000 MWD/MT LPRM calibration using the TIPs (SR 3.3.1.3.2).

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency of 24 months is based upon the assumption of the magnitude of equipment drift provided by the equipment supplier. (Ref. 7)

SR 3.3.1.3.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods, in LCO 3.1.3, "Control Rod OPERABILITY," and scram discharge volume (SDV) vent and drain valves, in LCO 3.1.8, "Scram Discharge Volume (SDV) Vent and Drain Valves," overlaps this Surveillance to provide complete testing of the assumed safety function. The OPRM self-test function may be utilized to perform this testing for those components that it is designed to monitor.

The 24 month Frequency is based on engineering judgement, reliability of the components and operating experience.

SR 3.3.1.3.5

The SR ensures that trips initiated from the OPRM System will not be inadvertently bypassed when THERMAL POWER is ≥ 30% RTP and core flow is ≤ 65 MLb/Hr. This normally involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodology are incorporated into the actual setpoints (Ref. 7).

If any bypass channel setpoint is nonconservative (i.e., the OPRM module is bypassed at ≥ 30% RTP and core flow is ≤ 65 MLb/Hr), then the affected OPRM module is considered inoperable. Alternatively, the bypassed channel can be manually placed in the conservative position (Manual Enable). If placed in the MANUAL ENABLE condition, this SR is met and the module is considered OPERABLE.

The 24 month Frequency is based on engineering judgement and reliability of the components.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.3.6

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the safety analysis (Ref. 6). The OPRM self-test function may be utilized to perform this testing for those components it is designed to monitor. The LPRM amplifier cards inputting to the OPRM are excluded from the OPRM RESPONSE TIME testing. The RPS RESPONSE TIME acceptance criteria are included in Reference 8.

As noted, neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time. RPS RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS. This Frequency is based upon operating experience, which shows that random failures of instrumentation components causing serious time degradation, but not channel failure, are infrequent occurrences.

(continued)

BASES

REFERENCES

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

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

3. NRC Letter, A. Thadani to L.A. England, "Acceptance for Referencing of Topical Reports NEDO-31960, Supplement 1, 'BWR Owners Group Long-Term Stability Solutions Licensing Methodology". July 12, 1994.

4. Generic Letter 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors", July 11, 1994.

5. BWROG Letter BWROG-9479, "Guidelines for Stability Interim Corrective Action", June 6, 1994.

6. NEDO-32465-A, "BWR Owners Group Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology and Reload Applications", August 1996.

7. CENPD-400-P-A, Rev 01, "Generic Topical Report for the ABB Option III Oscillation Power Range Monitor (OPRM)", May 1995.

8. FSAR Table 7.3-28.

9. FSAR Section 4.4.4.6.

10. FSAR Section 7.2.

11. EMF-CC-074(P)(A), Volume 4, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2."

B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

BACKGROUND

Control rods provide the primary means for control of reactivity changes. Control rod block instrumentation includes channel sensors, logic circuitry, switches, and relays that are designed to ensure that specified fuel design limits are not exceeded for postulated transients and accidents. During high power operation, the rod block monitor (RBM) provides protection for control rod withdrawal error events. During low power operations, control rod blocks from the rod worth minimizer (RWM) enforce specific control rod sequences designed to mitigate the consequences of the control rod drop accident (CRDA). During shutdown conditions, control rod blocks from the Reactor Mode Switch—Shutdown Position Function ensure that all control rods remain inserted to prevent inadvertent criticalities.

The purpose of the RBM is to limit control rod withdrawal if localized neutron flux exceeds a predetermined setpoint during control rod manipulations. The RBM supplies a trip signal to the Reactor Manual Control System (RMCS) to appropriately inhibit control rod withdrawal during power operation above the low power range setpoint. The RBM has two channels, either of which can initiate a control rod block when the channel output exceeds the control rod block setpoint. One RBM channel inputs into one RMCS rod block circuit and the other RBM channel inputs into the second RMCS rod block circuit. The RBM channel signal is generated by averaging a set of local power range monitor (LPRM) signals at various core heights surrounding the control rod being withdrawn. A signal from one average power range monitor (APRM) channel assigned to each Reactor Protection System (RPS) trip system supplies a reference signal for the RBM channel in the same trip system. This reference signal is used to enable the RBM. If the APRM is indicating less than the low power range setpoint, the RBM is automatically bypassed. The RBM is also automatically bypassed if a peripheral control rod is selected (Ref. 2).

The purpose of the RWM is to control rod patterns during startup, such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to 10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. Prescribed control rod sequences are stored in the RWM, which will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the stored sequence. The RWM determines the actual sequence

(continued)

INSERT B16:

An APRM flux signal from one of the four redundant average power range monitor (APRM) channels supplies a reference signal for one of the RBM channels and an APRM flux signal from another of the APRM channels supplies the reference signal to the second RBM channel.

BASES

ACTIONS (continued)

D.1

With the RWM inoperable during a reactor shutdown, the operator is still capable of enforcing the prescribed control rod sequence. Required Action D.1 allows for the RWM Function to be performed manually and requires a double check of compliance with the prescribed rod sequence by a second licensed operator (Reactor Operator or Senior Reactor Operator) or other qualified member of the technical staff. The RWM may be bypassed under these conditions to allow the reactor shutdown to continue.

E.1 and E.2

With one Reactor Mode Switch—Shutdown Position control rod withdrawal block channel inoperable, the remaining OPERABLE channel is adequate to perform the control rod withdrawal block function. However, since the Required Actions are consistent with the normal action of an OPERABLE Reactor Mode Switch—Shutdown Position Function (i.e., maintaining all control rods inserted), there is no distinction between having one or two channels inoperable.

In both cases (one or both channels inoperable), suspending all control rod withdrawal and initiating action to fully insert all insertable control rods in core cells containing one or more fuel assemblies will ensure that the core is subcritical with adequate SDM ensured by LCO 3.1.1. Control rods in core cells containing no fuel assemblies do not affect the reactivity of the core and are therefore not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

As noted at the beginning of the SRs, the SRs for each Control Rod Block instrumentation Function are found in the SRs column of Table 3.3.2.1-1.

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

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that a control rod block will be initiated when necessary.

SR 3.3.2.1.1

A CHANNEL FUNCTIONAL TEST is performed for each RBM channel to ensure that the entire channel will perform the intended function. It includes the Reactor Manual Control Multiplexing System input. The Frequency of 92 [184] days is based on reliability analyses (Ref. 8) [(Refs. 8, 12, and 13)].

SR 3.3.2.1.2 and SR 3.3.2.1.3

A CHANNEL FUNCTIONAL TEST is performed for the RWM to ensure that the entire system will perform the intended function. The CHANNEL FUNCTIONAL TEST for the RWM is performed by attempting to withdraw a control rod not in compliance with the prescribed sequence and verifying a control rod block occurs and by verifying proper indication of the selection error of at least one out-of-sequence control rod. As noted in the SRs, SR 3.3.2.1.2 is not required to be performed until 1 hour after any control rod is withdrawn in MODE 2. As noted, SR 3.3.2.1.3 is not required to be performed until 1 hour after THERMAL POWER is ≤ 10% RTP in MODE 1. This allows entry into MODE 2 for SR 3.3.2.1.2, and entry into MODE 1 when THERMAL POWER is ≤ 10% RTP for SR 3.3.2.1.3, to perform the required Surveillance if the 92 day Frequency is not met per SR 3.0.2. The 1 hour allowance is based on operating experience and in consideration of providing a reasonable time in which to complete the SRs. The Frequencies are based on reliability analysis (Ref. 8).

SR 3.3.2.1.4

The RBM trips are automatically bypassed when power is below a specified value and a peripheral control rod is not selected. The power Allowable Value must be verified periodically to not be bypassed when ≥ 30% RTP. This is performed by a Functional check. If any RBM bypass setpoint is non-conservative, then the affected RBM channel is

(continued)

BASES (continued)

REFERENCES

1. FSAR, Section 7.7.1.2.8.
2. FSAR, Section 7.6.1.a.5.7
3. NEDE-24011-P-A-9-US, "General Electrical Standard Application for Reload Fuel," Supplement for United States, Section S 2.2.3.1, September 1988.
4. "Modifications to the Requirements for Control Rod Drop Accident Mitigating Systems," BWR Owners' Group, July 1986.
5. NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.
6. NRC SER, "Acceptance of Referencing of Licensing Topical Report NEDE-24011-P-A," "General Electric Standard Application for Reactor Fuel, Revision 8, Amendment 17," December 27, 1987.
7. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 32193)
8. NEDC-30851-P-A, "Technical Specification Improvement Analysis for BWR Control Rod Block Instrumentation," October 1988.
9. GENE-770-06-1, "Addendum to Bases for changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation, Technical Specifications," February 1991.
10. FSAR, Section 15.4.2.
11. NEDO 33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," April 2003.

INSERT B17

TECH SPEC BASES MARKUP

INSERT B17:

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

BASES

APPLICABLE SAFETY ANALYSES (continued)

Plant specific LOCA analyses have been performed assuming only one operating recirculation loop. These analyses have demonstrated 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, provided that the APLHGR limit for SPC ATRIUM™-10 fuel is modified.

The transient analyses of Chapter 15 of the FSAR have also been performed for single recirculation loop operation 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 APLHGR, LHGR, and MCPR limits for single loop operation are specified in the COLR. The APRM ~~flow biased simulated THERMAL POWER~~ setpoint is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." In addition, a restriction on recirculation pump speed is incorporated to address reactor vessel internals vibration concerns and assumptions in the event analysis.

Simulated Thermal Power - High

Recirculation loops operating satisfies Criterion 2 of the NRC Policy Statement (Ref. 5).

LCO

Two recirculation loops are 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 assumptions of the LOCA analysis are satisfied. With the limits specified in SR 3.4.1.1 not met, the recirculation loop with the lower flow must be considered not in operation. With only one recirculation loop in operation, modifications to the required APLGHR limits (LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE"), LHGR limits (LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)"), and APRM ~~Flow Biased~~ Simulated Thermal Power—High setpoint (LCO 3.3.1.1) may be applied to allow continued operation consistent with the safety analysis assumptions. Furthermore, restrictions are placed on recirculation pump speed to ensure the initial assumption of the event analysis are maintained.

(continued)

BASES

LCO (continued)

The LCO is modified by a Note that allows up to 12 hours to establish the required limits and setpoints after a change from two recirculation loops operation to single recirculation loop operation. If the limits and setpoints are not in compliance with the applicable requirements at the end of the this period, the ACTIONS required by the applicable specifications must be implemented. This time is provided to stabilize operation with one recirculation loop by: limiting flow in the operating loop, limiting total THERMAL POWER, monitor APRM and local power range monitor (LPRM) neutron flux noise levels; and, fully implementing and confirming the required limit and setpoint 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.

ACTIONS

A.1

When operating with no recirculation loops operating in MODE 1, the potential for thermal-hydraulic oscillations is greatly increased. Although this transient is protected for expected modes of oscillation by the OPRM system, when OPERABLE per LCO ~~3.3.1.3~~ 3.3.1.1, Function 2.f (Reference 3, 4), the prudent response to the natural circulation condition is to preclude potential thermal-hydraulic oscillations by immediately placing the mode switch in the shutdown position.

B.1

Recirculation loop flow must match within required limits when both recirculation loops are in operation. If flow mismatch is not within required limits, matched flow must be restored within 2 hours. If matched flows are not restored, the recirculation loop with lower flow must be declared "not in operation." Should a LOCA occur with recirculation loop flow not matched, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed prior to imposing restrictions associated with single loop operation. Operation with only one recirculation loop satisfies the requirements of the LCO and the initial conditions of the accident sequence.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

CRDA analyses assume that the reactor operator follows prescribed withdrawal sequences. For SDM tests performed within these defined sequences, the analyses of Reference 1 is applicable. However, for some sequences developed for the SDM testing, the control rod patterns assumed in the safety analyses of Reference 1 may not be met. Therefore, special CRDA analyses, performed in accordance with an NRC approved methodology, are required to demonstrate the SDM test sequence will not result in unacceptable consequences should a CRDA occur during the testing. For the purpose of this test, the protection provided by the normally required MODE 5 applicable LCOs, in addition to the requirements of this LCO, will maintain normal test operations as well as postulated accidents within the bounds of the appropriate safety analyses (Ref. 1). In addition to the added requirements for the RWM, APRM, and control rod coupling, the notch out mode is specified for control rod withdrawals that are not in conformance with the BPWS. Requiring the notch out mode limits withdrawal steps to a single notch, which limits inserted reactivity, and allows adequate monitoring of changes in neutron flux, which may occur during the test.

As described in LCO 3.0.7, compliance with Special Operations LCOs is optional, and therefore, no criteria of the NRC Policy Statement apply. Special Operations LCOs provide flexibility to perform certain operations by appropriately modifying requirements of other LCOs. A discussion of the criteria satisfied for the other LCOs is provided in their respective Bases.

LCO

As described in LCO 3.0.7, compliance with this Special Operations LCO is optional. SDM tests may be performed while in MODE 2, in accordance with Table 1.1-1, without meeting this Special Operations LCO or its ACTIONS. For SDM tests performed while in MODE 5, additional requirements must be met to ensure that adequate protection against potential reactivity excursions is available. To provide additional scram protection, beyond the normally required IRMs, the APRMs are also required to be OPERABLE (LCO 3.3.1.1, Functions ~~2.a and 2.d~~ 2.a, 2.d and 2.e) as though the reactor were in MODE 2. Because multiple control rods will be withdrawn and the reactor will potentially become critical, RPS MODE 2 requirements for Functions ~~2.a and 2.d~~ 2.a, 2.d and 2.e of Table 3.3.1.1-1

(continued)

BASES

ACTIONS

A.1 (continued)

are governed by subsequent entry into the Condition and application of the Required Actions.

B.1

With one or more of the requirements of this LCO not met for reasons other than an uncoupled control rod, the testing should be immediately stopped by placing the reactor mode switch in the shutdown or refuel position. This results in a condition that is consistent with the requirements for MODE 5 where the provisions of this Special Operations LCO are no longer required.

SURVEILLANCE REQUIREMENTS

SR 3.10.8.1

Performance of the applicable SRs for LCO 3.3.1.1, Functions 2.a and 2.d will ensure that the reactor is operated within the bounds of the safety analysis.

SR 3.10.8.1, SR 3.10.8.2, and SR 3.10.8.3

, 2.d and 2.e,

LCO 3.3.1.1, Functions 2.a ~~and 2.d~~, made applicable in this Special Operations LCO, are required to have applicable Surveillances met to establish that this Special Operations LCO is being met. However, the control rod withdrawal sequences during the SDM tests may be enforced by the RWM (LCO 3.3.2.1, Function 2, MODE 2 requirements) or by a second licensed operator or other qualified member of the technical staff. As noted, either the applicable SRs for the RWM (LCO 3.3.2.1) must be satisfied according to the applicable Frequencies (SR 3.10.8.2), or the proper movement of control rods must be verified (SR 3.10.8.3). This latter verification (i.e., SR 3.10.8.3) must be performed during control rod movement to prevent deviations from the specified sequence. These surveillances provide adequate assurance that the specified test sequence is being followed.

(continued)

Unit 2

Technical Specification Bases Mark-ups

For Information

BASES

ACTIONS

A.1 (continued)

Insert B1

The APRM setpoints include the APRM Rod Block Flow Bias Neutron Flux Upscale Setpoint which is controlled in the Technical Requirements Manual 3.1.3 "Control Rod Block Instrumentation."

B.1

If MFLPD cannot be restored to within its required limits within the associated Completion Time, the plant must be brought to a MODE or other specified condition in which the LCO does not apply. To achieve this status, THERMAL POWER is reduced to < 25% RTP within 4 hours. The allowed Completion Time is reasonable, based on operating experience, to reduce THERMAL POWER to < 25% RTP in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.2.4.1 and SR 3.2.4.2

The MFLPD is required to be calculated and compared to FRTP or APRM gain or setpoints to ensure that the reactor is operating within the assumptions of the safety analysis. These SRs are only required to determine the MFLPD and, assuming MFLPD is greater than FRTP, the appropriate gain or setpoint, and is not intended to be a CHANNEL FUNCTIONAL TEST for the APRM gain or flow biased neutron flux scram circuitry (functions). The 24 hour Frequency of SR 3.2.4.1 is chosen to coincide with the determination of other thermal limits, specifically those for the APLHGR (LCO 3.2.1). The 24 hour Frequency is based on both engineering judgment and recognition of the slowness of changes in power distribution during normal operation. The 24 hour allowance after THERMAL POWER ≥ 25% RTP is achieved is acceptable given the large inherent margin to operating limits at low power levels and because the MFLPD must be calculated prior to exceeding 50% RTP unless performed in the previous 24 hours. When MFLPD is greater than FRTP, SR 3.2.4.2 must be performed. The 12 hour Frequency of SR 3.2.4.2 requires a more frequent verification when MFLPD is greater than the fraction of rated thermal power (FRTP) because more rapid changes in power distribution are typically expected.

(continued)

TECH SPEC BASES MARKUP

INSERT B1:

The APRM setpoints include the APRM Simulated Thermal Power – High RPS scram setpoint, LCO 3.3.1.1 "RPS Instrumentation," Function 2.b, and APRM Simulated Thermal Power – High rod block setpoint, Technical Requirements Manual (TRM) TRO 3.1.3 "Control Rod Block Instrumentation", Function 1.b.

Insert B2

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Average Power Range Monitor

2.a. Average Power Range Monitor Neutron Flux—High, Setdown

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. 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 Intermediate Range Monitor Neutron Flux—High Function because of the relative setpoints. With the IRMs at Range 9 or 10, 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.

Remove , comma after High (β)

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 APRM System is divided into two trip systems with three APRM channel inputs to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Neutron Flux—High, Setdown with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 14 LPRM inputs are required for each APRM channel, with at least two

(continued)

TECH SPEC BASES MARKUP

INSERT B2:

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

The APRM trip 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 Trip 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, with no more than [9], LPRM detectors declared inoperable since the most recent APRM gain calibration. Per Reference 23, the minimum input requirement for an APRM channel with 43 LPRM inputs is determined given that the total number of LPRM outputs used as inputs to an APRM channel that may be bypassed shall not exceed twenty-three (23). Hence, (20) LPRM inputs needed to be operable. For the OPRM Trip Function 2.f, each LPRM in an APRM channel is further associated in a pattern of OPRM "cells," as described in References 17 and 18. Each OPRM cell is capable of producing a channel trip signal.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

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

LPRM inputs from each of the four axial levels at which the LPRMs are located.

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 protects against control rod withdrawal error events.

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function monitors 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 Fixed Neutron Flux—High Function Allowable Value. The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function is not credited in any plant Safety Analyses. The Average Power Range Monitor Flow Biased Simulated Thermal Power – High Function Limit is set above the APRM Rod Block to provide defense in depth to the APRM fixed Neutron Flux – High for transients where THERMAL POWER increases slowly (such as loss of feedwater heating event). During these events, the THERMAL POWER increase does not significantly lag the neutron flux response and, because of a lower trip setpoint, will initiate a scram before the high neutron flux scram. For rapid neutron flux increase events, the THERMAL POWER lags the neutron flux and the Average Power Range Monitor Fixed Neutron Flux—High Function will provide a scram signal before the Average

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High (continued)

Power Range Monitor Flow Biased Simulated Thermal Power—High Function setpoint is exceeded.

Insert B3

The APRM System is divided into two trip systems with three APRM inputs to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Flow Biased Simulated Thermal Power—High with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 14 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located. Each APRM channel receives two total drive flow signals representative of total core flow. The total drive flow signals are generated by four flow units, two of which supply signals to the trip system A APRMs, while the other two supply signals to the trip system B APRMs. Each flow unit signal is provided by summing up the flow signals from the two recirculation loops. To obtain the most conservative reference signals, the total flow signals from the two flow units (associated with a trip system as described above) are routed to a low auction circuit associated with each APRM. Each APRM's auction circuit selects the lower of the two flow unit signals for use as the scram trip reference for that particular APRM. Each required Average Power Range Monitor Flow Biased Simulated Thermal Power—High channel only requires an input from one OPERABLE flow unit, because the function is not credited in the Safety Analyses and the individual APRM channel will perform the intended function with only one OPERABLE flow unit input. Industry standards (e.g., IEEE-279-1971) require that a system be single failure proof if it performs a protective function (e.g., mitigate an accident described in the SAR). A review of the Safety Analyses described in the FSAR demonstrate that the APRM Flow Biased Simulated Thermal Power – High scram is not credited. Since the flow-biased scram is not credited it does not need to meet single failure criteria. Therefore, an inoperable flow unit does not require that the associated trip system be declared inoperable. However, if both flow units in a given trip system become inoperable, then one of the two required Average Power Range Monitor Flow Biased Simulated Thermal Power – High channels in the associated trip system must be considered inoperable.

(continued)

TECH SPEC BASES MARKUP

INSERT B3:

The Average Power Range Monitor Simulated Thermal Power - High Function uses a trip level generated based on recirculation loop drive flow (W) representative of total core flow. Each APRM channel uses one total recirculation drive flow signal. The total recirculation drive flow signal is generated by the flow processing logic, part of the APRM channel, by summing the flow calculated from two flow transmitter signal inputs, one from each of the two recirculation drive flow loops. The flow processing logic OPERABILITY is part of the APRM channel OPERABILITY requirements for this Function.

The adequacy of drive flow as a representation of core flow is ensured through drive flow alignment, accomplished by SR 3.3.1.1.20.

A note is included, applicable when the plant is in single recirculation loop operation per LCO 3.4.1, which requires reducing by ΔW the recirculation flow value used in the APRM Simulated Thermal Power - High Allowable Value equation. The Average Power Range Monitor Scram Function varies as a function of recirculation loop drive flow (W). ΔW is defined as the difference in indicated drive flow (in percent of drive flow, which produces rated core flow) between two loop and single loop operation at the same core flow. 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. This adjusted Allowable Value thus maintains thermal margins essentially unchanged from those for two-loop operation.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High (continued)

The THERMAL POWER time constant of < 7 seconds is based on the fuel heat transfer dynamics and provides a signal proportional to the THERMAL POWER. The simulated thermal time constant is part of the filter circuit that simulates the relationship between neutron flux and core thermal power.

filtering logic in the APRM

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function and at least one flow unit per division are required to be OPERABLE in MODE 1 when there is the possibility of generating excessive THERMAL POWER and potentially exceeding the SL applicable to high pressure and core flow conditions (MCPR SL). During MODES 2 and 5, other IRM and APRM Functions provide protection for fuel cladding integrity.

is

2.c. Average Power Range Monitor Fixed Neutron Flux—High

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The Average Power Range Monitor Fixed Neutron Flux—High Function is capable of generating a trip signal to prevent fuel damage or excessive RCS pressure. For the overpressurization protection analysis of Reference 4, the Average Power Range Monitor Fixed Neutron Flux—High Function is assumed to terminate the main steam isolation valve (MSIV) closure event and, along with the safety/relief valves (S/RVs), limits the peak reactor pressure vessel (RPV) pressure to less than the ASME Code limits. The control rod drop accident (CRDA) analysis (Ref. 5) takes credit for the Average Power Range Monitor Fixed Neutron Flux—High Function to terminate the CRDA.

The APRM System is divided into two trip systems with three APRM channels inputting to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.c. Average Power Range Monitor Fixed Neutron Flux—High (continued)

Average Power Range Monitor Fixed Neutron Flux—High with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 14 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located.

The CRDA analysis assume that reactor scram occurs on Average Power Range Monitor Fixed Neutron Flux - High Function.

The Average Power Range Monitor Fixed Neutron Flux—High Function is required to be OPERABLE in MODE 1 where the potential consequences of the analyzed transients could result in the SLs (e.g., MCPR and RCS pressure) being exceeded. Although the Average Power Range Monitor Fixed Neutron Flux—High Function is assumed in the CRDA analysis, which is applicable in MODE 2, the Average Power Range Monitor Neutron Flux—High (Setdown) Function conservatively bounds the assumed trip and, together with the assumed IRM trips, provides adequate protection. Therefore, the Average Power Range Monitor Fixed Neutron Flux—High Function is not required in MODE 2.

2.d. Average Power Range Monitor—Inop

Insert B4

This signal provides assurance that a minimum number of APRMs are OPERABLE. Anytime an APRM mode switch is moved to any position other than "Operate" or the APRM has too few LPRM inputs (< 14), an inoperative trip signal will be received by the RPS, unless the APRM is bypassed. Since only one APRM in each trip system may be bypassed, only one APRM in each trip system may be inoperable without resulting in an RPS trip signal. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

(continued)

TECH SPEC BASES MARKUP

INSERT B4:

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 its associated trip system.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.d. Average Power Range Monitor—Inop (continued)

Four channels of Average Power Range Monitor—Inop with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal.

There is no Allowable Value for this Function.

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

Insert B5

3. Reactor Vessel Steam Dome Pressure—High

An increase in the RPV pressure during reactor operation compresses the steam voids and results in a positive reactivity insertion. This causes the neutron flux and THERMAL POWER transferred to the reactor coolant to increase, which could challenge the integrity of the fuel cladding and the RCPB. This trip Function is assumed in the low power generator load rejection without bypass and the recirculation flow controller failure (increasing) event. However, the Reactor Vessel Steam Dome Pressure—High Function initiates a scram for transients that results in a pressure increase, counteracting the pressure increase by rapidly reducing core power. For the overpressurization protection analysis of Reference 4, reactor scram (the analyses conservatively assume scram on the Average Power Range Monitor Fixed Neutron Flux—High signal, not the Reactor Vessel Steam Dome Pressure—High signal), along with the S/RVs, limits the peak RPV pressure to less than the ASME Section III Code limits.

High reactor pressure signals are initiated from four pressure instruments that sense reactor pressure. The Reactor Vessel Steam Dome Pressure—High Allowable Value is chosen to provide a sufficient margin to the ASME Section III Code limits during the event.

Four channels of Reactor Vessel Steam Dome Pressure—High Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. The Function is

(continued)

TECH SPEC BASES MARKUP

INSERT B5:

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

The 2-out-of-4 Voter Function provides the interface between the APRM Functions, including the OPRM Trip 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 is required 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 RPS trip system.

The Two-Out-Of-Four Logic Module includes both the 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 Two-Out-Of-Four Logic Module. The voter includes separate outputs to RPS for the two independently voted sets of Functions, each of which is redundant (four total outputs). The analysis in Reference 15 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. The voter Function 2.e does not need to be declared inoperable due to any failure affecting only the APRM Interface hardware portion of the Two-Out-Of-Four Logic Module.

There is no Allowable Value for this Function.

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

The OPRM Trip Function provides compliance with GDC 10, "Reactor Design," and GDC 12, "Suppression of Reactor Power Oscillaitons" thereby providing protection from exceeding the fuel MCPR safety limit (SL) due to anticipated thermal-hydraulic power oscillations.

References 17, 18 and 19 describe three algorithms for detecting thermal-hydraulic instability related neutron flux oscillations: the period based detection algorithm (confirmation count and cell amplitude), the amplitude based algorithm, and the growth rate algorithm. All three are implemented in the OPRM Trip Function, but the safety analysis takes credit only for the period based detection algorithm. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. OPRM Trip Function OPERABILITY for Technical Specification purposes is based only on the period based detection algorithm.

The OPRM Trip 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.

(continued next sheet)

INSERT B5 (continued):

The OPRM Trip is automatically enabled (bypass removed) when THERMAL POWER is ≥ 30% RTP, as indicated by the APRM Simulated Thermal Power, and reactor core flow is ≤ the value defined in the COLR, as indicated by APRM measured recirculation drive flow. This is the operating region where actual thermal-hydraulic instability and related neutron flux oscillations are expected to occur. Reference 21 includes additional discussion of OPRM Trip enable region limits.

These setpoints, which are sometimes referred to as the "auto-bypass" setpoints, establish the boundaries of the OPRM Trip enabled region. The APRM Simulated Thermal Power auto-enable setpoint has 1% deadband while the drive flow setpoint has a 2% deadband. The deadband for these setpoints is established so that it increases the enabled region once the region is entered.

The OPRM Trip 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 without operator action while the plant is operating below 30% RTP causes a power increase to or beyond the 30% APRM Simulated Thermal Power OPRM Trip auto-enable setpoint. This OPERABILITY requirement assures that the OPRM Trip auto-enable function will be OPERABLE when required.

An APRM channel is also required to have a minimum number of OPRM cells OPERABLE for the Upscale Function 2.f to be OPERABLE. The OPRM cell operability requirements are documented in the Technical Requirements Manual, TRO 3.3.9, and are established as necessary to support the trip setpoint calculations performed in accordance with methodologies in Reference 19.

An OPRM Trip is issued from an APRM channel when the period based detection algorithm 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 OPRM Trip from that channel. An OPRM Trip is also issued from the channel if either the growth rate or amplitude based algorithms detect oscillatory changes in the neutron flux for one or more cells in that channel. (Note: To facilitate placing the OPRM Trip Function 2.f in one APRM channel in a "tripped" state, if necessary to satisfy a Required Action, the APRM equipment is conservatively designed to force an OPRM Trip output from the APRM channel if an APRM Inop condition occurs, such as when the APRM chassis keylock switch is placed in the Inop position.)

There are three "sets" of OPRM related setpoints or adjustment parameters: a) OPRM Trip auto-enable region setpoints for STP and drive flow; b) period based detection algorithm (PBDA) confirmation count and amplitude setpoints; and c) period based detection algorithm tuning parameters.

The first set, the OPRM Trip auto-enable setpoints, as discussed in the SR 3.3.1.1.19 Bases, are treated as nominal setpoints with no additional margins added. The settings are defined in the Technical Requirements Manual, TRO 3.3.9, 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 19, 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 requirements in the Technical Requirements Manual, TRO 3.3.9.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

4. Reactor Vessel Water Level—Low, Level 3 (continued)

Level 1 provide sufficient protection for level transients in all other MODES.

5. Main Steam Isolation Valve—Closure

MSIV closure results in loss of the main turbine and the condenser as a heat sink for the nuclear steam supply system and indicates a need to shut down the reactor to reduce heat generation. Therefore, a reactor scram is initiated on a Main Steam Isolation Valve—Closure signal before the MSIVs are completely closed in anticipation of the complete loss of the normal heat sink and subsequent overpressurization transient. However, for the overpressurization protection analysis of Reference 4, the Average Power Range Monitor Fixed Neutron Flux—High Function, along with the S/RVs, limits the peak RPV pressure to less than the ASME Code limits. That is, the direct scram on position switches for MSIV closure events is not assumed in the overpressurization analysis. Additionally, MSIV closure is assumed in the transients analyzed in Reference 7 (e.g., low steam line pressure, manual closure of MSIVs, high steam line flow). The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the ECCS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

MSIV closure signals are initiated from position switches located on each of the eight MSIVs. Each MSIV has two position switches; one inputs to RPS trip system A while the other inputs to RPS trip system B. Thus, each RPS trip system receives an input from eight Main Steam Isolation Valve—Closure channels, each consisting of one position switch. The logic for the Main Steam Isolation Valve—Closure Function is arranged such that either the inboard or outboard valve on three or more of the main steam lines must close in order for a scram to occur.

The Main Steam Isolation Valve—Closure Allowable Value is specified to ensure that a scram occurs prior to a significant reduction in steam flow, thereby reducing the severity of the subsequent pressure transient.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

8. Turbine Stop Valve—Closure (continued)

the transients that would result from the closure of these valves. The Turbine Stop Valve—Closure Function is the primary scram signal for the turbine trip event analyzed in Reference 7. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the End of Cycle Recirculation Pump Trip (EOC-RPT) System, ensures that the MCPR SL is not exceeded. Turbine Stop Valve—Closure signals are initiated from position switches located on each of the four TSVs. Two independent position switches are associated with each stop valve. One of the two switches provides input to RPS trip system A; the other, to RPS trip system B. Thus, each RPS trip system receives an input from four Turbine Stop Valve—Closure channels, each consisting of one position switch. The logic for the Turbine Stop Valve—Closure Function is such that three or more TSVs must be closed to produce a scram. This Function must be enabled at THERMAL POWER ≥ 30% RTP. This is accomplished automatically by pressure instruments sensing turbine first stage pressure. Because an increase in the main turbine bypass flow can affect this function non-conservatively, THERMAL POWER is derived from first stage pressure. The main turbine bypass valves must not cause the trip Function to be bypassed when THERMAL POWER is ≥ 30% RTP.

The Turbine Stop Valve—Closure Allowable Value is selected to be high enough to detect imminent TSV closure, thereby reducing the severity of the subsequent pressure transient.

Eight channels (arranged in pairs) of Turbine Stop Valve—Closure Function, with four channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function if any three TSVs should close. This Function is required, consistent with analysis assumptions, whenever THERMAL POWER is ≥ 30% RTP. This Function is not required when THERMAL POWER is < 30% RTP since the Reactor Vessel Steam Dome Pressure—High and the Average Power Range Monitor/Fixed/Neutron Flux—High Functions are adequate to maintain the necessary safety margins.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

9. Turbine Control Valve Fast Closure, Trip Oil Pressure—Low

Fast closure of the TCVs results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated on TCV fast closure in anticipation of the transients that would result from the closure of these valves. The Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Function is the primary scram signal for the generator load rejection event analyzed in Reference 7. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the EOC-RPT System, ensures that the MCPR SL is not exceeded.

Turbine Control Valve Fast Closure, Trip Oil Pressure—Low signals are initiated by the electrohydraulic control (EHC) fluid pressure at each control valve. One pressure instrument is associated with each control valve, and the signal from each transmitter is assigned to a separate RPS logic channel. This Function must be enabled at THERMAL POWER $\geq$ 30% RTP. This is accomplished automatically by pressure instruments sensing turbine first stage pressure. Because an increase in the main turbine bypass flow can affect this function non-conservatively, THERMAL POWER is derived from first stage pressure. The main turbine bypass valves must not cause the trip Function to be bypassed when THERMAL POWER is $\geq$ 30% RTP.

The Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Allowable Value is selected high enough to detect imminent TCV fast closure.

Four channels of Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Function with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. This Function is required, consistent with the analysis assumptions, whenever THERMAL POWER is $\geq$ 30% RTP. This Function is not required when THERMAL POWER is < 30% RTP, since the Reactor Vessel Steam Dome Pressure—High and the Average Power Range Monitor Fixed Neutron Flux—High Functions are adequate to maintain the necessary safety margins.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

11. Manual Scram (continued)

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

Four channels of Manual Scram with two channels in each trip system arranged in a one-out-of-two logic are available and required to be OPERABLE in MODES 1 and 2, and in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies, since these are the MODES and other specified conditions when control rods are withdrawn.

ACTIONS

A Note has been provided to modify the ACTIONS related to RPS instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPS instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RPS instrumentation channel.

A.1 and A.2

Because of the diversity of sensors available to provide trip signals and the redundancy of the RPS design, an allowable out of service time of 12 hours has been shown to be acceptable ~~(Ref. 9)~~ (Refs. 9, 15 and 16) to permit restoration of any inoperable channel to OPERABLE status. However, this out of service time is only acceptable provided the associated 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

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

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.

Insert B6

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 ~~Reference 9~~ References 9, 15 or 16 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.

Completing one of these Required Actions restores RPS to a reliability level equivalent to that evaluated in ~~Reference 9~~ References 9, 15 and 16 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).

(continued)

INSERT B6:

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.

BASES

ACTIONS

B.1 and B.2 (continued)

If this action would result in a scram, 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.

Insert B7

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same trip system for the same Function result in the Function not maintaining RPS trip capability. A Function is considered to be maintaining RPS trip capability when sufficient channels are OPERABLE or in trip (or the associated trip system is in trip), such that both trip systems will generate a trip signal from the given Function on a valid signal. For the typical Function with one-out-of-two taken twice logic, this would require both trip systems to have one channel OPERABLE or in trip (or the associated trip system in trip). For Function 5 (Main Steam Isolation Valve—Closure), this would require both trip systems to have each channel associated with the MSIVs in three main steam lines (not necessarily the same main steam lines for both trip systems) OPERABLE or in trip (or the associated trip system in trip).

For Function 8 (Turbine Stop Valve—Closure), this would require both trip systems to have three channels, each OPERABLE or in trip (or the associated trip system in trip).

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The

(continued)

TECH SPEC BASES MARKUP

INSERT B7:

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 (Function 2.e) 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 Conditions 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 because 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.

BASES

ACTIONS

C.1 (continued)

1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

D.1

Required Action D.1 directs entry into the appropriate Condition referenced in Table 3.3.1.1-1. The applicable Condition specified in the Table is Function and MODE or other specified condition dependent and may change as the Required Action of a previous Condition is completed. Each time an inoperable channel has not met any Required Action of Condition A, B, or C and the associated Completion Time has expired, Condition D will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

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

(continued)

BASES

ACTIONS

H.1 (continued)

Insert B8

the reactivity of the core and are, therefore, not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

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

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis ~~(Ref. 9)~~ Refs. 9, 15 and 16 assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RPS will trip when necessary.

SR 3.3.1.1.1 and SR 3.3.1.1.2

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

(continued)

TECH SPEC BASES MARKUP

INSERT B8:

I.1 and I.2

Required Actions I.1 and I.2 are intended to ensure that appropriate actions are taken if more than two inoperable or bypassed OPRM channels result in not maintaining OPRM trip capability.

In the 4-OPRM channel configuration, any 'two' of the OPRM channels out of the total of four and one 2-out-of-4 voter channels in each RPS trip system are required to function for the OPRM safety trip function to be accomplished. Therefore, three OPRM channels assures at least two OPRM channels can provide trip inputs to the 2-out-of-4 voter channels even in the event of a single OPRM channel failure, and the minimum of two 2-out-of-4 voter channels per RPS trip system assures at least one voter channel will be operable per RPS trip system even in the event of a single voter channel failure.

References 15 and 16 justified use of alternate methods to detect and suppress oscillations under limited conditions. The alternate methods are consistent with the guidelines identified in Reference 20. The alternate-methods procedures require increased operator awareness and monitoring for neutron flux oscillations when operating in the region where oscillations are possible. If operator observes indications of oscillation, as described in Reference 20, the operator will take the actions described by procedures, which include manual scram of the reactor. The power/flow map regions where oscillations are possible are developed based on the methodology in Reference 22. The applicable regions are contained in the COLR.

The alternate methods would adequately address detection and mitigation in the event of thermal hydraulic instability oscillations. Based on industry operating experience with actual instability oscillations, the operator would be able to recognize instabilities during this time and take action to suppress them through a manual scram. In addition, the OPRM system may still be available to provide alarms to the operator if the onset of oscillations were to 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 hours is judged to be reasonable.

The 120-day allowed Completion Time, the time that was evaluated in References 15 and 16, is considered adequate because with operation minimized in regions where oscillations may occur and implementation of the alternate methods, 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 primary purpose of Required Actions I.1 and I.2 is to allow an orderly completion, without undue impact on plant operation, of design and verification activities required to correct unanticipated equipment design or functional problems that cause OPRM Trip Function INOPERABILITY in all APRM channels that cannot reasonably be corrected by normal maintenance or repair actions. These Required Actions are not intended and were not evaluated as a routine alternative to returning failed or inoperable equipment to OPERABLE status.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.1 (continued) and SR 3.3.1.1.2

Agreement criteria which are determined by the plant staff based on an investigation of a combination of the channel instrument uncertainties, may be used to support this parameter comparison and include indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit, and does not necessarily indicate the channel is Inoperable.

Insert B8A

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

SR 3.3.1.1.~~2~~ 3

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are calibrated to the reactor power calculated from a heat balance. LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within 2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated MFLPD times 100. The Frequency of once per 7 days is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.8.

A restriction to satisfying this SR when < 25% RTP is provided that requires the SR to be met only at ≥ 25% RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when < 25% RTP. At low power levels, a high degree of accuracy is unnecessary because of the large, inherent margin to thermal limits (MCPR, LHGR and APLHGR). At ≥ 25% RTP, the Surveillance is required to have been satisfactorily performed within the last 7 days, in accordance with SR 3.0.2. A Note is provided which allows an increase in THERMAL POWER above 25% if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after reaching or exceeding 25% RTP. Twelve hours is based on operating

(continued)

TECH SPEC BASES MARKUP

INSERT B8A:

The Frequency of once every 12 hours for SR 3.3.1.1.1 is based upon operating experience that demonstrates that channel failure is rare. The Frequency of once every 24 hours for SR 3.3.1.1.2 is based upon operating experience that demonstrates that channel failure is rare and the evaluation in References 15 and 16.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.2 3 (continued)

experience and in consideration of providing a reasonable time in which to complete the SR.

SR 3.3.1.1.3

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function uses the recirculation loop drive flows to vary the trip setpoint. This SR verifies proper operation of the total loop drive flow signals from the drive flow units used to vary the setpoint of the APRM. The components operation is verified in two steps. The first step is a CHANNEL CHECK performed by reading the output of the four drive flow units. This gross check ensures that all drive flow units are within a tolerance defined by station staff. The second step is a verification that the flow signal from the APRM readout (which is the lowest flow signal from two associated drive flow units) is conservative with respect to the total core flow/drive flow relationship. This two step process ensures that the drive flow signal is consistent with the actual total core flow. If the flow unit signal is not within the limit, one required APRM that receives an input from the inoperable flow unit must be declared inoperable. If instruments are found within tolerance, adjustments are not required.

The Frequency of 7 days is based on engineering judgment, operating experience, and the reliability of this instrumentation.

SR 3.3.1.1.4

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

As noted, SR 3.3.1.1.4 is not required to be performed when entering MODE 2 from MODE 1, since testing of the MODE 2 required IRM and APRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This allows entry into MODE 2 if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.6 and SR 3.3.1.1.7 (continued)

between SRMs and IRMs similarly exists when, prior to fully withdrawing the SRMs from the core, IRMs are above mid-scale on range 1 before SRMs have reached the upscale rod block.

As noted, SR 3.3.1.1.7 is only required to be met during entry into MODE 2 from MODE 1. That is, after the overlap requirement has been met and indication has transitioned to the IRMs, maintaining overlap is not required (APRMs may be reading downscale once in MODE 2).

If overlap for a group of channels is not demonstrated (e.g., IRM/APRM overlap), the reason for the failure of the Surveillance should be determined and the appropriate channel(s) declared inoperable. Only those appropriate channels that are required in the current MODE or condition should be declared inoperable.

A Frequency of 7 days is reasonable based on engineering judgment and the reliability of the IRMs and APRMs.

SR 3.3.1.1.8

LPRM gain settings are determined from the local flux profiles that are either measured by the Traversing Incore Probe (TIP) System at all functional locations or calculated for TIP locations that are not functional. The methodology used to develop the power distribution limits considers the uncertainty for both measured and calculated local flux profiles. This methodology assumes that all the TIP locations are functional for the first LPRM calibration following a refueling outage, and a minimum of 25 functional TIP locations for subsequent LPRM calibrations. The calibrated LPRMs establish the relative local flux profile for appropriate representative input to the APRM System. The 1000 MWD/MT Frequency is based on operating experience with LPRM sensitivity changes.

SR 3.3.1.1.9 and SR 3.3.1.1.~~12~~ 14

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. The 92 day Frequency of SR 3.3.1.1.9 is based on the reliability analysis of Reference 9.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.9 and SR 3.3.1.1.12 (continued)

SR 3.3.1.1.9 is modified by a Note that provides a general exception to the definition of CHANNEL FUNCTIONAL TEST. This exception is necessary because the design of instrumentation does not facilitate functional testing of all required contacts of the relay which input into the combinational logic. (Reference 10) Performance of such a test could result in a plant transient or place the plant in an undo risk situation. Therefore, for this SR, the CHANNEL FUNCTIONAL TEST verifies acceptable response by verifying the change of state of the relay which inputs into the combinational logic. The required contacts not tested during the CHANNEL FUNCTIONAL TEST are tested under the LOGIC SYSTEM FUNCTIONAL TEST, SR 3.3.1.1.15. This is acceptable because operating experience shows that the contacts not tested during the CHANNEL FUNCTIONAL TEST normally pass the LOGIC SYSTEM FUNCTIONAL TEST, and the testing methodology minimizes the risk of unplanned transients.

The 24 month Frequency of SR 3.3.1.1.12 is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.10, SR 3.3.1.1.11 and SR 3.3.1.1.13

A CHANNEL CALIBRATION 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 plant specific setpoint methodology.

Note 1 states that neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/MT LPRM calibration against the TIPs (SR 3.3.1.1.8). A second Note is provided that requires the APRM and IRM SRs to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM and IRM Functions cannot be performed in

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10, SR 3.3.1.1.11 and SR 3.3.1.1.13 (continued)

, and SR 3.3.1.1.18

MODE 1 without utilizing jumpers, lifted leads, or movable links. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

Insert B9

The Frequency of 184 days for SR 3.3.1.1.11 is based upon the assumption of a 184 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of 92 days for SR 3.3.1.1.12 and 24 months for SR 3.3.1.1.13 and SR 3.3.1.1.18 is based upon the assumptions in the determination of the magnitude of equipment drift in the setpoint analysis.

Insert B10

SR 3.3.1.1.14

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function uses an electronic filter circuit to generate a signal proportional to the core THERMAL POWER from the APRM neutron flux signal. This filter circuit is representative of the fuel heat transfer dynamics that produce the relationship between the neutron flux and the core THERMAL POWER. The Surveillance filter time constant must be verified to be ≤ 7 seconds to ensure that the channel is accurately reflecting the desired parameter.

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

SR 3.3.1.1.15

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.

Insert B11

The 24 month Frequency is based on the need to perform portions of this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned

(continued)

INSERT B9:

A second note is provided for SR 3.3.1.1.18 that requires that the recirculation flow (drive flow) transmitters, which supply the flow signal to the APRMs, be included in the SR for Functions 2.b and 2.f. The APRM Simulated Thermal Power-High Function (Function 2.b) and the OPRM Trip 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 Trip Function uses drive flow to automatically enable or bypass the OPRM Trip output to the RPS. A CHANNEL CALIBRATION of the APRM drive flow signal requires both calibrating the drive flow transmitters and the processing hardware in the APRM equipment. SR 3.3.1.1.20 establishes a valid drive flow / core flow relationship. 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 Trip Function.

INSERT B10:

SR 3.3.1.1.12

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the 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 that which is necessary to test the hardware. Software controlled functions are tested as part of the initial verification and validation and are only incidentally tested as part of the surveillance testing. Automatic self-test functions check the EPROMs in which the software-controlled logic is defined. Changes in the EPROMs will be detected by the self-test function and alarmed via the APRM trouble alarm. SR 3.3.1.1.1 for the APRM functions includes a step to confirm that the automatic self-test function is still operating.

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 3.3.1.1.12 is based on the reliability analyses of References 15 & 16. (NOTE: The actual voting logic of the 2-out-of-4 Voter Function is tested as part of SR 3.3.1.1.15. The auto-enable setpoints for the OPRM 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 Functions 2.b and 2.f that clarifies that the CHANNEL FUNCTIONAL TEST for Functions 2.b and 2.f includes testing of the recirculation flow processing electronics, excluding the flow transmitters.

TECH SPEC BASES MARKUP

INSERT B11:

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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.15 (continued)

transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.16

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 ≥ 30% RTP. This is performed by a Functional check that ensures the scram feature is not bypassed at ≥ 30% RTP. Because main turbine bypass flow can affect this function nonconservatively (THERMAL POWER is derived from turbine first stage pressure), the opening of the main turbine bypass valves must not cause the trip Function to be bypassed when Thermal Power is > 30% RTP.

If any bypass channel's trip function is nonconservative (i.e., the Functions are bypassed at ≥ 30% RTP, either due to open main turbine bypass valve(s) or other reasons), then the 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

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis. This test may be performed in one measurement or in overlapping segments, with verification that all components are tested. The RPS RESPONSE TIME acceptance criteria are included in Reference 11.

Insert B12 →

(continued)

TECH SPEC BASES MARKUP

INSERT B12:

RPS RESPONSE TIME for the APRM 2-out-of-4 Voter Function (2.e) includes the APRM Flux Trip output relays and the OPRM Trip output relays of the voter and the associated RPS relays and contactors. (Note: The digital portion of the APRM, OPRM and 2-out-of-4 Voter channels are excluded from RPS RESPONSE TIME testing because self-testing and calibration checks the time base of the digital electronics. Confirmation of the time base is adequate to assure required response times are met. Neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time. See Reference 12 and 13)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.17 (continued)

As noted, neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time.

RPS RESPONSE TIME tests are conducted on an 24 month STAGGERED TEST BASIS. Note 3 requires STAGGERED TEST BASIS Frequency to be determined based on 4 channels per trip system, in lieu of the 8 channels specified in Table 3.3.1.1-1 for the MSIV Closure Function because channels are arranged in pairs. ¶ This Frequency is based on the logic interrelationships of the various channels required to produce an RPS scram signal. The 24 month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

SR 3.3.1.1.17 for Function 2.~~c~~ e confirms the response time of that function, and also confirms the response time of components common to Function 2.~~c~~ e and other RPS Functions. (Reference 14)

Insert B13

REFERENCES

Insert B14

1. FSAR, Figure 7.2-1.
2. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).
3. NEDO-23842, "Continuous Control Rod Withdrawal in the Startup Range," April 18, 1978.
4. FSAR, Section 5.2.2.
5. FSAR, Section 15.4.9.
6. FSAR, Section 6.3.3.
7. FSAR, Chapter 15.
8. P. Check (NRC) letter to G. Lainas (NRC), "BWR Scram Discharge System Safety Evaluation," December 1, 1980.

(continued)

INSERT B13:

Note 3 allows the STAGGERED TEST BASIS Frequency for Function 2.e to be determined based on 8 channels rather than the 4 actual 2-Out-Of-4 Voter channels. The redundant outputs from the 2-Out-Of-4 Voter channel (2 for APRM trips and 2 for OPRM trips) are considered part of the same channel, but the OPRM and APRM outputs are considered to be separate channels for application of SR 3.3.1.1.17, so N = 8. The note further requires that testing of OPRM and APRM outputs from a 2-out-of-4 Voter be alternated. In addition to these commitments, References 15 & 16 require that the testing of inputs to each RPS Trip System alternate.

Combining these frequency requirements, an acceptable test sequence is one that:

a. Tests each RPS Trip System interface every other cycle,
b. Alternates the testing of APRM and OPRM outputs from any specific 2-Out-Of-4 Voter Channel
c. Alternates between divisions at least every other test cycle.

The testing sequence shown in the table below is one sequence that satisfies these requirements.

Function 2.e Testing Sequence for SR 3.3.1.1.17

24-Month Cycle	Voter output tested	"Staggering"					
		Voter A1 output	Voter A2 output	Voter B1 output	Voter B2 output	RPS Trip System	Division
1st	OPRM A1	OPRM				A	1
2nd	APRM B1			APRM		B	1
3rd	OPRM A2		OPRM			A	2
4th	APRM B2				APRM	B	2
5th	APRM A1	APRM				A	1
6th	OPRM B1			OPRM		B	1
7th	APRM A2		APRM			A	2
8th	OPRM B2				OPRM	B	2

After 8 cycles, the sequence repeats.

Each test of an OPRM or APRM output tests each of the redundant outputs from the 2-Out-Of-4 Voter channel for that Function and each of the corresponding relays in the RPS. Consequently, each of the RPS relays is tested every fourth cycle. The RPS relay testing frequency is twice the frequency justified by References 15 and 16.

TECH SPEC BASES MARKUP

INSERT B14:

SR 3.3.1.1.19

This surveillance involves confirming the OPRM Trip auto-enable setpoints. The auto-enable setpoint values are considered to be nominal values as discussed in Reference 21. This surveillance ensures that the OPRM 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 3.3.1.1.20), respectively.

If any auto-enable setpoint is nonconservative (i.e., the OPRM Trip is bypassed when APRM Simulated Thermal Power ≥ 30% and recirculation drive flow ≤ value equivalent to the core flow value defined in the COLR, then the affected channel is considered inoperable for the OPRM Trip Function. Alternatively, the OPRM Trip auto-enable setpoint(s) may be adjusted to place the channel in a conservative condition (not bypassed). If the OPRM Trip is placed in the not-bypassed condition, this SR is met and the channel is considered OPERABLE.

For purposes of this surveillance, consistent with Reference 21, the conversion from core flow values defined in the COLR to drive flow values used for this SR can be conservatively determined by a linear scaling assuming that 100% drive flow corresponds to 100 Mlb/hr core flow, with no adjustment made for expected deviations between core flow and drive flow below 100%.

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

SR 3.3.1.1.20

The APRM Simulated Thermal Power-High Function (Function 2.b) uses drive flow to vary the trip setpoint. The OPRM Trip Function (Function 2.f) uses drive flow to automatically enable or bypass the OPRM Trip output to RPS. Both of these Functions use drive flow as a representation of reactor core flow. SR 3.3.1.1.18 ensures that the drive flow transmitters and processing electronics are calibrated. This SR adjusts the recirculation drive flow scaling factors in each APRM channel to provide the appropriate drive flow/core flow alignment.

The Frequency of 24 months considers that any change in the core flow to drive flow functional relationship during power operation would be gradual and the maintenance of the Recirculation System and core components that may impact the relationship is expected to be performed during refueling outages. This frequency also considers the period after reaching plant equilibrium conditions necessary to perform the test, engineering judgment of the time required to collect and analyze the necessary flow data, and engineering judgment of the time required to enter and check the applicable scaling factors in each of the APRM channels. This timeframe is acceptable based on the relatively small alignment errors expected, and the margins already included in the APRM Simulated Thermal Power - High and OPRM Trip Function trip-enable setpoints.

BASES

REFERENCES (continued)

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

10. NRC Inspection and Enforcement Manual, Part 9900: Technical Guidance, Standard Technical Specification 1.0 Definitions, Issue date 12/08/86.

11. FSAR, Table 7.3-28.

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

13. NRC Safety Evaluation Report related to Amendment No. 171 for License No. NPF 14 and Amendment No. 144 License No. NPF 22.

14. NEDO 32291-A, Supplement 1, "System Analyses for the Elimination of Selected Response Time Testing Requirements," October 1999.

Insert B15

INSERT B15:

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

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

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

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

19. NEDO-32465-A, "BWR Owners' Group Long-Term Stability Detect and Suppress Solutions Licensing Basis Methodology And Reload Applications," August 1996.

20. BWROG Letter BWROG 9479, L. A. England (BWROG) to M. J. Virgilio, "BWR Owners' Group Guidelines for Stability Interim Corrective Action", June 6, 1994.

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

22. EMF-CC-074(P)(A), Volume 4, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2."

23. GE Letter to PPL, GE-2005-EMC426, "Susquehanna 1 & 2 Minimum LPRM Input Requirement for NUMAC APRM 4-Channel Design," April 26, 2005.

B 3.3 INSTRUMENTATION

B 3.3.1.2 Source Range Monitor (SRM) Instrumentation

BASES

BACKGROUND

The SRMs provide the operator with information relative to the neutron flux level at startup and low flux levels in the core. As such, the SRM indication is used by the operator to monitor the approach to criticality and determine when criticality is achieved. The SRMs are not fully withdrawn from the core until the SRM to intermediate range monitor (IRM) overlap is demonstrated (as required by SR 3.3.1.1.6), when the SRMs are normally fully withdrawn from the core.

The SRM subsystem of the Neutron Monitoring System (NMS) consists of four channels. Each of the SRM channels can be bypassed, but only one at any given time, by the operation of a bypass switch. Each channel includes one detector that can be physically positioned in the core. Each detector assembly consists of a miniature fission chamber with associated cabling, signal conditioning equipment, and electronics associated with the various SRM functions. The signal conditioning equipment converts the current pulses from the fission chamber to analog DC currents that correspond to the count rate. Each channel also includes indication, alarm, and control rod blocks. However, this LCO specifies OPERABILITY requirements only for the monitoring and indication functions of the SRMs.

During refueling, shutdown, and low power operations, the primary indication of neutron flux levels is provided by the SRMs or special movable detectors connected to the normal SRM circuits. The SRMs provide monitoring of reactivity changes during fuel or control rod movement and give the control room operator early indication of unexpected subcritical multiplication that could be indicative of an approach to criticality.

APPLICABLE SAFETY ANALYSES

Prevention and mitigation of prompt reactivity excursions during refueling and low power operation is provided by LCO 3.9.1, "Refueling Equipment Interlocks"; LCO 3.1.1, "SHUTDOWN MARGIN (SDM)"; LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation"; IRM Neutron Flux—High and Average Power Range Monitor (APRM) Neutron Flux—High,

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

(Setdown) Functions; and LCO 3.3.2.1, "Control Rod Block Instrumentation."

The SRMs have no safety function and are not assumed to function during any FSAR design basis accident or transient analysis. However, the SRMs provide the only on-scale monitoring of neutron flux levels during startup and refueling. Therefore, they are being retained in Technical Specifications.

LCO

During startup in MODE 2, three of the four SRM channels are required to be OPERABLE to monitor the reactor flux level prior to and during control rod withdrawal, subcritical multiplication and reactor criticality, and neutron flux level and reactor period until the flux level is sufficient to maintain the IRMs on Range 3 or above. All but one of the channels are required in order to provide a representation of the overall core response during those periods when reactivity changes are occurring throughout the core.

In MODES 3 and 4, with the reactor shut down, two SRM channels provide redundant monitoring of flux levels in the core.

In MODE 5, during a spiral offload or reload, an SRM outside the fueled region will no longer be required to be OPERABLE, since it is not capable of monitoring neutron flux in the fueled region of the core. Fueled region is a continuous area with fuel. Thus, CORE ALTERATIONS are allowed in a quadrant with no OPERABLE SRM in an adjacent quadrant provided the Table 3.3.1.2-1, footnote (b), requirement that the bundles being spiral reloaded or spiral offloaded are all in a single fueled region containing at least one OPERABLE SRM is met. Spiral reloading and offloading encompass reloading or offloading a cell on the edge of a continuous fueled region (the cell can be reloaded or offloaded in any sequence).

In nonspiral routine operations, two SRMs are required to be OPERABLE to provide redundant monitoring of reactivity changes occurring in the reactor core. Because of the local nature of reactivity changes during refueling, adequate coverage is provided by requiring one SRM to be OPERABLE in

(continued)

B 3.3 INSTRUMENTATION

B 3.3.1.3 Oscillation Power Range Monitor (OPRM)

BASES

BACKGROUND

General Design Criterion 10 (GDC 10) requires the reactor core and associated coolant, control, and protection systems to be designed with appropriate margin to assure that acceptable fuel design limits are not exceeded during any condition of normal operation including the affects of anticipated operational occurrences. Additionally, GDC 12 requires the reactor core and associated coolant control and protection systems to be designed to assure that power oscillations which can result in conditions exceeding acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed. The OPRM System provides compliance with GDC 10 and GDC 12 thereby providing protection from exceeding the fuel MCPR safety limit.

References 1, 2, and 3 describe three separate algorithms for detecting stability related oscillations: the period based detection algorithm, the amplitude based algorithm, and the growth rate algorithm. The OPRM System hardware implements these algorithms in microprocessor based modules. These modules execute the algorithms based on LPRM inputs and generate alarms and trips based on these calculations. These trips result in tripping the Reactor Protection System (RPS) when the appropriate RPS trip logic is satisfied, as described in the Bases for LCO 3.3.1.1, "RPS Instrumentation." Only the period based detection algorithm is used in the safety analysis (Ref. 1, 2, 6, & 7). The remaining algorithms provide defense-in-depth and additional protection against unanticipated oscillations.

The period based detection algorithm detects a stability-related oscillation based on the occurrence of a fixed number of consecutive LPRM signal period confirmations followed by the LPRM signal amplitude exceeding a specified setpoint. Upon detection of a stability related oscillation a trip is generated for that OPRM channel.

(continued)

BASES

BACKGROUND (continued)

The OPRM System consists of 4 OPRM trip channels, each channel consisting of two OPRM modules. Each OPRM module receives input from LPRMs. Each OPRM module also receives input from the NMS average power range monitor (APRM) power and flow signals to automatically enable the trip function of the OPRM module.

Each OPRM module is continuously tested by a self-test function. On detection of any OPRM module failure, either a Trouble alarm or INOP alarm is activated. The OPRM module provides an INOP alarm when the self-test feature indicates that the OPRM module may not be capable of meeting its functional requirements.

APPLICABLE SAFETY ANALYSES

It has been shown that BWR cores may exhibit thermal-hydraulic reactor instabilities in high power and low flow portions of the core power to flow operating domain. GDC 10 requires the reactor core and associated coolant control and protection systems to be designed with appropriate margin to assure that acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. GDC 12 requires assurance that power oscillations which can result in conditions exceeding acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed. The OPRM System provides compliance with GDC 10 and GDC 12 by detecting the onset of oscillations and suppressing them by initiating a reactor scram. This assures that the MCPR safety limit will not be violated for anticipated oscillations.

The OPRM Instrumentation satisfies Criteria 3 of the NRC Policy Statement.

LCO

Four channels of the OPRM System are required to be OPERABLE to ensure that stability related oscillations are detected and suppressed prior to exceeding the MCPR safety limit. Only one of the two OPRM modules is required for OPRM channel OPERABILITY. The minimum number of LPRMs required OPERABLE to maintain an OPRM channel OPERABLE is consistent with the minimum number of LPRMs required to maintain the APRM system OPERABLE per LCO 3.3.1.1.

(continued)

BASES

LCO (continued)

The OPRM setpoints are determined based on the NRC approved methodology described in NEDO-32465-A (Ref 6). The Allowable Value for the OPRM Period Based Algorithm setpoint (SP) is derived from the analytic limit corrected for instrument and calibration errors as contained in the COLR.

The OPRM bypass flow setpoint (SR 3.3.1.3.5) is conservatively established based on the greater of 60 MLb/Hr. (NEDO-32465-A) and the value obtained based on the NRC approved methodology described in EMF-CC-074(P)(A), Volume 4, (Ref. 11).

APPLICABILITY

The OPRM instrumentation is required to be OPERABLE in order to detect and suppress neutron flux oscillations in the event of thermal-hydraulic instability. As described in References 1, 2, and 3, the power/core flow region protected against anticipated oscillations is defined by THERMAL POWER ≥ 30% RTP and core flow ≤ 65 MLb/Hr. The OPRM trip is required to be enabled in this region, and the OPRM must be capable of enabling the trip function as a result of anticipated transients that place the core in that power/flow condition. Therefore, the OPRM is required to be OPERABLE with THERMAL POWER ≥ 25% RTP and at all core flows while above that THERMAL POWER. It is not necessary for the OPRM to be operable with THERMAL POWER ≤ 25% RTP because transients from below this THERMAL POWER are not anticipated to result in power that exceeds 30% RTP.

ACTIONS

A Note has been provided to modify the ACTIONS related to the OPRM instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable OPRM instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable OPRM instrumentation channel.

(continued)

BASES

ACTIONS (continued)

A.1, A.2 and A.3

Because of the reliability and on-line self-testing of the OPRM instrumentation and the redundancy of the RPS design, an allowable out of service time of 30 days has been shown to be acceptable (Ref. 7) to permit restoration of any inoperable channel to OPERABLE status. However, this out of service time is only acceptable provided the OPRM instrumentation still maintains OPRM trip capability (refer to Required Actions B.1 and B.2). The remaining OPERABLE OPRM channels continue to provide trip capability (see Condition B) and provide operator information relative to stability activity. The remaining OPRM modules have high reliability. With this high reliability, there is a low probability of a subsequent channel failure within the allowable out of service time. In addition, the OPRM modules continue to perform on-line self-testing and alert the operator if any further system degradation occurs.

If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the OPRM channel or associated RPS trip system must be placed in the tripped condition per Required actions A.1 and A.2. Placing the inoperable OPRM channel in trip (or the associated RPS trip system in trip) would conservatively compensate for the inoperability, provide the capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the OPRM channel (or RPS trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), the alternate method of detecting and suppressing thermal hydraulic instability oscillations is required (Required Action A.3). This alternate method is described in Reference 5. It consists of increased operator awareness and monitoring for neutron flux oscillations when operating in the region where oscillations are possible. If indications of oscillation, as described in Reference 5 are observed by the operator, the operator will take the actions described by procedures which include initiating a manual scram of the reactor. The power/flow map regions are developed based on methodology in Reference 11. The applicable regions are contained in the COLR.

(continued)

BASES

ACTIONS (continued)

B.1 and B.2

Required action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped OPRM channels within the same RPS trip system result in not maintaining OPRM trip capability. OPRM trip capability is considered to be maintained when sufficient OPRM channels are OPERABLE or in trip (or the associated RPS trip system is in trip), such that a valid OPRM signal will generate a trip signal in both RPS trip systems (this would require both RPS trip systems to have at least one OPRM channel OPERABLE or the associated RPS trip system in trip).

Because of the low probability of the occurrence of an instability, 12 hours is an acceptable time to initiate the alternate method of detecting and suppressing thermal hydraulic instability oscillations described in Action A.3 above. The alternate method of detecting and suppressing thermal hydraulic instability oscillations would adequately address detection and mitigation in the event of instability oscillations. Based on industry operating experience with actual instability oscillation, the operator would be able to recognize instabilities during this time and take action to suppress them through a manual scram. In addition, the OPRM System may still be available to provide alarms to the operator if the onset of oscillations were to occur. Since plant operation is minimized in areas where oscillations may occur, operation for 120 days without OPRM trip capability is considered acceptable with implementation of the alternate method of detecting and suppressing thermal hydraulic instability oscillations.

C.1

With any Required Action and associated Completion Time not met, THERMAL POWER must be reduced to < 25% RTP within 4 hours. Reducing THERMAL POWER to < 25% RTP places the plant in a condition where instabilities are not likely to occur. The 4 hours in reasonable, based on operating experience, to reduce THERMAL POWER < 25% RTP from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.3.1

A CHANNEL FUNCTIONAL TEST is performed to ensure that the entire channel will perform the intended function. A Frequency of 184 days provides an acceptable level of system average availability over the Frequency and is based on the reliability of the channel (Ref. 7).

SR 3.3.1.3.2

LPRM gain settings are determined from the local flux profiles measured by the Traversing Incore Probe (TIP) System. This establishes the relative local flux profile for appropriate representative input to the OPRM System. The 1000 MWD/MT Frequency is based on operating experience with LPRM sensitivity changes.

SR 3.3.1.3.3

A CHANNEL CALIBRATION 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. Calibration of the channel provides a check of the internal reference voltage and the internal processor clock frequency. It also compares the desired trip setpoints with those in processor memory. Since the OPRM is a digital system, the internal reference voltage and processor clock frequency are, in turn, used to automatically calibrate the internal analog to digital converters. As noted, neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 1000 MWD/MT LPRM calibration using the TIPs (SR 3.3.1.3.2).

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency of 24 months is based upon the assumption of the magnitude of equipment drift provided by the equipment supplier. (Ref. 7)

SR 3.3.1.3.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods, in LCO 3.1.3, "Control Rod OPERABILITY," and scram discharge volume (SDV) vent and drain valves, in LCO 3.1.8, "Scram Discharge Volume (SDV) Vent and Drain Valves," overlaps this Surveillance to provide complete testing of the assumed safety function. The OPRM self-test function may be utilized to perform this testing for those components that it is designed to monitor.

The 24 month Frequency is based on engineering judgement, reliability of the components and operating experience.

SR 3.3.1.3.5

The SR ensures that trips initiated from the OPRM System will not be inadvertently bypassed when THERMAL POWER is ≥ 30% RTP and core flow is ≤ 65 MLb/Hr. This normally involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodology are incorporated into the actual setpoints (Ref. 7).

If any bypass channel setpoint is nonconservative (i.e., the OPRM module is bypassed at ≥ 30% RTP and core flow is ≤ 65 MLb/Hr), then the affected OPRM module is considered inoperable. Alternatively, the bypassed channel can be manually placed in the conservative position (Manual Enable). If placed in the MANUAL ENABLE condition, this SR is met and the module is considered OPERABLE.

The 24 month Frequency is based on engineering judgement and reliability of the components.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.3.6

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the safety analysis (Ref. 6). The OPRM self-test function may be utilized to perform this testing for those components it is designed to monitor. The LPRM amplifier cards inputting to the OPRM are excluded from the OPRM RESPONSE TIME testing. The RPS RESPONSE TIME acceptance criteria are included in Reference 8.

As noted, neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time. RPS RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS. This Frequency is based upon operating experience, which shows that random failures of instrumentation components causing serious time degradation, but not channel failure, are infrequent occurrences.

(continued)

BASES

REFERENCES

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

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

3. NRC Letter, A. Thadani to L.A. England, "Acceptance for Referencing of Topical Reports NEDO-31960, Supplement 1, 'BWR Owners Group Long-Term Stability Solutions Licensing Methodology". July 12, 1994.

4. Generic Letter 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors", July 11, 1994.

5. BWROG Letter BWROG-9479, "Guidelines for Stability Interim Corrective Action", June 6, 1994.

6. NEDO-32465-A, "BWR Owners Group Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology and Reload Applications", August 1996.

7. CENPD-400-P-A, Rev 01, "Generic Topical Report for the ABB Option III Oscillation Power Range Monitor (OPRM)", May 1995.

8. FSAR Table 7.3-28.

9. FSAR Section 4.4.4.6.

10. FSAR Section 7.2.

11. EMF-CC-074(P)(A), Volume 4, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2."

B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

BACKGROUND

Control rods provide the primary means for control of reactivity changes. Control rod block instrumentation includes channel sensors, logic circuitry, switches, and relays that are designed to ensure that specified fuel design limits are not exceeded for postulated transients and accidents. During high power operation, the rod block monitor (RBM) provides protection for control rod withdrawal error events. During low power operations, control rod blocks from the rod worth minimizer (RWM) enforce specific control rod sequences designed to mitigate the consequences of the control rod drop accident (CRDA). During shutdown conditions, control rod blocks from the Reactor Mode Switch—Shutdown Position Function ensure that all control rods remain inserted to prevent inadvertent criticalities.

The purpose of the RBM is to limit control rod withdrawal if localized neutron flux exceeds a predetermined setpoint during control rod manipulations. The RBM supplies a trip signal to the Reactor Manual Control System (RMCS) to appropriately inhibit control rod withdrawal during power operation above the low power range setpoint. The RBM has two channels, either of which can initiate a control rod block when the channel output exceeds the control rod block setpoint. One RBM channel inputs into one RMCS rod block circuit and the other RBM channel inputs into the second RMCS rod block circuit. The RBM channel signal is generated by averaging a set of local power range monitor (LPRM) signals at various core heights surrounding the control rod being withdrawn. A signal from one average power range monitor (APRM) channel assigned to each Reactor Protection System (RPS) trip system supplies a reference signal for the RBM channel in the same trip system. This reference signal is used to enable the RBM. If the APRM is indicating less than the low power range setpoint, the RBM is automatically bypassed. The RBM is also automatically bypassed if a peripheral control rod is selected (Ref. 2).

Insert B1b

new ¶

The purpose of the RWM is to control rod patterns during startup, such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to 10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. Prescribed control rod sequences are stored in the RWM, which will initiate control rod withdrawal and

(continued)

TECH SPEC BASES MARKUP

INSERT B16:

An APRM flux signal from one of the four redundant average power range monitor (APRM) channels supplies a reference signal for one of the RBM channels and an APRM flux signal from another of the APRM channels supplies the reference signal to the second RBM channel.

BASES (continued)

SURVEILLANCE REQUIREMENTS

As noted at the beginning of the SRs, the SRs for each Control Rod Block instrumentation Function are found in the SRs column of Table 3.3.2.1-1.

The Surveillances are modified by a Note to indicate that when an RBM channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains control rod block capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 9) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that a control rod block will be initiated when necessary.

SR 3.3.2.1.1

A CHANNEL FUNCTIONAL TEST is performed for each RBM channel to ensure that the entire channel will perform the intended function. It includes the Reactor Manual Control Multiplexing System input. The Frequency of 92 days is based on reliability analyses (Ref. 8).

SR 3.3.2.1.2 and SR 3.3.2.1.3

A CHANNEL FUNCTIONAL TEST is performed for the RWM to ensure that the entire system will perform the intended function. The CHANNEL FUNCTIONAL TEST for the RWM is performed by attempting to withdraw a control rod not in compliance with the prescribed sequence and verifying a control rod block occurs and by verifying proper indication of the selection error of at least one out-of-sequence control rod. As noted in the SRs, SR 3.3.2.1.2 is not required to be performed until 1 hour after any control rod is withdrawn in MODE 2. As noted, SR 3.3.2.1.3 is not required to be performed until 1 hour after THERMAL POWER is ≤ 10% RTP in MODE 1. This allows entry into MODE 2 for SR 3.3.2.1.2, and entry into MODE 1 when THERMAL POWER is ≤ 10% RTP for SR 3.3.2.1.3, to perform the required Surveillance if the 92 day Frequency is not met per SR 3.0.2. The 1 hour allowance is based on operating experience and in consideration of providing a reasonable time in which to complete the SRs. The Frequencies are based on reliability analysis (Ref. 8).

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.1.8

The RWM will only enforce the proper control rod sequence if the rod sequence is properly input into the RWM computer. This SR ensures that the proper sequence is loaded into the RWM so that it can perform its intended function. The Surveillance is performed once prior to declaring RWM OPERABLE following loading of sequence into RWM, since this is when rod sequence input errors are possible.

REFERENCES

1. FSAR, Section 7.7.1.2.8.
2. FSAR, Section 7.6.1.a.5.7
3. NEDE-24011-P-A-9-US, "General Electrical Standard Application for Reload Fuel," Supplement for United States, Section S 2.2.3.1, September 1988.
4. "Modifications to the Requirements for Control Rod Drop Accident Mitigating Systems," BWR Owners' Group, July 1986.
5. NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.
6. NRC SER, "Acceptance of Referencing of Licensing Topical Report NEDE-24011-P-A," "General Electric Standard Application for Reactor Fuel, Revision 8, Amendment 17," December 27, 1987.
7. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 32193)
8. NEDC-30851-P-A, "Technical Specification Improvement Analysis for BWR Control Rod Block Instrumentation," October 1988.
9. GENE-770-06-1, "Addendum to Bases for changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation, Technical Specifications," February 1991.
10. FSAR, Section 15.4.2.
11. NEDO 33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," April 2003.

Insert B17

TECH SPEC BASES MARKUP

INSERT B17:

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

BASES

APPLICABLE SAFETY ANALYSES (continued)

Plant specific LOCA analyses have been performed assuming only one operating recirculation loop. These analyses have demonstrated 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, provided that the APLHGR limit for SPC ATRIUM™-10 fuel is modified.

The transient analyses of Chapter 15 of the FSAR have also been performed for single recirculation loop operation 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 APLHGR, LHGR, and MCPR limits for single loop operation are specified in the COLR. The APRM ~~flow biased simulated THERMAL POWER~~ setpoint is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." In addition, a restriction on recirculation pump speed is incorporated to address reactor vessel internals vibration concerns and assumptions in the event analysis.

Simulated thermal Power- High

Recirculation loops operating satisfies Criterion 2 of the NRC Policy Statement (Ref. 5).

LCO

Two recirculation loops are 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 assumptions of the LOCA analysis are satisfied. With the limits specified in SR 3.4.1.1 not met, the recirculation loop with the lower flow must be considered not in operation. With only one recirculation loop in operation, modifications to the required APLGHR limits (LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE"), LHGR limits (LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)"), and APRM ~~Flow Biased~~ Simulated Thermal Power—High setpoint (LCO 3.3.1.1) may be applied to allow continued operation consistent with the safety analysis assumptions. Furthermore, restrictions are placed on recirculation pump speed to ensure the initial assumption of the event analysis are maintained.

(continued)

BASES

LCO (continued)

The LCO is modified by a Note that allows up to 12 hours to establish the required limits and setpoints after a change from two recirculation loops operation to single recirculation loop operation. If the limits and setpoints are not in compliance with the applicable requirements at the end of the this period, the ACTIONS required by the applicable specifications must be implemented. This time is provided to stabilize operation with one recirculation loop by: limiting flow in the operating loop, limiting total THERMAL POWER, monitor APRM and local power range monitor (LPRM) neutron flux noise levels; and, fully implementing and confirming the required limit and setpoint 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.

ACTIONS

A.1

When operating with no recirculation loops operating in MODE 1, the potential for thermal-hydraulic oscillations is greatly increased. Although this transient is protected for expected modes of oscillation by the OPRM system, when OPERABLE per LCO ~~3.3.1.3~~ 3.3.1.1, Function 2.f (Reference 3, 4), the prudent response to the natural circulation condition is to preclude potential thermal-hydraulic oscillations by immediately placing the mode switch in the shutdown position.

B.1

Recirculation loop flow must match within required limits when both recirculation loops are in operation. If flow mismatch is not within required limits, matched flow must be restored within 2 hours. If matched flows are not restored, the recirculation loop with lower flow must be declared "not in operation." Should a LOCA occur with recirculation loop flow not matched, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed prior to imposing restrictions associated with single loop operation. Operation with only one recirculation loop satisfies the requirements of the LCO and the initial conditions of the accident sequence.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

CRDA analyses assume that the reactor operator follows prescribed withdrawal sequences. For SDM tests performed within these defined sequences, the analyses of Reference 1 is applicable. However, for some sequences developed for the SDM testing, the control rod patterns assumed in the safety analyses of Reference 1 may not be met. Therefore, special CRDA analyses, performed in accordance with an NRC approved methodology, are required to demonstrate the SDM test sequence will not result in unacceptable consequences should a CRDA occur during the testing. For the purpose of this test, the protection provided by the normally required MODE 5 applicable LCOs, in addition to the requirements of this LCO, will maintain normal test operations as well as postulated accidents within the bounds of the appropriate safety analyses (Ref. 1). In addition to the added requirements for the RWM, APRM, and control rod coupling, the notch out mode is specified for control rod withdrawals that are not in conformance with the BPWS. Requiring the notch out mode limits withdrawal steps to a single notch, which limits inserted reactivity, and allows adequate monitoring of changes in neutron flux, which may occur during the test.

As described in LCO 3.0.7, compliance with Special Operations LCOs is optional, and therefore, no criteria of the NRC Policy Statement apply. Special Operations LCOs provide flexibility to perform certain operations by appropriately modifying requirements of other LCOs. A discussion of the criteria satisfied for the other LCOs is provided in their respective Bases.

LCO

As described in LCO 3.0.7, compliance with this Special Operations LCO is optional. SDM tests may be performed while in MODE 2, in accordance with Table 1.1-1, without meeting this Special Operations LCO or its ACTIONS. For SDM tests performed while in MODE 5, additional requirements must be met to ensure that adequate protection against potential reactivity excursions is available. To provide additional scram protection, beyond the normally required IRMs, the APRMs are also required to be OPERABLE (LCO 3.3.1.1, Functions ~~2.a and 2.d~~ 2.a, 2.d and 2.e) as though the reactor were in MODE 2. Because multiple control rods will be withdrawn and the reactor will potentially become critical, RPS MODE 2 requirements for Functions ~~2.a and 2.d~~ 2.a, 2.d and 2.e of Table 3.3.1.1-1

(continued)

BASES

ACTIONS

A.1 (continued)

are governed by subsequent entry into the Condition and application of the Required Actions.

B.1

With one or more of the requirements of this LCO not met for reasons other than an uncoupled control rod, the testing should be immediately stopped by placing the reactor mode switch in the shutdown or refuel position. This results in a condition that is consistent with the requirements for MODE 5 where the provisions of this Special Operations LCO are no longer required.

SURVEILLANCE REQUIREMENTS

SR 3.10.8.1

Performance of the applicable SRs for LCO 3.3.1.1, Functions 2.a and 2.d will ensure that the reactor is operated within the bounds of the safety analysis.

SR 3.10.8.1, SR 3.10.8.2, and SR 3.10.8.3

, 2.d and 2.e,

LCO 3.3.1.1, Functions 2.a ~~and 2.d~~ made applicable in this Special Operations LCO, are required to have applicable Surveillances met to establish that this Special Operations LCO is being met. However, the control rod withdrawal sequences during the SDM tests may be enforced by the RWM (LCO 3.3.2.1, Function 2, MODE 2 requirements) or by a second licensed operator or other qualified member of the technical staff. As noted, either the applicable SRs for the RWM (LCO 3.3.2.1) must be satisfied according to the applicable Frequencies (SR 3.10.8.2), or the proper movement of control rods must be verified (SR 3.10.8.3). This latter verification (i.e., SR 3.10.8.3) must be performed during control rod movement to prevent deviations from the specified sequence. These surveillances provide adequate assurance that the specified test sequence is being followed.

(continued)