Edward Casulli
Site Vice President

Susquehanna Nuclear, LLC
769 Salem Boulevard
Berwick, PA 18603
Tel. 570.542.3795 Fax 570.542.1504
Edward.Casulli@talenenergy.com

TALEN ENERGY

June 8, 2023

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

10 CFR 50.90

SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED AMENDMENT TO LICENSES NPF-14 AND NPF-22: REMOVE CONTROL ROD OPERABILITY SEPARATION CRITERIA AND REPLACE REFERENCE TO BANKED POSITION WITHDRAWAL SEQUENCE WITH THE ANALYZED ROD POSITION SEQUENCE
PLA-8054

Docket No. 50-387
and 50-388

References: 1) *Framatome Topical Report ANP-10333P-A, Revision 0, "AURORA-B: An Evaluation Model for Boiling Water Reactors; Application to Control Rod Drop Accident (CRDA)," dated March 2018 (ADAMS Accession No. ML18208A448).*

2) *Susquehanna Steam Electric Station, Units 1 and 2 – Issuance of Amendment Nos. 278 and 260 to Allow Application of Advance Framatome ATRIUM 11 Fuel Methodologies (EPID L-2019-LLA-0153), dated January 21, 2021 (ADAMS Accession No. ML20164A181 [Proprietary]).*

3) *Susquehanna Steam Electric Station, Unit 2 – Issuance of Amendment No. 268 Re: Change to Certain Technical Specification for Control Rods (Emergency Circumstances) (EPID L-2023-LLA-0003), dated January 15, 2023 (ADAMS Accession No. ML23010A108).*

Pursuant to 10 CFR 50.90, Susquehanna Nuclear, LLC (Susquehanna), is submitting a request for an amendment to the Technical Specifications (TS) for the Susquehanna Steam Electric Station (SSES), Units 1 and 2, Facility Operating License numbers NPF-14 and NPF-22. The proposed amendment would modify TS 3.1.3, Control Rod Operability, TS 3.1.6, Rod Pattern Control, TS 3.3.2.1, Control Rod Block Instrumentation, TS 3.10.7, Control Rod Testing – Operating, and TS 3.10.8, Shutdown Margin (SDM) Test – Refueling. The proposed amendment would modify the current requirements on control rod withdrawal order and conditions to

protect against a postulated control rod drop accident (CRDA) during startup and low power conditions.

The proposed amendment would remove TS 3.1.3 Limiting Condition of Operation (LCO), Conditions D and E, eliminating the control rod operability separation criteria and banked position withdrawal sequence (BPWS) group requirements in startup or low power conditions. The proposed amendment would also modify TS 3.1.6, 3.3.2.1, 3.10.7, and 3.10.8 to replace current reference to BPWS with reference to "the analyzed rod position sequence" to allow for greater flexibility in control rod operations during various stages of reactor power operation. These changes would align the plant startup sequences with the calculated control rod reactivity worths during the control rod withdrawal process.

The analyzed rod position sequence is evaluated consistent with NRC approved methodology described in Framatome Topical Report ANP-10333P-A, "AURORA-B: An Evaluation Model for Boiling Water Reactors; Application to Control Rod Drop Accident (CRDA)," (Reference 1) which was previously approved for use at Susquehanna as described in Reference 2 and incorporated as approved methods under Units 1 and 2 TS 5.6, Administrative Controls.

The use of the analyzed rod position sequence in lieu of only BPWS was previously approved for Susquehanna, Unit 2, as a one-time only change in Reference 3. The proposed amendment would remove notation of the one-time only allowance and modify the Unit 2 TS sections to apply the analyzed rod position sequence permanently.

Enclosure 1 provides a description and assessment of the proposed changes along with Susquehanna's determination that the proposed changes do not involve a significant hazard consideration. Enclosure 2 provides the existing TS pages marked to show the proposed changes. Enclosure 3 provides revised (clean) TS pages. Enclosure 4 provides the existing TS Bases pages marked up to show the proposed changes and is provided for information only.

Susquehanna requests NRC approval of the proposed changes and issuance of the requested license amendment by June 30, 2024. Once approved, the amendment shall be implemented within 90 days.

In accordance with 10 CFR 50.91, Susquehanna is providing a copy of this application, with enclosures, to the designated Commonwealth of Pennsylvania state official.

Both the Plant Operations Review Committee and the Nuclear Safety Review Board have reviewed the proposed changes.

There are no new or revised regulatory commitments contained in this submittal.

Should you have any questions regarding this submittal, please contact Ms. Melisa Krick, Manager – Nuclear Regulatory Affairs, at (570) 542-1818.

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

Executed on June 8, 2023.

E. Casulli

Enclosures:
1. Description and Assessment
2. Marked-Up Technical Specification Pages
3. Revised (Clean) Technical Specification Pages
4. Marked-Up Technical Specification Bases Pages (Provided for Information Only)

Copy: NRC Region I
Mr. C. Highley, NRC Senior Resident Inspector
Ms. A. Klett, NRC Project Manager
Mr. M. Shields, PA DEP/BRP

Enclosure 1 to PLA-8054

Description and Assessment

SUSQUEHANNA ASSESSMENT

1. Summary Description

Pursuant to 10 CFR 50.90, Susquehanna Nuclear, LLC (Susquehanna), is submitting a request for an amendment to the Technical Specifications (TS) for the Susquehanna Steam Electric Station (SSES), Units 1 and 2, Facility Operating License numbers NPF-14 and NPF-22. The proposed amendment would modify TS 3.1.3, Control Rod Operability, TS 3.1.6, Rod Pattern Control, TS 3.3.2.1, Control Rod Block Instrumentation, TS 3.10.7, Control Rod Testing – Operating, and TS 3.10.8, Shutdown Margin (SDM) Test – Refueling. The proposed amendment would modify the current requirements on control rod withdrawal order and conditions to protect against a postulated control rod drop accident (CRDA) during startup and low power conditions.

The proposed amendment would remove TS 3.1.3 Limiting Condition of Operation (LCO), Conditions D and E, eliminating the control rod operability separation criteria and banked position withdrawal sequence (BPWS) requirements in startup or low power conditions. The proposed amendment would also modify TS 3.1.6, 3.3.2.1, 3.10.7, and 3.10.8 to replace current reference to BPWS with reference to "the analyzed rod position sequence" to allow for greater flexibility in control rod operations during various stages of reactor power operation. These changes would align the plant startup sequences with the calculated control rod reactivity worths during the control rod withdrawal process.

The analyzed rod position sequence is evaluated consistent with NRC approved methodology described in Framatome Topical Report ANP-10333P-A, "AURORA-B: An Evaluation Model for Boiling Water Reactors; Application to Control Rod Drop Accident (CRDA)," (Reference 1) which was previously approved for use at Susquehanna as described in Reference 2 and incorporated as approved methods under Units 1 and 2 TS 5.6, Administrative Controls.

The use of the analyzed rod position sequence in lieu of only BPWS was previously approved for Susquehanna, Unit 2, as a one-time only change in Reference 3. The proposed amendment would remove notation of the one-time only allowance and modify the Unit 2 TS sections to apply the analyzed rod position sequence permanently.

2. Detailed Description

2.1 System Design and Operation

Control Rods are components of the Control Rod Drive (CRD) System, which is the primary reactivity control system for the reactor. In conjunction with the Reactor Protection System, the

CRD System provides the means for the reliable control of reactivity changes to ensure under conditions of normal operation, including anticipated operational occurrences, that specified acceptable fuel design limits are not exceeded. In addition, the control rods provide the capability to hold the reactor core subcritical under all conditions and to limit the potential amount and rate of reactivity increase caused by a malfunction in the CRD System.

Control rod patterns during startup conditions are controlled by the plant operator and the rod worth minimizer (RWM), so that only specified control rod sequences and relative positions are allowed over the operating range of all control rods inserted to 10% rated thermal power (RTP). The sequences limit the potential amount of reactivity addition that could occur in the event of a CRDA.

The CRDA is a postulated event in which a high worth control rod is inserted into the core. Subsequently, it becomes decoupled from its drive mechanism. The mechanism is withdrawn but the decoupled control rod is assumed to be stuck in place. At a later optimum moment, the control rod suddenly falls free and drops out of the core. This results in the insertion of large positive reactivity to the core and causes a localized power excursion.

2.2 Current Technical Specifications Requirements

TS 3.1.3 requires each control rod to be operable in Modes 1 and 2. Condition D requires, for two or more inoperable control rods not in compliance with BPWS and not separated by two or more operable control rods, that compliance with the BPWS shall be restored within 4 hours or the control rods shall be restored to operable status within 4 hours. Condition E requires, for one or more BPWS groups with four or more inoperable control rods, that the control rod be restored to operable status within 4 hours. If the Required Actions of Conditions D or E are not met within the specified Completion Times, Condition F requires placing the reactor in Mode 3 within 12 hours. A note identifies Conditions D and E are not applicable when thermal power is greater than 10% RTP.

TS 3.1.6 requires operable control rods to comply with the requirements of the BPWS in Modes 1 and 2 with thermal power less than or equal to 10% RTP. Condition A requires, for one or more operable control rods that are not in compliance with BPWS, that the associated control rod shall be moved to the correct position within 8 hours or the control rod shall be declared inoperable within 8 hours. Condition B requires, for nine or more operable control rods that are not in compliance with the BPWS, withdrawal of control rods shall be suspended immediately, and the reactor mode switch shall be placed in shutdown within 1 hour. Surveillance Requirement (SR) 3.1.6.1 requires all operable control rods to comply with BPWS in accordance with the Surveillance Frequency Control Program.

TS 3.3.2.1 requires the control rod block instrumentation for each function in Table 3.3.2.1-1 to be operable according to Table 3.3.2.1-1. Condition C requires for the RWM inoperable during

reactor startup, that control rod movement be suspended other than by scram immediately OR the verification of at least 12 rods withdrawn OR verification by administrative methods that startup with the RWM inoperable has not been performed in the last calendar year immediately, AND verification of movement of control rods is in compliance with BPWS by a second licensed operator or other qualified member of the technical staff during control rod movement. Condition D requires for the RWM inoperable during reactor shutdown, that movement of control rods is in accordance with BPWS and verified by a second licensed operator or other qualified member of the technical staff. SR 3.3.2.1.8 requires control rod sequence input into the RWM are in conformance with BPWS, prior to declaring the RWM operable following loading of the sequence into the RWM.

TS 3.10.7 allows the requirements of LCO 3.1.6 to be suspended for performance of SDM demonstrations, control rod scram time testing, control rod friction testing, and the Start-up Test Program provided the banked position withdrawal sequence requirements of SR 3.3.2.1.8 are changed to require the control rod sequence to conform to the specified test sequence OR the RWM is bypassed; the requirements of LCO 3.3.2.1, Function 2 are suspended; and conformance to the approved control rod sequence for the specified test is verified by a second licensed operator or other qualified member of the technical staff.

TS 3.10.8 identifies 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 specified requirements are met. Requirements related to BPWS include 1) LCO 3.3.2.1 Mode 2 requirements for Function 2 of Table 3.3.2.1-1, with the BPWS requirements of SR 3.3.2.1.8 changed to require the control rod sequence to conform to the SDM test sequence or 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 and 2) all control rod withdrawals that are not in conformance with the BPWS shall be made in notch out mode.

2.3 Reason for the Proposed Change

As currently required in the identified TS sections, control rod manipulations and separation criteria must comply with the requirements of the BPWS. These BPWS requirements are identified in NEDO-21231, “Banked Position Withdrawal Sequence,” dated January 1977 (Reference 4). Utilizing the phrase, “analyzed rod position sequence” in lieu of BPWS will provide greater flexibility in cycle-specific control rod patterns for cases when it is desirable to maintain a control rod fully inserted. This would include situations in which suspected channel bow locations or failed fuel suppression rods requiring rod insertion do not conform to BPWS requirements. The analyzed rod position sequence utilized is developed using NRC approved methods for use at Susquehanna as identified and implemented under Reference 1 and Reference 2, respectively.

2.4 Description of the Proposed Change

The proposed change deletes TS 3.1.3 Condition D and Condition E. TS 3.1.3 Condition F is updated accordingly to address the removal of Conditions D and E. The proposed change to Unit 2 TS 3.1.3 includes deletion of a temporary footnote that was incorporated by Reference 5.

The proposed change revises TS 3.1.6 to replace reference to BPWS with reference to the analyzed rod position sequence. Replacement of this reference is proposed for the LCO statement, Conditions A and B, and SR 3.1.6.1. The proposed change to Unit 2 TS 3.1.6 includes deletion of temporary notes and footnotes that were incorporated by Reference 5.

The proposed change revises TS 3.3.2.1 to replace reference to BPWS with reference to the analyzed rod position sequence. Replacement of this reference is proposed for Required Actions C.2.2 and D.1, and SR 3.3.2.1.8. The proposed change to Unit 2 TS 3.3.2.1 includes deletion of temporary footnotes that were incorporated by Reference 5.

The proposed change revises TS 3.10.7 to replace reference to BPWS with reference to the analyzed rod position sequence. Replacement of this reference is proposed for the LCO statement.

The proposed change revises TS 3.10.8 to replace reference to BPWS with reference to the analyzed rod position sequence. Replacement of this reference is proposed for the LCO statement.

Editorial formatting revisions were made to the applicable TS sections as identified in the enclosed markups.

The proposed TS pages are provided in Enclosures 2 and 3. Conforming changes are made to the TS Bases, and are provided in Enclosure 4 for information only.

3. Technical Evaluation

3.1 Background

General Design Criteria (GDC) 28, “Reactivity Limits,” of 10 CFR 50, Appendix A requires reactivity control systems to be designed with appropriate limits on the potential amount and rate of reactivity increase to ensure that the effects of postulated reactivity accidents can neither result in damage to the reactor coolant pressure boundary greater than limited local yielding, nor sufficiently disturb the core, its support structures, or other reactor pressure vessel internals so as to impair significantly the capability to cool the core. GDC 28 also requires that these postulated

reactivity accidents include consideration of rod ejection (unless prevented by positive means), rod dropout, steam line rupture, changes in reactor coolant temperature and pressure, and cold-water addition.

The design basis accident that results in a positive reactivity insertion in a Boiling Water Reactor (BWR) is the CRDA which assumes a control rod inadvertently and unknowingly becomes uncoupled from its control rod drive mechanism prior to or during it being withdrawn, and at a later point in time, after the decoupled drive is completely withdrawn, the control rod drops fully out of the core creating a positive reactivity addition and local power excursion. The BPWS limits the potential reactivity increase from a postulated CRDA during reactor startups and shutdowns below the low power setpoint (LPSP) of 10% RTP. CRDA analyses assume that the plant operator follows prescribed withdrawal sequences. These sequences define the potential initial conditions for the CRDA analysis.

Historically, to limit the impact of a CRDA, the BPWS is applied to both reactor startup and shutdown processes. Utilizing rod pattern control systems, such as the RWM, which applies the BPWS constraints, the maximum control rod worth during each step of the startup and shutdown process is reduced. The RWM and plant operator actions function within the constraints of the BPWS to regulate control rod manipulations and thus limit control rod worths. This minimizes the potential reactivity addition should a CRDA actually occur during the evolution. The RWM provides a backup to the plant operator control of the withdrawal sequences to ensure that the initial conditions assumed in the CRDA analysis remain bounding and are not violated. The RWM and plant operator actions are controlled by plant procedures during the evolution.

3.2 Proposed Change

This proposed change will allow startup sequence modifications beyond those allowed by the general requirements of the BPWS and will result in an overall reduction in unnecessary reactivity manipulations and associated operational challenges. This change will allow control rods to remain inserted in control cells with suspected channel bow or failed fuel suppression rods. The change will also allow optimization of cycle-specific control rod startup and shutdown sequences that conform to the Susquehanna CRDA requirements. These sequences will be developed to minimize incremental control rod reactivity worth in accordance with the NRC approved methodology in Reference 1. Cycle-specific CRDA results are reviewed and approved in accordance with the 10 CFR 50.59 process.

The Core Operating Limits Report (COLR) contains cycle-specific fuel thermal operating limits and cycle-specific rod block setpoints. TS 5.6.5 defines the contents of the COLR. Rod sequence patterns and control rod separation criteria do not fall within the category of information currently specified by Technical Specifications for incorporation into the COLR.

The Susquehanna calculation process is used to control the development, approval, and documentation of analyzed control rod sequences. This is consistent with existing process controls used in the development of BPWS compliant sequences. All sequences will continue to be documented in an engineering calculation. Existing administrative controls will continue to provide a back-up methodology to the RWM in assuring compliance with analyzed sequences.

Reference 1 was approved by the NRC for licensing applications and approved for use by Susquehanna by Reference 2. The approved methodology provides flexibility in withdrawal sequences beyond those allowed by the general requirements of the BPWS. The term "analyzed rod position sequence" is used to indicate that the sequence, regardless of the use of BPWS, will meet the same CRDA technical requirements as BPWS. The sequence will be developed using the same NRC approved methods as those used to support the current CRDA analysis and will be implemented in a manner equivalent to those used in the implementation of BPWS compliant sequences.

TS 3.1.3 Condition D for two or more inoperable control rods not in compliance with the BPWS and not separated by two or more operable control rods is being deleted. This condition is a generic BPWS requirement, which is superseded by the analyzed rod position sequence. The analyzed rod position sequence is evaluated consistent with the Reference 1 methodology, which has no required separation criteria. Any such configurations would be included in or bounded by the analyzed rod position sequence. Section 7.3 of Reference 1 describes selection of initial conditions that represent the most limiting conditions for the CRDA. Inoperable rod locations are defined consistent with those allowed by plant technical specifications in such a manner to maximize the worth of the candidate rods. This is typically done by assigning the out of service rods in close proximity to each other in one half of the core. If necessary, it is also done by using alternate inoperable rod locations to maximize the worth of the dropped rod. These alternate inoperable locations may not be limited to one half of the core. The selection of the inoperable rods is based on the core size, the rod grouping assignments, and the rod withdrawal sequence. The actual determination of the out of sequence rod is determined on a plant specific basis. Therefore, the elimination of TS 3.1.3, Condition D is appropriate.

TS 3.1.3 Condition E for one or more BPWS groups with four or more inoperable control rods is being deleted. This condition is a generic BPWS requirement, which is superseded by adherence to the analyzed rod position sequence. There are no limitations on the number of inoperable rods in any one BPWS group in the Reference 1 methodology. Section 7.3 of Reference 1 describes selection of initial conditions that represent the most limiting conditions for the CRDA. Inoperable rod locations are defined consistent with those allowed by plant technical specifications in such a manner to maximize the worth of the candidate rods. This is typically done by assigning the out of service rods in close proximity to each other in one half of the core. If necessary, it is also done by using alternate inoperable rod locations to maximize the worth of the dropped rod. These alternate inoperable locations may not be limited to one half of the core. The selection of the inoperable rods is based on the core size, the rod grouping assignments, and

the rod withdrawal sequence. The actual determination of the out of sequence rod is determined on a plant specific basis. Therefore, the elimination of TS 3.1.3, Condition E is appropriate.

TS 3.1.6 requires that "OPERABLE control rods shall comply with the requirements of the banked position withdrawal sequence (BPWS)." The replacement of BPWS with "analyzed rod position sequence" in TS 3.1.6, including SR 3.1.6.1, allows for compliance with the cycle-specific analyzed rod position sequence. Section 4.2 of Reference 1 states that "The Banked Position Withdrawal Sequence is an example of a set of restrictions intended to reduce the maximum rod worth that is used by most BWRs. These type of withdrawal sequences are typically enforced with rod pattern control systems. The AREVA CRDA methodology presented herein can be applied to any specified rod withdrawal sequence." Therefore, the use of an analyzed rod position sequence is consistent with the methodology defined in Reference 1. The analyzed rod position sequence will be controlled using existing controls under TS 3.1.6, as BPWS has been controlled, via the RWM and TS 3.3.2.1. Therefore, the proposed change to TS 3.1.6 is appropriate.

Consistent with the changes to TS 3.1.6 and allowance under the Reference 1 methodology, modification to TS 3.3.2.1 Required Actions C.2.2 and D.1, and SR 3.3.2.1.8 is necessary to permit compliance with the analyzed rod position sequence in lieu of BPWS.

TS 3.3.2.1 enforces the use of the BPWS via the RWM. In lieu of use of BPWS, cycle specific analyses may also be performed to develop control rod sequences, referred to as the analyzed rod position sequence. The RWM operability requirements remain unchanged and will enforce the analyzed rod position sequence instead of the BPWS. TS 3.3.2.1 Required Action C.2.2 states that in the event the RWM is inoperable during reactor startup, that "…movement of control rods is in compliance with the banked position withdrawal sequence (BPWS) by a second licensed operator or other qualified member of the technical staff." Required Action D.1 requires for the RWM inoperable during reactor shutdown, that movement of control rods is in accordance with BPWS and verified by a second licensed operator or other qualified member of the technical staff. SR 3.3.2.1.8 requires verification of the control rod sequences input to the RWM are in conformance with BPWS. Required Actions C.2.2 and D.1, and SR 3.3.2.1.8 are being modified to replace reference to BPWS with reference to "the analyzed rod position sequence." This modification ensures consistency between TS requirements and ensures that the use of the RWM to enforce control rod movement under analyzed sequences is maintained. Cycle-specific control rod patterns will continue to be controlled by the plant operator and the RWM so that only specified control rod sequences and relative positions are allowed over the operating range of all control rods inserted to 10% of RTP. As a result of this proposed change, these sequences will continue to limit the potential amount of reactivity addition that could occur in the event of a CRDA.

TS 3.10.7 and 3.10.8 enforce controls during Special Operations for Control Rod Testing – Operating and SDM Test – Refueling, respectively. Both TS sections reference the BPWS as the

enforced pull sequence, and provide administrative controls for rod sequences that do not comply with BPWS during performance of those tests. The replacement of the reference to BPWS with a reference to the analyzed rod position sequence is consistent with the aforementioned technical changes.

4. Regulatory Evaluation

4.1 Applicable Regulatory Requirements/Criteria

The proposed amendment has been evaluated to ensure the applicable regulations and requirements continue to be met.

Title 10 of the Code of Federal Regulations (10 CFR) 50.36(c)(2)(ii), paragraph (C), Criterion 3, states that a technical specification limiting condition of operation of a nuclear reactor must be established for a structure, system, or component that is the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

This regulatory requirement primarily applies to ensuring that the limiting system operating parameters and other controls in place (i.e., rod withdrawal limitations) are sufficient to ensure that the CRDA acceptance criteria are not exceeded. This is satisfied by ensuring that the initial conditions and limitations on rod withdrawal represented in the CRDA analyses are sufficiently representative or otherwise bound the most severe conditions allowed by the aforementioned controls.

GDC 28, "Reactivity Limits," of 10 CFR Part 50, Appendix A, requires that the effects of postulated reactivity accidents result in neither damage to the reactor coolant pressure boundary greater than limited local yielding nor result in sufficient damage to impair significantly core cooling capacity.

Conclusion

Susquehanna has determined that the proposed amendment conforms to the NRC approved methodology identified in Reference 1 and therefore remains in conformance with the SSES licensing basis and applicable regulatory requirements.

4.2 Precedent

In Reference 6, the NRC granted approval to Constellation Energy Generation, LLC, to revise the TS of LaSalle Unit 1 and 2 to remove TS 3.1.3 Condition D for “Two or more inoperable control rods not in compliance with analyzed rod position sequence and not separated by two or more OPERABLE control rods.” LaSalle applied NRC approved CRDA methodology allowing

greater flexibility in control rod operations during various stages of reactor power operation and allowing removal of control rod operability separation criterion while operating in these conditions. Similar to LaSalle, SSES proposes applying NRC approved CRDA methodology to remove control rod operability separation criteria from TS 3.1.3, allowing greater flexibility during startup and low power conditions.

In Reference 7, the NRC granted approval to Exelon Generation Company, LLC, to revise the TS of Peach Bottom Units 2 and 3 to replace reference to "banked position withdrawal sequence" with reference to "the analyzed rod position sequence" in TS Sections 3.1.3, 3.1.6, 3.3.2.1, 3.10.7, and 3.10.8. Peach Bottom applied NRC approved methodology for developing control rod position sequences allowing shutdown/startup sequence modification beyond those allowed by the general requirements of the BPWS. Similar to Peach Bottom, SSES proposes applying NRC approved CRDA methodology for development of these control rod position sequences and modification to the same TS sections.

4.3 No Significant Hazards Considerations Analysis

In accordance with the requirements of 10 CFR 50.90, Susquehanna Nuclear, LLC (Susquehanna), requests an amendment to the Technical Specifications (TS) for the Susquehanna Steam Electric Station (SSES), Units 1 and 2. The proposed amendment would modify TS 3.1.3, Control Rod Operability, TS 3.1.6, Rod Pattern Control, TS 3.3.2.1, Control Rod Block Instrumentation, TS 3.10.7, Control Rod Testing – Operating, and TS 3.10.8, Shutdown Margin (SDM) Test – Refueling, to allow for greater flexibility in rod control operations during various stages of reactor power operation.

The proposed amendment will modify the current requirements on control rod withdrawal order and conditions to protect against a postulated control rod drop accident (CRDA) during startup and low power conditions. The changes are being implemented to align the plant startup sequences with the calculated control rod reactivity worths, based on the analyzed rod position sequence. The analyzed rod position sequence is developed consistent with the NRC approved Framatome Topical Report ANP-10333P-A, "AURORA-B: An Evaluation Model for Boiling Water Reactors; Application to Control Rod Drop Accident (CRDA)," methodology, approved for use in Susquehanna TS 5.6, Administrative Controls. Cycle-specific CRDA results are reviewed and approved under the 10 CFR 50.59 process. This methodology incorporates the characteristics of advanced fuel products and the latest analytical methods into the design basis for the CRDA to meet the requirements for fuel cladding failure thresholds and allow more flexibility during plant startups. The proposed amendment would replace the current reference to "Banked Position Withdrawal Sequence (BPWS)" with "the analyzed rod position sequence."

Susquehanna has evaluated the proposed amendment against the standards in 10 CFR 50.92 and has determined that the operation of SSES in accordance with the proposed amendment presents

no significant hazards. Susquehanna's evaluation against each of the criteria in 10 CFR 50.92 follows.

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

   Response: No

   The proposed change will modify TS Sections 3.1.3, 3.1.6, 3.3.2.1, 3.10.7, and 3.10.8.

   The proposed change would replace the current references to "Banked Position Withdrawal Sequence (BPWS)" with reference to "the analyzed rod position sequence." The analyzed rod position sequence will continue to minimize the consequences of the CRDA. Additionally, the analyzed rod position sequence will provide an equivalent level of protection during plant startups and shutdowns and therefore will not increase the consequences of the CRDA.

   Control rod patterns during startup and shutdown conditions will continue to be controlled by the plant operator and the Rod Worth Minimizer (RWM) (TS 3.3.2.1), so that only specified control rod sequences and relative positions are allowed over the operating range of all control rods inserted to 10% of Rated Thermal Power (RTP). As a result of this change, these sequences will continue to limit the potential amount of reactivity addition that could occur in the event of a CRDA.

   Accidents are initiated by the malfunction of plant equipment, or the failure of plant structures, systems, or components. There are no changes being implemented to plant structures, systems, or components. The proposed changes will ensure that incremental control rod reactivity worths continue to be minimized by implementing rod withdrawal sequences that comply with the analyzed rod position sequence developed in accordance with the NRC approved Framatome Topical Report ANP-10333P-A methodology implemented in Susquehanna TS 5.6. These analyzed rod position sequences will limit the potential reactivity increase for a postulated CRDA during reactor startups and shutdowns below the Low Power Setpoint of 10% of RTP.

   The proposed change will continue to ensure that systems, structures, and components are capable of performing their intended safety functions.

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

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

   Response: No

   The proposed change does not affect the assumed accident performance of the control rods, nor any plant structure, system or component previously evaluated. The change does not involve a physical alteration of the plant (i.e., no different SSCs will be installed) or a change in the methods governing normal plant operations. The analyzed rod position sequence will be established pursuant to the approved methods controlling normal plant operations. As such, the proposed change does not introduce new failure mechanisms, malfunctions, or accident initiators not considered in the design and licensing basis.

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

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

   Response: No

   The proposed change ensures that analyzed rod position sequences are developed to minimize incremental control rod reactivity worth in accordance with the NRC approved Framatome Topical Report ANP-10333P-A methodology implemented in Susquehanna TS 5.6. Cycle-specific CRDA results are reviewed and approved in accordance with the 10 CFR 50.59 process. The proposed change will not adversely impact the plant's response to an accident or transient. All current safety margins will be maintained. There are no changes proposed which alter the set points to which protective actions are initiated and there is no change to the operability requirements for equipment assumed to operate for accident mitigation.

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

Based on the above evaluation, Susquehanna concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

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

and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5. Environmental Consideration

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

6. References

1. Framatome Topical Report ANP-10333P-A, Revision 0, "AURORA-B: An Evaluation Model for Boiling Water Reactors; Application to Control Rod Drop Accident (CRDA)," dated March 2018 (ADAMS Accession No. ML18208A448).

2. Susquehanna Steam Electric Station, Units 1 and 2 – Issuance of Amendment Nos. 278 and 260 to Allow Application of Advance Framatome ATRIUM 11 Fuel Methodologies (EPID L-2019-LLA-0153), dated January 21, 2021 (ADAMS Accession No. ML20164A181 [Proprietary]).

3. Susquehanna Steam Electric Station, Unit 2 – Issuance of Amendment No. 268 Re: Change to Certain Technical Specification for Control Rods (Emergency Circumstances) (EPID L-2023-LLA-0003), dated January 15, 2023 (ADAMS Accession No. ML23010A108).

4. General Electric Company Topical Report NEDO-21231, "Banked Position Withdrawal Sequence, General Electric Company," dated January 1977 (ADAMS Accession No. ML090771242 (non-public)).

5. Susquehanna Steam Electric Station, Unit 2 – Issuance of Amendment No. 268 Re: Change to Certain Technical Specification for Control Rods (Emergency Circumstances) (EPID L-2023-LLA-0003), dated January 15, 2023 (ADAMS Accession No. ML23010A108).

6. LaSalle County Station, Units 1 and 2 – Issuance of Amendment Nos. 255 and 241 Re: Revision to Technical Specification to Incorporate Licensing Topical Report NEDE-33885P-A, Revision 1, "GNF CRDA Application Methodology" (EPID L-2021-LLA-0016), dated February 4, 2022 (ADAMS Accession No. ML21362A721).

7. Peach Bottom Atomic Power Station, Units 2 and 3 – Issuance of Amendment Re: Deletion of Reference to Banked Position Withdrawal Sequence in the Technical Specification (TAC Nos. MD2310 and MD2311), dated June 29, 2007 (ADAMS Accession No. ML071720314).

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Revised Technical Specifications Pages

Unit 1 TS Pages
3.1-8, 3.1-9, 3.1-10, 3.1-18, 3.1-19, 3.3-17, 3.3-18, 3.3-19, 3.3-20, 3.10-18, 3.10-20

Unit 2 TS Pages
3.1-9, 3.1-10, 3.1-18, 3.1-19, 3.3-17, 3.3-20, 3.10-18, 3.10-20

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued) Formatting change only.	A.3 Perform SR 3.1.3.3 for each withdrawn OPERABLE control rod. AND A.4 Perform SR 3.1.1.1.	24 hours from discovery of Condition A concurrent with THERMAL POWER greater than the low power setpoint (LPSP) of the RWM. 72 hours
B. Two or more withdrawn control rods stuck.	B.1 Be in MODE 3.	12 hours
C. One or more control rods inoperable for reasons other than Condition A or B.	C.1 ----------NOTE---------- RWM may be bypassed as allowed by LCO 3.3.2.1, if required, to allow insertion of inoperable control rod and continued operation. ---------- Fully insert inoperable control rod. AND C.2 Disarm the associated CRD.	 3 hours 4 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~D. ----------NOTE---------- Not applicable when THERMAL POWER > 10% RTP. ----------~~ ~~Two or more inoperable control rods not in compliance with banked position withdrawal sequence (BPWS) and not separated by two or more OPERABLE control rods.~~	~~D.1 Restore compliance with BPWS.~~ ~~OR~~ ~~D.2 Restore control rod to OPERABLE status.~~	~~4 hours~~ ~~4 hours~~
~~E. ----------NOTE---------- Not applicable when THERMAL POWER > 10% RTP. ----------~~ ~~One or more BPWS groups with four or more inoperable control rods.~~	~~E.1 Restore control rod to OPERABLE status.~~	~~4 hours~~
~~F~~D. Required Action and associated Completion Time of Condition A or~~,~~ C~~, D, or E~~ not met. OR Nine or more control rods inoperable.	~~F~~D.1Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.3.1	Determine the position of each control rod.	In accordance with the Surveillance Frequency Control Program
SR 3.1.3.2	NOT USED	
SR 3.1.3.3	----------NOTE---------- Not required to be performed until 31 days after the control rod is withdrawn and THERMAL POWER is greater than the LPSP of the RWM. ---------- Insert each withdrawn control rod at least one notch.	In accordance with the Surveillance Frequency Control Program

Formatting change only

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.1.3.4	Verify each control rod scram time from fully withdrawn to notch position 05 is ≤ 7 seconds.	In accordance with SR 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3, and SR 3.1.4.4
SR 3.1.3.5	Verify each control rod does not go to the withdrawn overtravel position.	Each time the control rod is withdrawn to "full out" position AND Prior to declaring control rod OPERABLE after work on control rod or CRD System that could affect coupling

3.1 REACTIVITY CONTROL SYSTEMS

3.1.6 Rod Pattern Control

LCO 3.1.6 OPERABLE control rods shall comply with the requirements of the analyzed rod position sequence~~banked position withdrawal sequence (BPWS)~~.

APPLICABILITY: MODES 1 and 2 with THERMAL POWER ≤ 10% RTP.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more OPERABLE control rod(s) not in compliance with the analyzed rod position sequence~~BPWS~~.	A.1 ----------NOTE---------- Rod worth minimizer (RWM) may be bypassed as allowed by LCO 3.3.2.1, "Control Rod Block Instrumentation." ---------- Move associated control rod(s) to correct position.	8 hours
	OR	
	A.2 Declare associated control rod(s) inoperable.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Nine or more OPERABLE control rods not in compliance with the analyzed rod position sequence~~BPWS~~.	B.1 ----------NOTE---------- ~~Rod worth minimizer (~~RWM~~)~~ may be bypassed as allowed by LCO 3.3.2.1. ---------- Suspend withdrawal of control rods.	Immediately
	AND	
	B.2 Place the reactor mode switch in the shutdown position.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.6.1	Verify all OPERABLE control rods comply with the analyzed rod position sequence~~BPWS~~.	In accordance with the Surveillance Frequency Control Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Rod worth minimizer (RWM) inoperable during reactor startup.	C.1 Suspend control rod movement except by scram. OR	Immediately
	C.2.1.1 Verify ≥ 12 rods withdrawn. OR	Immediately
	C.2.1.2 Verify by administrative methods that startup with RWM inoperable has not been performed in the last calendar year. AND	Immediately
	C.2.2 Verify movement of control rods is in compliance with the analyzed rod position sequence ~~banked position withdrawal sequence (BPWS)~~ by a second licensed operator or other qualified member of the technical staff.	During control rod movement
D. RWM inoperable during reactor shutdown.	D.1 Verify movement of control rods is in accordance with the analyzed rod position sequence ~~BPWS~~ by a second licensed operator or other qualified member of the technical staff.	During control rod movement

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One or more Reactor Mode Switch-Shutdown Position channels inoperable.	E.1 Suspend control rod withdrawal. AND	Immediately
	E.2 Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

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.	In accordance with the Surveillance Frequency Control Program
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.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
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.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.4	Verify the RBM: a. Low Power Range – Upscale Function is not bypassed when APRM Simulated Thermal Power is ≥ 28% RTP and ≤ Intermediate Power Range Setpoint specified in the COLR. b. Intermediate Power Range – Upscale Function is not bypassed when APRM Simulated Thermal Power is > Intermediate Power Range Setpoint specified in the COLR and ≤ High Power Range Setpoint specified in the COLR. c. High Power Range – Upscale Function is not bypassed when APRM Simulated Thermal Power is > High Power Range Setpoint specified in the COLR.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.5	Verify the RWM is not bypassed when THERMAL POWER is ≤ 10% RTP.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.2.1.6	----------NOTE---------- Not required to be performed until 1 hour after reactor mode switch is in the shutdown position. ---------- Perform CHANNEL FUNCTIONAL TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.7	----------NOTE---------- Neutron detectors are excluded. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.8	Verify control rod sequences input to the RWM are in conformance with the analyzed rod position sequence ~~BPWS~~.	Prior to declaring RWM OPERABLE following loading of sequence into RWM

3.10 SPECIAL OPERATIONS

3.10.7 Control Rod Testing - Operating

LCO 3.10.7 The requirements of LCO 3.1.6, “Rod Pattern Control,” may be suspended to allow performance of SDM demonstrations, control rod scram time testing, control rod friction testing and the Start-up Test Program, provided:

a. The analyzed rod position sequence~~banked position withdrawal sequence~~ requirements of SR 3.3.2.1.8 are changed to require the control rod sequence to conform to the specified test sequence.

OR

b. The RWM is bypassed; the requirements of LCO 3.3.2.1, “Control Rod Block Instrumentation,” Function 2 are suspended; and conformance to the approved control rod sequence for the specified test is verified by a second licensed operator or other qualified member of the technical staff.

APPLICABILITY: MODES 1 and 2 with LCO 3.1.6 not met.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Suspend performance of the test and exception to LCO 3.1.6.	Immediately

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, 2.d, and 2.e of Table 3.3.1.1-1;

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 analyzed rod position sequence~~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.

OR

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 analyzed rod position sequence~~BPWS~~ shall be made in notch out mode;

e. No other CORE ALTERATIONS are in progress; and

f. CRD charging water header pressure $\geq$ 940 psig.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~D. ----------NOTE---------- Not applicable when THERMAL POWER > 10% RTP. ----------~~ ~~Two or more inoperable control rods not in compliance with banked position withdrawal sequence (BPWS) and not separated by two or more OPERABLE control rods.~~	~~D.1 Restore compliance with BPWS.~~ ~~OR~~ ~~D.2 Restore control rod to OPERABLE status.~~ ~~OR~~ ~~D.3 Confirm compliance with the analyzed rod position sequence.[1]~~	~~4 hours~~ ~~4 hours~~ ~~4 hours~~
~~E. ----------NOTE---------- Not applicable when THERMAL POWER > 10% RTP. ----------~~ ~~One or more BPWS groups with four or more inoperable control rods.~~	~~E.1 Restore control rod to OPERABLE status.~~ ~~OR~~ ~~E.2 Confirm compliance with the analyzed rod position sequence.[1]~~	~~4 hours~~ ~~4 hours~~
D~~F~~. Required Action and associated Completion Time of Condition A~~,~~ or C~~, D, or E~~ not met. OR Nine or more control rods inoperable.	~~F~~D.1 Be in MODE 3.	12 hours

~~[1] This Required Action is only applicable during the remainder of Unit 2, Cycle 21. Upon completion of Unit 2, Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.1.3.1	Determine the position of each control rod.	In accordance with the Surveillance Frequency Control Program
SR 3.1.3.2	NOT USED	
SR 3.1.3.3	----------NOTE---------- Not required to be performed until 31 days after the control rod is withdrawn and THERMAL POWER is greater than the LPSP of the RWM. ---------- Insert each withdrawn control rod at least one notch.	In accordance with the Surveillance Frequency Control Program

Formatting change only

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.1.3.4	Verify each control rod scram time from fully withdrawn to notch position 05 is ≤ 7 seconds.	In accordance with SR 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3, and SR 3.1.4.4
SR 3.1.3.5	Verify each control rod does not go to the withdrawn overtravel position.	Each time the control rod is withdrawn to "full out" position AND Prior to declaring control rod OPERABLE after work on control rod or CRD System that could affect coupling

3.1 REACTIVITY CONTROL SYSTEMS

3.1.6 Rod Pattern Control

LCO 3.1.6 OPERABLE control rods shall comply with the requirements of the analyzed rod position sequence~~banked position withdrawal sequence (BPWS)~~.

~~NOTE~~
~~For Unit 2, Cycle 21 only, OPERABLE control rods may comply with the requirements of the analyzed rod position sequence in lieu of the banked position withdrawal sequence.[1]~~

APPLICABILITY: MODES 1 and 2 with THERMAL POWER ≤ 10% RTP.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more OPERABLE control rod(s) not in compliance with the analyzed rod position sequence.~~BPWS.~~[2]	A.1 ----------NOTE---------- Rod worth minimizer (RWM) may be bypassed as allowed by LCO 3.3.2.1, "Control Rod Block Instrumentation." ---------- Move associated control rod(s) to correct position.	8 hours
	OR	
	A.2 Declare associated control rod(s) inoperable.	8 hours

[1] ~~This Note is only applicable during the remainder of Unit 2, Cycle 21. Upon completion of Unit 2, Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

[2] ~~During Unit 2, Cycle 21 only, one or more OPERABLE control rods not in compliance with the analyzed rod position sequence requires entry into Condition A. The Required Actions remain unchanged except that Required Action A.1 refers to the correct position per the analyzed rod position sequence in lieu of BPWS. Upon completion of Unit 2, Cycle 21, this temporary requirement is no longer applicable and will expire on April 15, 2023.~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Nine or more OPERABLE control rods not in compliance with the analyzed rod position sequence.~~BPWS.~~[1]	B.1 ----------NOTE---------- ~~Rod worth minimizer (~~RWM~~)~~ may be bypassed as allowed by LCO 3.3.2.1. ---------- Suspend withdrawal of control rods.	Immediately
	AND	
	B.2 Place the reactor mode switch in the shutdown position.	1 hour

[1] ~~During Unit 2, Cycle 21 only, nine or more OPERABLE control rods not in compliance with the analyzed rod position sequence requires entry into Condition B. The Required Actions remain unchanged. Upon completion of Unit 2, Cycle 21, this temporary requirement is no longer applicable and will expire on April 15, 2023.~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.6.1	Verify all OPERABLE control rods comply with the analyzed rod position sequence.~~BPWS.~~[2]	In accordance with the Surveillance Frequency Control Program

[2] ~~During Unit 2, Cycle 21 only, verification of compliance with the analyzed rod position sequence may be performed in lieu of compliance with the BPWS to meet SR 3.1.6.1. Upon completion of Unit 2, Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Rod worth minimizer (RWM) inoperable during reactor startup.	C.1 Suspend control rod movement except by scram. OR	Immediately
	C.2.1.1 Verify ≥ 12 rods withdrawn. OR	Immediately
	C.2.1.2 Verify by administrative methods that startup with RWM inoperable has not been performed in the last calendar year. AND	Immediately
	C.2.2 Verify movement of control rods is in compliance with the analyzed rod position sequence~~banked position withdrawal sequence (BPWS)~~ by a second licensed operator or other qualified member of the technical staff.[1]	During control rod movement
D. RWM inoperable during reactor shutdown.	D.1 Verify movement of control rods is in accordance with the analyzed rod position sequence~~BPWS~~ by a second licensed operator or other qualified member of the technical staff.[1]	During control rod movement

[1] ~~During Unit 2, Cycle 21 only, verification of compliance with the analyzed rod position sequence may be performed in lieu of verification of compliance with BPWS to meet Required Actions C.2.2 and D.1. Upon completion of Unit 2, Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.2.1.6	----------NOTE---------- Not required to be performed until 1 hour after reactor mode switch is in the shutdown position. ---------- Perform CHANNEL FUNCTIONAL TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.7	----------NOTE---------- Neutron detectors are excluded. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.8	Verify control rod sequences input to the RWM are in conformance with the analyzed rod position sequence. ~~BPWS.~~[1]	Prior to declaring RWM OPERABLE following loading of sequence into RWM

[1] ~~During Unit 2, Cycle 21 only, verification of compliance with the analyzed rod position sequence may be performed in lieu of verification of compliance with BPWS to meet SR 3.3.2.1.8. Upon completion of Unit 2, Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

3.10 SPECIAL OPERATIONS

3.10.7 Control Rod Testing - Operating

LCO 3.10.7 The requirements of LCO 3.1.6, “Rod Pattern Control,” may be suspended to allow performance of SDM demonstrations, control rod scram time testing, control rod friction testing and the Start-up Test Program, provided:

a. The analyzed rod position sequence~~banked position withdrawal sequence~~ requirements of SR 3.3.2.1.8 are changed to require the control rod sequence to conform to the specified test sequence.

OR

b. The RWM is bypassed; the requirements of LCO 3.3.2.1, “Control Rod Block Instrumentation,” Function 2 are suspended; and conformance to the approved control rod sequence for the specified test is verified by a second licensed operator or other qualified member of the technical staff.

APPLICABILITY: MODES 1 and 2 with LCO 3.1.6 not met.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Suspend performance of the test and exception to LCO 3.1.6.	Immediately

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, 2.d and 2.e of Table 3.3.1.1-1;

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 analyzed rod position sequence~~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.

OR

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 analyzed rod position sequence~~BPWS~~ shall be made in notch out mode;

e. No other CORE ALTERATIONS are in progress; and

f. CRD charging water header pressure $\geq$ 940 psig.

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

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Revised (Clean) Technical Specification Pages

Revised Technical Specifications Pages

Unit 1 TS Pages
3.1-8, 3.1-9, 3.1-10, 3.1-18, 3.1-19, 3.3-17, 3.3-18, 3.3-19, 3.3-20, 3.10-18, 3.10-20

Unit 2 TS Pages
3.1-9, 3.1-10, 3.1-18, 3.1-19, 3.3-17, 3.3-20, 3.10-18, 3.10-20

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued) Formatting change only	A.3 Perform SR 3.1.3.3 for each withdrawn OPERABLE control rod. AND A.4 Perform SR 3.1.1.1.	24 hours from discovery of Condition A concurrent with THERMAL POWER greater than the low power setpoint (LPSP) of the RWM. 72 hours
B. Two or more withdrawn control rods stuck.	B.1 Be in MODE 3.	12 hours
C. One or more control rods inoperable for reasons other than Condition A or B.	C.1 ----------NOTE---------- RWM may be bypassed as allowed by LCO 3.3.2.1, if required, to allow insertion of inoperable control rod and continued operation. ---------- Fully insert inoperable control rod. AND C.2 Disarm the associated CRD.	 3 hours 4 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A or C not met. OR Nine or more control rods inoperable.	D.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.3.1	Determine the position of each control rod.	In accordance with the Surveillance Frequency Control Program
SR 3.1.3.2	NOT USED	
SR 3.1.3.3	----------NOTE---------- Not required to be performed until 31 days after the control rod is withdrawn and THERMAL POWER is greater than the LPSP of the RWM. ---------- Insert each withdrawn control rod at least one notch.	In accordance with the Surveillance Frequency Control Program

Formatting change only

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.1.3.4	Verify each control rod scram time from fully withdrawn to notch position 05 is ≤ 7 seconds.	In accordance with SR 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3, and SR 3.1.4.4
SR 3.1.3.5	Verify each control rod does not go to the withdrawn overtravel position.	Each time the control rod is withdrawn to "full out" position AND Prior to declaring control rod OPERABLE after work on control rod or CRD System that could affect coupling

3.1 REACTIVITY CONTROL SYSTEMS

3.1.6 Rod Pattern Control

LCO 3.1.6 OPERABLE control rods shall comply with the requirements of the analyzed rod position sequence.

APPLICABILITY: MODES 1 and 2 with THERMAL POWER ≤ 10% RTP.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more OPERABLE control rod(s) not in compliance with the analyzed rod position sequence.	A.1 ----------NOTE---------- Rod worth minimizer (RWM) may be bypassed as allowed by LCO 3.3.2.1, "Control Rod Block Instrumentation." ---------- Move associated control rod(s) to correct position.	8 hours
	OR	
	A.2 Declare associated control rod(s) inoperable.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Nine or more OPERABLE control rods not in compliance with the analyzed rod position sequence.	B.1 ----------NOTE---------- RWM may be bypassed as allowed by LCO 3.3.2.1. ---------- Suspend withdrawal of control rods.	Immediately
	AND	
	B.2 Place the reactor mode switch in the shutdown position.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.6.1	Verify all OPERABLE control rods comply with the analyzed rod position sequence.	In accordance with the Surveillance Frequency Control Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Rod worth minimizer (RWM) inoperable during reactor startup.	C.1 Suspend control rod movement except by scram. OR	Immediately
	C.2.1.1 Verify ≥ 12 rods withdrawn.	Immediately
	OR	
	C.2.1.2 Verify by administrative methods that startup with RWM inoperable has not been performed in the last calendar year.	Immediately
	AND	
	C.2.2 Verify movement of control rods is in compliance with the analyzed rod position sequence by a second licensed operator or other qualified member of the technical staff.	During control rod movement
D. RWM inoperable during reactor shutdown.	D.1 Verify movement of control rods is in accordance with the analyzed rod position sequence by a second licensed operator or other qualified member of the technical staff.	During control rod movement

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One or more Reactor Mode Switch-Shutdown Position channels inoperable.	E.1 Suspend control rod withdrawal. AND	Immediately
	E.2 Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

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.	In accordance with the Surveillance Frequency Control Program
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.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
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.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.4	Verify the RBM: a. Low Power Range – Upscale Function is not bypassed when APRM Simulated Thermal Power is ≥ 28% RTP and ≤ Intermediate Power Range Setpoint specified in the COLR. b. Intermediate Power Range – Upscale Function is not bypassed when APRM Simulated Thermal Power is > Intermediate Power Range Setpoint specified in the COLR and ≤ High Power Range Setpoint specified in the COLR. c. High Power Range – Upscale Function is not bypassed when APRM Simulated Thermal Power is > High Power Range Setpoint specified in the COLR.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.5	Verify the RWM is not bypassed when THERMAL POWER is ≤ 10% RTP.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.2.1.6	----------NOTE---------- Not required to be performed until 1 hour after reactor mode switch is in the shutdown position. ---------- Perform CHANNEL FUNCTIONAL TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.7	----------NOTE---------- Neutron detectors are excluded. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.8	Verify control rod sequences input to the RWM are in conformance with the analyzed rod position sequence.	Prior to declaring RWM OPERABLE following loading of sequence into RWM

3.10 SPECIAL OPERATIONS

3.10.7 Control Rod Testing - Operating

LCO 3.10.7 The requirements of LCO 3.1.6, “Rod Pattern Control,” may be suspended to allow performance of SDM demonstrations, control rod scram time testing, control rod friction testing and the Start-up Test Program, provided:

a. The analyzed rod position sequence requirements of SR 3.3.2.1.8 are changed to require the control rod sequence to conform to the specified test sequence.

OR

b. The RWM is bypassed; the requirements of LCO 3.3.2.1, “Control Rod Block Instrumentation,” Function 2 are suspended; and conformance to the approved control rod sequence for the specified test is verified by a second licensed operator or other qualified member of the technical staff.

APPLICABILITY: MODES 1 and 2 with LCO 3.1.6 not met.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Suspend performance of the test and exception to LCO 3.1.6.	Immediately

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, 2.d, and 2.e of Table 3.3.1.1-1;

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 analyzed rod position sequence requirements of SR 3.3.2.1.8 changed to require the control rod sequence to conform to the SDM test sequence.

OR

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 analyzed rod position sequence shall be made in notch out mode;

e. No other CORE ALTERATIONS are in progress; and

f. CRD charging water header pressure $\geq$ 940 psig.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A or C not met. OR Nine or more control rods inoperable.	D.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.3.1	Determine the position of each control rod.	In accordance with the Surveillance Frequency Control Program
SR 3.1.3.2	NOT USED	
SR 3.1.3.3	----------NOTE---------- Not required to be performed until 31 days after the control rod is withdrawn and THERMAL POWER is greater than the LPSP of the RWM. ---------- Insert each withdrawn control rod at least one notch.	In accordance with the Surveillance Frequency Control Program

Formatting change only

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.1.3.4	Verify each control rod scram time from fully withdrawn to notch position 05 is ≤ 7 seconds.	In accordance with SR 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3, and SR 3.1.4.4
SR 3.1.3.5	Verify each control rod does not go to the withdrawn overtravel position.	Each time the control rod is withdrawn to "full out" position AND Prior to declaring control rod OPERABLE after work on control rod or CRD System that could affect coupling

3.1 REACTIVITY CONTROL SYSTEMS

3.1.6 Rod Pattern Control

LCO 3.1.6 OPERABLE control rods shall comply with the requirements of the analyzed rod position sequence.

APPLICABILITY: MODES 1 and 2 with THERMAL POWER ≤ 10% RTP.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more OPERABLE control rod(s) not in compliance with the analyzed rod position sequence.	A.1 ----------NOTE---------- Rod worth minimizer (RWM) may be bypassed as allowed by LCO 3.3.2.1, "Control Rod Block Instrumentation." ---------- Move associated control rod(s) to correct position.	8 hours
	OR	
	A.2 Declare associated control rod(s) inoperable.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Nine or more OPERABLE control rods not in compliance with the analyzed rod position sequence.	B.1 ----------NOTE---------- RWM may be bypassed as allowed by LCO 3.3.2.1. ---------- Suspend withdrawal of control rods.	Immediately
	AND	
	B.2 Place the reactor mode switch in the shutdown position.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.6.1	Verify all OPERABLE control rods comply with the analyzed rod position sequence.	In accordance with the Surveillance Frequency Control Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Rod worth minimizer (RWM) inoperable during reactor startup.	C.1 Suspend control rod movement except by scram. OR	Immediately
	C.2.1.1 Verify ≥ 12 rods withdrawn. OR	Immediately
	C.2.1.2 Verify by administrative methods that startup with RWM inoperable has not been performed in the last calendar year. AND	Immediately
	C.2.2 Verify movement of control rods is in compliance with the analyzed rod position sequence by a second licensed operator or other qualified member of the technical staff.	During control rod movement
D. RWM inoperable during reactor shutdown.	D.1 Verify movement of control rods is in accordance with the analyzed rod position sequence by a second licensed operator or other qualified member of the technical staff.	During control rod movement

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.2.1.6	----------NOTE---------- Not required to be performed until 1 hour after reactor mode switch is in the shutdown position. ---------- Perform CHANNEL FUNCTIONAL TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.7	----------NOTE---------- Neutron detectors are excluded. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.1.8	Verify control rod sequences input to the RWM are in conformance with the analyzed rod position sequence.	Prior to declaring RWM OPERABLE following loading of sequence into RWM

3.10 SPECIAL OPERATIONS

3.10.7 Control Rod Testing - Operating

LCO 3.10.7 The requirements of LCO 3.1.6, “Rod Pattern Control,” may be suspended to allow performance of SDM demonstrations, control rod scram time testing, control rod friction testing and the Start-up Test Program, provided:

a. The analyzed rod position sequence requirements of SR 3.3.2.1.8 are changed to require the control rod sequence to conform to the specified test sequence.

OR

b. The RWM is bypassed; the requirements of LCO 3.3.2.1, “Control Rod Block Instrumentation,” Function 2 are suspended; and conformance to the approved control rod sequence for the specified test is verified by a second licensed operator or other qualified member of the technical staff.

APPLICABILITY: MODES 1 and 2 with LCO 3.1.6 not met.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Suspend performance of the test and exception to LCO 3.1.6.	Immediately

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, 2.d and 2.e of Table 3.3.1.1-1;

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 analyzed rod position sequence requirements of SR 3.3.2.1.8 changed to require the control rod sequence to conform to the SDM test sequence.

OR

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 analyzed rod position sequence shall be made in notch out mode;

e. No other CORE ALTERATIONS are in progress; and

f. CRD charging water header pressure $\geq$ 940 psig.

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

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Marked-Up Technical Specification Bases Pages

Revised Technical Specification Bases Pages

Unit 1 TS Bases Pages
3.1-5, 3.1-18, 3.1-19, 3.1-20, 3.1-34, 3.1-35, 3.1-36, 3.1-37, 3.3-49, 3.3-50, 3.3-54c, 3.3-54d, 3.10-34, 3.10-35

Unit 2 TS Bases Pages
3.1-5, 3.1-17, 3.1-18, 3.1-19, 3.1-34, 3.1-35, 3.1-36, 3.1-37, 3.1-38, 3.3.49, 3.3-50, 3.3-52, 3.3-53, 3.3-54b, 3.3-54c, 3.10-35, 3.10-36

(Provided for Information Only)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.1.1 (continued)

demonstrations that rely solely on calculation of the highest worth control rod, additional margin (0.10% $\Delta k/k$) must be added to the SDM limit of 0.28% $\Delta k/k$ to account for uncertainties in the calculation.

The SDM may be demonstrated during an in sequence control rod withdrawal, in which the highest worth control rod is analytically determined, or during local criticals, where the highest worth control rod is determined by analysis or testing.

Local critical tests require the withdrawal of control rods in a sequence that is not in conformance with the analyzed rod position sequence~~BPWS~~. This testing would therefore require re-programming or bypassing of the rod worth minimizer to allow the withdrawal of control rods not in conformance with the analyzed rod position sequence~~BPWS~~, and therefore additional requirements must be met (see LCO 3.10.7, "Control Rod Testing - Operating").

The Frequency of 4 hours after reaching criticality is allowed to provide a reasonable amount of time to perform the required calculations and have appropriate verification.

During MODE 5, adequate SDM is required to ensure that the reactor does not reach criticality during control rod withdrawals. An evaluation of each planned in-vessel fuel movement during fuel loading (including shuffling fuel within the core) is required to ensure adequate SDM is maintained during refueling. This evaluation ensures that the intermediate loading patterns are bounded by the safety analyses for the final core loading pattern. For example, bounding analyses that demonstrate adequate SDM for the most reactive configurations during the refueling may be performed to demonstrate acceptability of the entire fuel movement sequence. These bounding analyses include additional margins to the associated uncertainties. Spiral offload/reload sequences inherently satisfy the SR, provided the fuel assemblies are reloaded in the same configuration analyzed for the new cycle. Removing fuel from the core will always result in an increase in SDM.

BASES

ACTIONS

C.1 and C.2 (continued)

within 3 hours and disarmed (electrically or hydraulically within 4 hours. Inserting a control rod ensures the shutdown and scram capabilities are not adversely affected. The control rod is disarmed to prevent inadvertent withdrawal during subsequent operations. The control rods can be hydraulically disarmed by closing the drive water and exhaust water isolation valves. The control rods can be electrically disarmed by disconnecting power from all four directional control valve solenoids. Required Action C.1 is modified by a Note, which allows the RWM to be bypassed if required to allow insertion of the inoperable control rods and continued operation. LCO 3.3.2.1 provides additional requirements when the RWM is bypassed to ensure compliance with the CRDA analysis.

The allowed Completion Times are reasonable, considering the small number of allowed inoperable control rods, and provide time to insert and disarm the control rods in an orderly manner and without challenging plant systems.

~~D.1 and D.2~~

~~Out of sequence control rods may increase the potential reactivity worth of a dropped control rod during a CRDA. At ≤ 10% RTP, the generic banked position withdrawal sequence (BPWS) analysis requires inserted control rods not in compliance with BPWS to be separated by at least two OPERABLE control rods in all directions, including the diagonal. Therefore, if two or more inoperable control rods are not in compliance with BPWS and not separated by at least two OPERABLE control rods, action must be taken to restore compliance with BPWS or restore the control rods to OPERABLE status. Condition D is modified by a Note indicating that the Condition is not applicable when > 10% RTP, since the BPWS is not required to be followed under these conditions, as described in the Bases for LCO 3.1.6. The allowed Completion Time of 4 hours is acceptable, considering the low probability of a CRDA occurring.~~

BASES

ACTIONS (continued)

E.1

In addition to the separation requirements for inoperable control rods, a BPWS assumption requires that no more than three inoperable control rods are allowed in any one BPWS group.

Therefore, with one or more BPWS groups having four or more inoperable control rods, control rods must be restored to OPERABLE status so that no BPWS group has four or more inoperable control rods. Required Action E.1 is modified by a Note indicating that the Condition is not applicable when THERMAL POWER is > 10% RTP since the BPWS is not required to be followed under these conditions, as described in the Bases for LCO 3.1.6. The allowed Completion Time of 4 hours is acceptable, considering the low probability of a CRDA occurring.

D.1

If any Required Action and associated Completion Time of Condition A, or C, D, or E are not met, or there are nine or more inoperable control rods, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours. This ensures all insertable control rods are inserted and places the reactor in a condition that does not require the active function (i.e., scram) of the control rods. The number of control rods permitted to be inoperable when operating above 10% RTP (e.g., no CRDA considerations) could be more than the value specified, but the occurrence of a large number of inoperable control rods could be indicative of a generic problem, and investigation and resolution of the potential problem should be undertaken. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.3.1

The position of each control rod must be determined to ensure adequate information on control rod position is available to the operator for determining CRD OPERABILITY and controlling rod patterns. Control rod position may be

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.3.1 (continued)

determined by the use of OPERABLE position indicators, by moving control rods to a position with an OPERABLE indicator, or by the use of other appropriate methods. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.1.3.2

NOT USED

SR 3.1.3.3

Control rod insertion capability is demonstrated by inserting each partially or fully withdrawn control rod at least one notch and observing that the control rod moves. The control rod may then be returned to its original position. This ensures the control rod is not stuck and is free to insert on a scram signal. These Surveillances are not required when THERMAL POWER is less than or equal to the actual LPSP of the RWM, since the notch insertions may not be compatible with the requirements of the ~~Banked Position Withdrawal Sequence (BPWS)~~analyzed rod position sequence (LCO 3.1.6) and the RWM (LCO 3.3.2.1). The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.1.3.4

Verifying that the scram time for each control rod to notch position 05 is $\leq$ 7 seconds provides reasonable assurance that the control rod will insert when required during a DBA or transient, thereby completing its shutdown function. This SR is performed in conjunction with the control rod scram time testing of SR 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3, and SR 3.1.4.4. The LOGIC SYSTEM FUNCTIONAL TEST in

(continued)

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.6 Rod Pattern Control

BASES

BACKGROUND

Control rod patterns during startup conditions are controlled by the operator and the rod worth minimizer (RWM) (LCO 3.3.2.1, "Control Rod Block Instrumentation"), so that only specified control rod sequences and relative positions are allowed over the operating range of all control rods inserted to 10% RTP. The sequences limit the potential amount of reactivity addition that could occur in the event of a Control Rod Drop Accident (CRDA).

This Specification assures that the control rod patterns are consistent with the assumptions of the CRDA analyses of References 1 and 2.

APPLICABLE SAFETY ANALYSES

The analytical methods and assumptions used in evaluating the CRDA are summarized in References 1 and 2. CRDA analyses assume that the reactor operator follows prescribed withdrawal sequences. These sequences define the potential initial conditions for the CRDA analysis. The RWM (LCO 3.3.2.1) provides backup to operator control of the withdrawal sequences to ensure that the initial conditions of the CRDA analysis are not violated.

Prevention or mitigation of positive reactivity insertion events is necessary to limit the energy deposition in the fuel, thereby preventing significant fuel damage which could result in the undue release of radioactivity. Since the failure consequences for UO_2 have been shown to be insignificant below fuel energy depositions of 300 cal/gm (Ref. 3), the fuel damage limit of 280 cal/gm provides a margin of safety from significant core damage which would result in release of radioactivity (Refs. 4 and 5). Generic evaluations (Ref. 1 & 6) of a design basis CRDA have shown that the maximum reactor pressure will be less than the required ASME Code limits (Ref.7). The offsite doses are calculated each cycle using the methodology in reference 1 to demonstrate that the calculated offsite doses will be well within the required limits (Ref. 5). Control rod patterns analyzed in Reference 1 follow the analyzed rod position sequence~~banked position withdrawal sequence (BPWS)~~. The analyzed rod position sequence~~BPWS~~ is applicable from the condition of all control rods fully inserted to 10% RTP (Ref. 2). For the ~~BPWS~~analyzed rod position sequence, the control rods are required to be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions ~~(e.g., between notches 08 and 12)~~. The banked positions are established to minimize the maximum incremental control rod worth without being overly restrictive during normal plant operation. For each reload cycle the CRDA is analyzed to

BASES

APPLICABLE SAFETY ANALYSES (continued)

demonstrate that the 280 cal/gm fuel damage limit will not be violated during a CRDA while following the cycle specific analyzed rod position sequence~~BPWS mode of operation~~ for control rod patterns. These analyses consider the effects of fully inserted inoperable and OPERABLE control rods not withdrawn in the normal sequence of the analyzed rod position sequence~~BPWS, but are still in compliance with the BPWS requirements regarding out of sequence control rods~~. These requirements allow a limited number (i.e., eight)~~ and distribution~~ of fully inserted inoperable control rods.

When performing a shutdown of the plant, an optional ~~BPWS~~ control rod sequence (Ref. 9) may be used provided that all withdrawn control rods have been confirmed to be coupled prior to reaching THERMAL POWER of ≤10% RTP. The rods may be inserted without the need to stop at intermediate positions since the possibility of a CRDA is eliminated by the confirmation that withdrawn control rods are coupled. When using the Reference 9 control rod sequence for shutdown, the RWM may be reprogrammed to enforce the requirements of the improved ~~BPWS~~ control rod insertion, or may be bypassed and the ~~improved BPWS shutdown~~analyzed rod position sequence implemented under LCO 3.3.2.1, Condition D controls.

In order to use the Reference 9 ~~BPWS~~ shutdown process, an extra check is required in order to consider a control rod to be “confirmed” to be coupled. This extra check ensures that no Single Operator Error can result in an incorrect coupling check. For purposes of this shutdown process, the method for confirming that control rods are coupled varies depending on the position of the control rod in the core. Details on this coupling confirmation requirement are provided in Reference 9, which requires that any partially inserted control rods, which have not been confirmed to be coupled since their last withdrawal, be fully inserted prior to reaching THERMAL POWER of ≤10% RTP. If a control rod has been checked for coupling at notch 48 and the rod has since only been moved inward, this rod is in contact with it's drive and is not required to be fully inserted prior to reaching THERMAL POWER of ≤10% RTP. However, if it cannot be confirmed that the control rod has been moved inward, then that rod shall be fully inserted prior to reaching the THERMAL POWER of ≤10% RTP. This extra check may be performed as an administrative check, by examining logs, previous surveillance's or other information. If the requirements for use of the ~~BPWS~~ control rod insertion process contained in Reference 9 are followed, the plant is considered to be in compliance with the analyzed rod position sequence~~BPWS requirements,~~ as required by ~~LOC~~LCO 3.1.6.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Rod pattern control satisfies Criterion 3 of the NRC Policy Statement (Ref. 8).

LCO

Compliance with the prescribed control rod sequences minimizes the potential consequences of a CRDA by limiting the initial conditions to those consistent with the analyzed rod position sequence~~BPWS~~. This LCO only applies to OPERABLE control rods. For inoperable control rods required to be inserted, separate requirements are specified in LCO 3.1.3, "Control Rod OPERABILITY," consistent with the allowances for inoperable control rods in the analyzed rod position sequence~~BPWS~~.

APPLICABILITY

In MODES 1 and 2, when THERMAL POWER is ≤ 10% RTP, the CRDA is a Design Basis Accident and, therefore, compliance with the assumptions of the safety analysis is required. When THERMAL POWER is > 10% RTP, there is no credible control rod configuration that results in a control rod worth that could exceed the 280 cal/gm fuel damage limit during a CRDA (Ref. 2). In MODES 3, 4, and 5, since the reactor is shut down and only a single control rod can be withdrawn from a core cell containing fuel assemblies, adequate SDM ensures that the consequences of a CRDA are acceptable, since the reactor will remain subcritical with a single control rod withdrawn.

ACTIONS

A.1 and A.2

With one or more OPERABLE control rods not in compliance with the prescribed control rod sequence, actions may be taken to either correct the control rod pattern or declare the associated control rods inoperable within 8 hours. Noncompliance with the prescribed sequence may be the result of "double notching," drifting from a control rod drive cooling water transient, leaking scram valves, or a power reduction to ≤ 10% RTP before establishing the correct control rod pattern. The number of OPERABLE control rods not in compliance with the prescribed sequence is limited to eight, to prevent the operator from attempting to correct a control rod pattern that significantly deviates from the prescribed sequence. When the control rod pattern is not in compliance with the prescribed sequence, all control rod movement should be stopped except for moves needed to correct the rod pattern, or scram if warranted.

Required Action A.1 is modified by a Note which allows the RWM to be bypassed to allow the affected control rods to be returned to their correct position. LCO 3.3.2.1 requires verification of control rod movement by a

BASES

ACTIONS (continued)

A.1 and A.2 (continued)

qualified member of the technical staff. This ensures that the control rods will be moved to the correct position. A control rod not in compliance with the prescribed sequence is not considered inoperable except as required by Required Action A.2. OPERABILITY of control rods is determined by compliance with LCO 3.1.3, "Control Rod OPERABILITY," LCO 3.1.4, "Control Rod Scram Times," and LCO 3.1.5, "Control Rod Scram Accumulators." The allowed Completion Time of 8 hours is reasonable, considering the restrictions on the number of allowed out of sequence control rods and the low probability of a CRDA occurring during the time the control rods are out of sequence.

B.1 and B.2

If nine or more OPERABLE control rods are out of sequence, the control rod pattern significantly deviates from the prescribed sequence. Control rod withdrawal should be suspended immediately to prevent the potential for further deviation from the prescribed sequence. Control rod insertion to correct control rods withdrawn beyond their allowed position is allowed since, in general, insertion of control rods has less impact on control rod worth than withdrawals have. Required Action B.1 is modified by a Note which allows the RWM to be bypassed to allow the affected control rods to be returned to their correct position. LCO 3.3.2.1 requires verification of control rod movement by a qualified member of the technical staff.

When nine or more OPERABLE control rods are not in compliance with the prescribed control rod sequence~~BPWS~~, the reactor mode switch must be placed in the shutdown position within 1 hour. With the mode switch in shutdown, the reactor is shut down, and as such, does not meet the applicability requirements of this LCO. The allowed Completion Time of 1 hour is reasonable to allow insertion of control rods to restore compliance, and is appropriate relative to the low probability of a CRDA occurring with the control rods out of sequence.

SURVEILLANCE REQUIREMENTS

SR 3.1.6.1

The control rod pattern is periodically verified to be in compliance with the analyzed rod position sequence~~BPWS~~ to ensure the assumptions of the CRDA analyses are met. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The RWM which provides control rod blocks to enforce the required sequence and is required to be OPERABLE when operating at ≤ 10% RTP.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1. Rod Block Monitor (continued)

is below the low power setpoint, the RBM flux trip outputs are automatically bypassed but the low trip setpoint continues to be applied to indicate the RBM flux setpoint on the NUMAC RBM displays.

The calculated setpoints and applicable power ranges are bounding values. In the equipment implementation, it is necessary to apply a "deadband" to each setpoint. The deadband is applied to the RBM trip setpoint selection logic and the RBM trip automatic bypass logic such that the setpoint being applied is always equal to or more conservative than the required setpoint. Since the RBM flux trip setpoint applicable to the higher power ranges are more conservative than the corresponding trip setpoints for lower power ranges, the trip setpoint applicable to the higher power range (high power range or intermediate power range) continues to be applied when STP decreases below the lower limit of that range until STP is below the power range setpoint by a value exceeding the deadband. Similarly, when STP decreases below the low power setpoint, the automatic bypass of RBM flux trip outputs will not be applied until STP decreases below the trip setpoint a value exceeding the deadband.

The RBM channel uses THERMAL POWER, as represented by the STP input value from its reference APRM channel, to automatically enable RBM flux trip outputs (remove the automatic bypass) and to select the RBM flux trip setpoint to be applied. However, the RBM Upscale function is only required to be OPERABLE when the MCPR values are less than the values defined in the COLR, depending on the THERMAL POWER level. Therefore, even though the RBM Upscale Function is implemented in each RBM channel as a single trip function with a selected trip setpoint, it is characterized in Table 3.3.2.1-1 as three Functions, the Low Power Range – Upscale Function, the Intermediate Power Range – Upscale Function, and the High Power Range – Upscale Function, to facilitate correct definition of the OPERABILITY requirements for the Functions. Each Function corresponds to one of the RBM power ranges. Due to the deadband effects on the determination of the current power range, the transition between these three Functions will occur at slightly different THERMAL POWER levels for increasing power versus decreasing power.

2. Rod Worth Minimizer

The RWM enforces the analyzed rod position~~banked position withdrawal~~ sequence ~~(BPWS)~~ to ensure that the initial conditions of the CRDA analysis are not violated.

The analytical methods and assumptions used in evaluating the CRDA are summarized in Reference~~s 2, 3, 4, and~~ 15. The analyzed rod position sequence~~BPWS~~ requires that control rods be moved in groups, with all

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2. Rod Worth Minimizer (continued)

control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the ~~BPWS~~analyzed rod position sequence are specified in LCO 3.1.6, "Rod Pattern Control."

When performing a shutdown of the plant, an optional ~~BPWS~~ control rod sequence (Ref. ~~7~~11) may be used if the coupling of each withdrawn control rod has been confirmed. The rods may be inserted without the need to stop at intermediate positions. When using the Reference 11 control rod insertion sequence for shutdown, the rod worth minimizer may be reprogrammed to enforce the requirements of the improved ~~BPWS~~ control rod insertion process, or may be bypassed and the improved ~~BPWS~~control rod shutdown sequence implemented under the controls in Condition D.

The RWM Function satisfies Criterion 3 of the NRC Policy Statement. (Ref. 7)

Since the RWM is designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE ~~(Ref. 6)~~. Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the analyzed rod position sequence~~BPWS~~. The RWM may be bypassed as required by these conditions, but then it must be considered inoperable and the Required Actions of this LCO followed.

Compliance with the analyzed rod position sequence~~BPWS~~, and therefore OPERABILITY of the RWM, is required in MODES 1 and 2 when THERMAL POWER is < 10% RTP. When THERMAL POWER is > 10% RTP, there is no possible control rod configuration that results in a control rod worth that could exceed the 280 cal/gm fuel damage limit during a CRDA (Ref~~s~~. ~~4 and 6~~15). In MODES 3 and 4, all control rods are required to be inserted into the core (except as provided in 3.10 "Special Operations"); therefore, a CRDA cannot occur. In MODE 5, since only a single control rod can be withdrawn from a core cell containing fuel assemblies, adequate SDM ensures that the consequences of a CRDA are acceptable, since the reactor will be subcritical.

3. Reactor Mode Switch – Shutdown Position

During MODES 3 and 4, and during MODE 5 when the reactor mode

BASES

REFERENCES

1. FSAR, Section 7.7.1.2.8.

2. FSAR, Section 7.6.1.a.5.7

3. Deleted~~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. Deleted~~"Modifications to the Requirements for Control Rod Drop Accident Mitigating Systems," BWR Owners' Group, July 1986.~~

5. Deleted~~NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.~~

6. Deleted~~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,” July 2004.

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.

14. XN-NF-80-19(P)(A) Volume 4, Revision 1, “Exxon Nuclear Methodology for Boiling Water Reactors: Application of the ENC Methodology to BWR Reloads,” Exxon Nuclear Company, June 1986.

~~14.~~15. ANP-10333P-A, “AURORA-B: An Evaluation Model for Boiling Water Reactors; Application to Control Rod Drop Accident (CRDA),” (as identified in the COLR).

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 analyzed rod position sequence~~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, 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, 2.d, and 2.e of Table 3.3.1.1-1 must be enforced and the approved control rod withdrawal sequence must be enforced by the RWM (LCO 3.3.2.1, Function 2, MODE 2), or must be verified by a second licensed operator or other qualified member of the technical staff. The SDM may be demonstrated during an in sequence control rod withdrawal, in which the highest worth control rod is analytically determined, or during local criticals, where the highest worth control rod is determined by analysis or testing.

BASES

LCO (continued)

Local critical tests require the withdrawal of control rods in a sequence that is not in conformance with the analyzed rod position sequence~~BPWS~~. This testing would therefore require bypassing or reprogramming of the rod worth minimizer to allow the withdrawal of rods not in conformance with the analyzed rod position sequence~~BPWS~~, and therefore additional requirements must be met (see LCO 3.10.7, "Control Rod Testing – Operating").

Control rod withdrawals that do not conform to the analyzed rod position sequence~~banked position withdrawal sequence~~ specified in LCO 3.1.6, "Rod Pattern Control," (i.e., out of sequence control rod withdrawals) must be made in the individual notched withdrawal mode to minimize the potential reactivity insertion associated with each movement.

Coupling integrity of withdrawn control rods is required to minimize the probability of a CRDA and ensure proper functioning of the withdrawn control rods, if they are required to scram. Because the reactor vessel head may be removed during these tests, no other CORE ALTERATIONS may be in progress. Furthermore, since the control rod scram function with the RCS at atmospheric pressure relies solely on the CRD accumulator, it is essential that the CRD charging water header remain pressurized. This Special Operations LCO then allows changing the Table 1.1-1 reactor mode switch position requirements to include the startup/hot standby position, such that the SDM tests may be performed while in MODE 5.

APPLICABILITY

These SDM test Special Operations requirements are only applicable if the SDM tests performed in accordance with LCO 3.1.1, "SDM" are to be performed while in MODE 5 with the reactor vessel head removed or the head bolts not fully tensioned. Additional requirements during these tests to enforce control rod withdrawal sequences and restrict other CORE ALTERATIONS provide protection against potential reactivity excursions. Operations in all other MODES are unaffected by this LCO.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.1.1 (continued)

demonstrations that rely solely on calculation of the highest worth control rod, additional margin (0.10% $\Delta k/k$) must be added to the SDM limit of 0.28% $\Delta k/k$ to account for uncertainties in the calculation.

The SDM may be demonstrated during an in sequence control rod withdrawal, in which the highest worth control rod is analytically determined, or during local criticals, where the highest worth control rod is determined by analysis or testing.

Local critical tests require the withdrawal of control rods in a sequence that is not in conformance with the analyzed rod position sequence~~BPWS~~. This testing would therefore require re-programming or bypassing of the rod worth minimizer to allow the withdrawal of control rods not in conformance with the analyzed rod position sequence~~BPWS~~, and therefore additional requirements must be met (see LCO 3.10.7, "Control Rod Testing—Operating").

The Frequency of 4 hours after reaching criticality is allowed to provide a reasonable amount of time to perform the required calculations and have appropriate verification.

During MODE 5, adequate SDM is required to ensure that the reactor does not reach criticality during control rod withdrawals. An evaluation of each planned in-vessel fuel movement during fuel loading (including shuffling fuel within the core) is required to ensure adequate SDM is maintained during refueling. This evaluation ensures that the intermediate loading patterns are bounded by the safety analyses for the final core loading pattern. For example, bounding analyses that demonstrate adequate SDM for the most reactive configurations during the refueling may be performed to demonstrate acceptability of the entire fuel movement sequence. These bounding analyses include additional margins to the associated uncertainties. Spiral offload/reload sequences inherently satisfy the SR, provided the fuel assemblies are reloaded in the same configuration analyzed for the new cycle. Removing fuel from the core will always result in an increase in SDM.

BASES

ACTIONS (continued)

B.1

With two or more withdrawn control rods stuck, the plant must be brought to MODE 3 within 12 hours. The occurrence of more than one control rod stuck at a withdrawn position increases the probability that the reactor cannot be shut down if required. Insertion of all insertable control rods eliminates the possibility of an additional failure of a control rod to insert. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

C.1 and C.2

With one or more control rods inoperable for reasons other than being stuck in the withdrawn position, operation may continue, provided the control rods are fully inserted within 3 hours and disarmed (electrically or hydraulically) within 4 hours. Inserting a control rod ensures the shutdown and scram capabilities are not adversely affected. The control rod is disarmed to prevent inadvertent withdrawal during subsequent operations. The control rods can be hydraulically disarmed by closing the drive water and exhaust water isolation valves. The control rods can be electrically disarmed by disconnecting power from all four directional control valve solenoids. Required Action C.1 is modified by a Note, which allows the RWM to be bypassed if required to allow insertion of the inoperable control rods and continued operation. LCO 3.3.2.1 provides additional requirements when the RWM is bypassed to ensure compliance with the CRDA analysis.

The allowed Completion Times are reasonable, considering the small number of allowed inoperable control rods, and provide time to insert and disarm the control rods in an orderly manner and without challenging plant systems.

~~D.1, D.2, and D.3~~

~~Out of sequence control rods may increase the potential reactivity worth of a dropped control rod during a CRDA. At $\leq$ 10% RTP, the generic banked position withdrawal sequence (BPWS) analysis requires inserted control rods not in compliance with BPWS to be separated by at least two OPERABLE control rods in all directions, including the diagonal. Therefore, if two or more inoperable control rods are not in compliance with BPWS and not separated by at least two OPERABLE control rods, action must be taken to restore compliance with BPWS or restore the control rods to OPERABLE status. Condition D is modified by a Note indicating that the Condition is not applicable when > 10% RTP, since the BPWS is not~~

BASES

ACTIONS (continued)

~~D.1, D.2, and D.3 (continued)~~

~~required to be followed under these conditions, as described in the Bases for LCO 3.1.6. The allowed Completion Time of 4 hours is acceptable, considering the low probability of a CRDA occurring.~~

~~Alternatively, Required Action D.3 allows action to be taken to confirm compliance with the analyzed rod position sequence within four hours. The analyzed rod position sequence shall be established consistent with Ref. 6, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicable only during Cycle 21. Upon completion of Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

~~E.1 and E.2~~

~~In addition to the separation requirements for inoperable control rods, a BPWS assumption requires that no more than three inoperable control rods are allowed in any one BPWS group.~~

~~Therefore, with one or more BPWS groups having four or more inoperable control rods, control rods must be restored to OPERABLE status so that no BPWS group has four or more inoperable control rods. Required Action E.1 is modified by a Note indicating that the Condition is not applicable when THERMAL POWER is > 10% RTP since the BPWS is not required to be followed under these conditions, as described in the Bases for LCO 3.1.6. The allowed Completion Time of 4 hours is acceptable, considering the low probability of a CRDA occurring.~~

~~Alternatively, Required Action E.2 allows action to be taken to confirm compliance with the analyzed rod position sequence within four hours. The analyzed rod position sequence shall be established consistent with Ref. 6, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicable only during Cycle 21. Upon completion of Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

BASES

ACTIONS (continued)

~~F~~D.1

If any Required Action and associated Completion Time of Condition A~~,~~ or C~~, D, or E~~ are not met, or there are nine or more inoperable control rods, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours. This ensures all insertable control rods are inserted and places the reactor in a condition that does not require the active function (i.e., scram) of the control rods. The number of control rods permitted to be inoperable when operating above 10% RTP (e.g., no CRDA considerations) could be more than the value specified, but the occurrence of a large number of inoperable control rods could be indicative of a generic problem, and investigation and resolution of the potential problem should be undertaken. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.3.1

The position of each control rod must be determined to ensure adequate information on control rod position is available to the operator for determining CRD OPERABILITY and controlling rod patterns. Control rod position may be determined by the use of OPERABLE position indicators, by moving control rods to a position with an OPERABLE indicator, or by the use of other appropriate methods. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.1.3.2

NOT USED

SR 3.1.3.3

Control rod insertion capability is demonstrated by inserting each partially or fully withdrawn control rod at least one notch and observing that the control rod moves. The control rod may then be returned to its original position. This ensures the control rod is not stuck and is free to insert on a scram signal. These Surveillances are not required when THERMAL POWER is less than or equal to the actual LPSP of the RWM, since the notch insertions may not be compatible with the requirements of the analyzed rod position sequence ~~Banked Position Withdrawal Sequence (BPWS)~~ (LCO 3.1.6) and the RWM (LCO 3.3.2.1). The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.6 Rod Pattern Control

BASES

BACKGROUND

Control rod patterns during startup conditions are controlled by the operator and the rod worth minimizer (RWM) (LCO 3.3.2.1, "Control Rod Block Instrumentation"), so that only specified control rod sequences and relative positions are allowed over the operating range of all control rods inserted to 10% RTP. The sequences limit the potential amount of reactivity addition that could occur in the event of a Control Rod Drop Accident (CRDA).

This Specification assures that the control rod patterns are consistent with the assumptions of the CRDA analyses of References 1 and 2.

APPLICABLE SAFETY ANALYSES

The analytical methods and assumptions used in evaluating the CRDA are summarized in References 1 and 2. CRDA analyses assume that the reactor operator follows prescribed withdrawal sequences. These sequences define the potential initial conditions for the CRDA analysis. The RWM (LCO 3.3.2.1) provides backup to operator control of the withdrawal sequences to ensure that the initial conditions of the CRDA analysis are not violated.

Prevention or mitigation of positive reactivity insertion events is necessary to limit the energy deposition in the fuel, thereby preventing significant fuel damage which could result in the undue release of radioactivity. Since the failure consequences for UO_2 have been shown to be insignificant below fuel energy depositions of 300 cal/gm (Ref. 3), the fuel damage limit of 280 cal/gm provides a margin of safety from significant core damage which would result in release of radioactivity (Refs. 4 and 5). Generic evaluations (Ref. 1 & 6) of a design basis CRDA have shown that the maximum reactor pressure will be less than the required ASME Code limits (Ref.7). The offsite doses are calculated each cycle using the methodology in reference 1 to demonstrate that the calculated offsite doses will be well within the required limits (Ref. 5). Control rod patterns analyzed in Reference 1 follow the analyzed rod position sequence~~banked position withdrawal sequence (BPWS)~~. The analyzed rod position sequence~~BPWS~~ is applicable from the condition of all control rods fully inserted to 10% RTP (Ref. 2). For the analyzed rod position sequence~~BPWS~~, the control rods are required to be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions ~~(e.g., between notches 08 and 12)~~. The banked positions are established to minimize the maximum incremental control rod worth without being overly restrictive during normal plant operation. For each reload cycle the CRDA is analyzed to demonstrate

BASES

APPLICABLE SAFETY ANALYSES (continued)

that the 280 cal/gm fuel damage limit will not be violated during a CRDA while following the cycle specific analyzed rod position sequence~~BPWS mode of operation~~ for control rod patterns. These analyses consider the effects of fully inserted inoperable and OPERABLE control rods not withdrawn in the normal sequence of the analyzed rod position sequence~~BPWS, but are still in compliance with the BPWS requirements regarding out of sequence control rods~~. These requirements allow a limited number (i.e., eight)~~ and distribution~~ of fully inserted inoperable control rods.

When performing a shutdown of the plant, an optional ~~BPWS~~ control rod sequence (Ref. 9) may be used provided that all withdrawn control rods have been confirmed to be coupled prior to reaching THERMAL POWER of ≤10% RTP. The rods may be inserted without the need to stop at intermediate positions since the possibility of a CRDA is eliminated by the confirmation that withdrawn control rods are coupled. When using the Reference 9 control rod sequence for shutdown, the RWM may be reprogrammed to enforce the requirements of the improved ~~BPWS~~ control rod insertion, or may be bypassed and the ~~improved BPWS shutdown~~analyzed rod position sequence implemented under LCO 3.3.2.1, Condition D controls.

In order to use the Reference 9 ~~BPWS~~ shutdown process, an extra check is required in order to consider a control rod to be “confirmed” to be coupled. This extra check ensures that no Single Operator Error can result in an incorrect coupling check. For purposes of this shutdown process, the method for confirming that control rods are coupled varies depending on the position of the control rod in the core. Details on this coupling confirmation requirement are provided in Reference 9, which requires that any partially inserted control rods, which have not been confirmed to be coupled since their last withdrawal, be fully inserted prior to reaching THERMAL POWER of ≤10% RTP. If a control rod has been checked for coupling at notch 48 and the rod has since only been moved inward, this rod is in contact with it's drive and is not required to be fully inserted prior to reaching THERMAL POWER of ≤10% RTP. However, if it cannot be confirmed that the control rod has been moved inward, then that rod shall be fully inserted prior to reaching the THERMAL POWER of ≤10% RTP. This extra check may be performed as an administrative check, by examining logs, previous surveillance's or other information. If the requirements for use of the BPWS control rod insertion process contained in Reference 9 are followed, the plant is considered to be in compliance with the analyzed rod position sequence~~BPWS requirements,~~ as required by ~~LOC~~LCO 3.1.6.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Rod pattern control satisfies Criterion 3 of the NRC Policy Statement (Ref. 8).

LCO

Compliance with the prescribed control rod sequences minimizes the potential consequences of a CRDA by limiting the initial conditions to those consistent with the analyzed rod position sequence~~BPWS~~. This LCO only applies to OPERABLE control rods. For inoperable control rods required to be inserted, separate requirements are specified in LCO 3.1.3, "Control Rod OPERABILITY," consistent with the allowances for inoperable control rods in the analyzed rod position sequence~~BPWS~~.

~~The LCO is modified by a Note which states OPERABLE control rods may comply with the requirements of the analyzed rod position sequence in lieu of the BPWS. The analyzed rod position sequence shall be established consistent with Ref. 1, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicable only during Cycle 21. Upon completion of Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

APPLICABILITY

In MODES 1 and 2, when THERMAL POWER is $\leq$ 10% RTP, the CRDA is a Design Basis Accident and, therefore, compliance with the assumptions of the safety analysis is required. When THERMAL POWER is > 10% RTP, there is no credible control rod configuration that results in a control rod worth that could exceed the 280 cal/gm fuel damage limit during a CRDA (Ref. 2). In MODES 3, 4, and 5, since the reactor is shut down and only a single control rod can be withdrawn from a core cell containing fuel assemblies, adequate SDM ensures that the consequences of a CRDA are acceptable, since the reactor will remain subcritical with a single control rod withdrawn.

ACTIONS

A.1 and A.2

~~Condition A is modified by a footnote which states that for Cycle 21 only, one or more OPERABLE control rods not in compliance with the analyzed rod position sequence requires entry into Condition A rather than one or more OPERABLE control rods not in compliance with the BPWS. The analyzed rod position sequence shall be established consistent with Ref. 1, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicable only during Cycle 21. Upon completion of Cycle 21, this~~

BASES

ACTIONS (continued)

A.1 and A.2 (continued)

~~temporary allowance is no longer applicable and will expire on April 15, 2023. Required Actions A.1 and A.2 remain unchanged for this temporary requirement.~~ With one or more OPERABLE control rods not in compliance with the prescribed control rod sequence, actions may be taken to either correct the control rod pattern or declare the associated control rods inoperable within 8 hours. Noncompliance with the prescribed sequence may be the result of "double notching," drifting from a control rod drive cooling water transient, leaking scram valves, or a power reduction to $\leq$ 10% RTP before establishing the correct control rod pattern. The number of OPERABLE control rods not in compliance with the prescribed sequence is limited to eight, to prevent the operator from attempting to correct a control rod pattern that significantly deviates from the prescribed sequence. When the control rod pattern is not in compliance with the prescribed sequence, all control rod movement should be stopped except for moves needed to correct the rod pattern, or scram if warranted.

Required Action A.1 is modified by a Note which allows the RWM to be bypassed to allow the affected control rods to be returned to their correct position. LCO 3.3.2.1 requires verification of control rod movement by a qualified member of the technical staff. This ensures that the control rods will be moved to the correct position. A control rod not in compliance with the prescribed sequence is not considered inoperable except as required by Required Action A.2. OPERABILITY of control rods is determined by compliance with LCO 3.1.3, "Control Rod OPERABILITY," LCO 3.1.4,

"Control Rod Scram Times," and LCO 3.1.5, "Control Rod Scram Accumulators." The allowed Completion Time of 8 hours is reasonable, considering the restrictions on the number of allowed out of sequence control rods and the low probability of a CRDA occurring during the time the control rods are out of sequence.

B.1 and B.2

~~Condition B is modified by a footnote which states that for Cycle 21 only, nine or more OPERABLE control rods not in compliance with the analyzed rod position sequence requires entry into Condition B rather than nine or more OPERABLE control rods not in compliance with the BPWS. The analyzed rod position sequence shall be established consistent with Ref. 1, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicable only during Cycle 21. Upon completion of Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023. Required Actions B.1 and B.2 remain unchanged for this temporary~~

BASES

ACTIONS (continued)

B.1 and B.2 (continued)

~~requirement.~~ If nine or more OPERABLE control rods are out of sequence, the control rod pattern significantly deviates from the prescribed sequence. Control rod withdrawal should be suspended immediately to prevent the potential for further deviation from the prescribed sequence. Control rod insertion to correct control rods withdrawn beyond their allowed position is allowed since, in general, insertion of control rods has less impact on control rod worth than withdrawals have. Required Action B.1 is modified by a Note which allows the RWM to be bypassed to allow the affected control rods to be returned to their correct position. LCO 3.3.2.1 requires verification of control rod movement by a qualified member of the technical staff.

When nine or more OPERABLE control rods are not in compliance with the prescribed control rod sequence, the reactor mode switch must be placed in the shutdown position within 1 hour. With the mode switch in shutdown, the reactor is shut down, and as such, does not meet the applicability requirements of this LCO. The allowed Completion Time of 1 hour is reasonable to allow insertion of control rods to restore compliance, and is appropriate relative to the low probability of a CRDA occurring with the control rods out of sequence.

SURVEILLANCE REQUIREMENTS

SR 3.1.6.1

The control rod pattern is periodically verified to be in compliance with the analyzed rod position sequence~~BPWS~~ to ensure the assumptions of the CRDA analyses are met. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The RWM provides control rod blocks to enforce the required sequence and is required to be OPERABLE when operating at ≤ 10% RTP.

~~SR 3.1.6.1 is modified by a footnote which allows verification of the control rod sequence against the analyzed rod position sequence in lieu of the BPWS. The analyzed rod position sequence shall be established consistent with Ref. 1, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicable only during Cycle 21. Upon completion of Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1. Rod Block Monitor (continued)

The calculated setpoints and applicable power ranges are bounding values. In the equipment implementation, it is necessary to apply a "deadband" to each setpoint. The deadband is applied to the RBM trip setpoint selection logic and the RBM trip automatic bypass logic such that the setpoint being applied is always equal to or more conservative than the required setpoint. Since the RBM flux trip setpoint applicable to the higher power ranges are more conservative than the corresponding trip setpoints for lower power ranges, the trip setpoint applicable to the higher power range (high power range or intermediate power range) continues to be applied when STP decreases below the lower limit of that range until STP is below the power range setpoint by a value exceeding the deadband. Similarly, when STP decreases below the low power setpoint, the automatic bypass of RBM flux trip outputs will not be applied until STP decreases below the trip setpoint a value exceeding the deadband.

The RBM channel uses THERMAL POWER, as represented by the STP input value from its reference APRM channel, to automatically enable RBM flux trip outputs (remove the automatic bypass) and to select the RBM flux trip setpoint to be applied. However, the RBM Upscale function is only required to be OPERABLE when the MCPR values are less than the values defined in the COLR, depending on the THERMAL POWER level. Therefore, even though the RBM Upscale Function is implemented in each RBM channel as a single trip function with a selected trip setpoint, it is characterized in Table 3.3.2.1-1 as three Functions, the Low Power Range – Upscale Function, the Intermediate Power Range – Upscale Function, and the High Power Range – Upscale Function, to facilitate correct definition of the OPERABILITY requirements for the Functions. Each Function corresponds to one of the RBM power ranges. Due to the deadband effects on the determination of the current power range, the transition between these three Functions will occur at slightly different THERMAL POWER levels for increasing power versus decreasing power.

2. Rod Worth Minimizer

The RWM enforces the analyzed rod position sequence~~banked position withdrawal sequence (BPWS)~~ to ensure that the initial conditions of the CRDA analysis are not violated.

The analytical methods and assumptions used in evaluating the CRDA are summarized in Reference~~s 2, 3, 4, and~~ 15. The analyzed rod position sequence~~BPWS~~ requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the analyzed rod position sequence~~BPWS~~ are specified in LCO 3.1.6, "Rod Pattern Control."

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2. Rod Worth Minimizer (continued)

When performing a shutdown of the plant, an optional ~~BPWS~~ control rod sequence (Ref. ~~7~~11) may be used if the coupling of each withdrawn control rod has been confirmed. The rods may be inserted without the need to stop at intermediate positions. When using the Reference 11 control rod insertion sequence for shutdown, the rod worth minimizer may be reprogrammed to enforce the requirements of the improved ~~BPWS~~ control rod insertion process, or may be bypassed and the improved ~~BPWS~~ control rod shutdown sequence implemented under the controls in Condition D.

The RWM Function satisfies Criterion 3 of the NRC Policy Statement. (Ref. 7)

Since the RWM is designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE ~~(Ref. 6)~~. Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the analyzed rod position sequence ~~BPWS~~. The RWM may be bypassed as required by these conditions, but then it must be considered inoperable and the Required Actions of this LCO followed.

Compliance with the analyzed rod position sequence ~~BPWS~~, and therefore OPERABILITY of the RWM, is required in MODES 1 and 2 when THERMAL POWER is < 10% RTP. When THERMAL POWER is > 10% RTP, there is no possible control rod configuration that results in a control rod worth that could exceed the 280 cal/gm fuel damage limit during a CRDA (Ref~~s~~. ~~4 and 6~~15). In MODES 3 and 4, all control rods are required to be inserted into the core (except as provided in 3.10 "Special Operations"); therefore, a CRDA cannot occur. In MODE 5, since only a single control rod can be withdrawn from a core cell containing fuel assemblies, adequate SDM ensures that the consequences of a CRDA are acceptable, since the reactor will be subcritical.

3. Reactor Mode Switch – Shutdown Position

During MODES 3 and 4, and during MODE 5 when the reactor mode switch is required to be in the shutdown position, the core is assumed to be subcritical; therefore, no positive reactivity insertion events are analyzed. The Reactor Mode Switch – Shutdown Position control rod withdrawal block ensures that the reactor remains subcritical by blocking control rod withdrawal, thereby preserving the assumptions of the safety analysis.

BASES

ACTIONS (continued)

C.1, C.2.1.1, C.2.1.2, and C.2.2

With the RWM inoperable during a reactor startup, the operator is still capable of enforcing the prescribed control rod sequence. However, the overall reliability is reduced because a single operator error can result in violating the control rod sequence. Therefore, control rod movement must be immediately suspended except by scram. Alternatively, startup may continue if at least 12 control rods have already been withdrawn, or a reactor startup with an inoperable RWM was not performed in the last calendar year, i.e. the last 12 months. Required Actions C.2.1.1 and C.2.1.2 require verification of these conditions by review of plant logs and control room indications. A reactor startup with an inoperable RWM is defined as rod withdrawal during startup when the RWM is required to be OPERABLE. Once Required Action C.2.1.1 or C.2.1.2 is satisfactorily completed, control rod withdrawal may proceed in accordance with the restrictions imposed by Required Action C.2.2. Required Action C.2.2 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 continued operations. In addition, Required Actions of LCO 3.1.3 and LCO 3.1.6 may require bypassing the RWM, during which time the RWM must be considered inoperable with Condition C entered and its Required Actions taken.

~~Required Action C.2.2 is modified by a footnote which still allows for manual performance of the RWM function and requires a verification of compliance with the analyzed rod position sequence by a second licensed operator. The analyzed rod position sequence shall be established consistent with Ref. 15, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicably only during Cycle 21. Upon completion of Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

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.

BASES

ACTIONS (continued)

D.1 (continued)

~~Required Action D.1 is modified by a footnote which still allows for manual performance of the RWM function and requires a verification of compliance with the analyzed rod position sequence by a second licensed operator. The analyzed rod position sequence shall be established consistent with Ref. 15, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicably only during Cycle 21. Upon completion of Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

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 Refs. 9, 12, and 13 assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance

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SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.1.7 (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.3.2.1.7 for the RBM Functions is modified by two Notes as identified in Table 3.3.2.1-1. The RBM Functions are Functions that are LSSSs for reactor core Safety Limits. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is not the NTSP but is conservative with respect to the Allowable Value. For digital channel components, no as-found tolerance or as-left tolerance can be specified. Evaluation of instrument performance will verify that the instrument will continue to behave in accordance with design-basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the instrument be returned to the NTSP. If the as-left instrument setting cannot be returned to the NTSP, then the instrument channel shall be declared inoperable. The second Note also requires that the NTSP and NTSP methodology are to be contained in a document controlled by 10 CFR 50.59.

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.

~~SR 3.3.2.1.8 is modified by a footnote which allows verification of the control rod sequence against the analyzed rod position sequence in lieu of the BPWS prior to declaring the RWM operable following loading of the sequence into the RWM. The analyzed rod position sequence shall be established consistent with Ref. 15, and may or may not be in compliance with the BPWS. The analyzed rod position sequence will ensure that all licensing requirements continue to be met with respect to the CRDA analyses. This is a temporary allowance and applicably only during Cycle 21. Upon completion of Cycle 21, this temporary allowance is no longer applicable and will expire on April 15, 2023.~~

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REFERENCES

1. FSAR, Section 7.7.1.2.8.

2. FSAR, Section 7.6.1.a.5.7

3. Deleted~~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. Deleted~~"Modifications to the Requirements for Control Rod Drop Accident Mitigating Systems," BWR Owners' Group, July 1986.~~

5. Deleted~~NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.~~

6. Deleted~~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," July 2004.

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.

14. XN-NF-90-10(P)(A) Volume 4, Revision 1, "Exxon Nuclear Methodology for Boiling Water Reactors: Application of the ENC Methodology to BWR Reloads," Exxon Nuclear Company, June 1986.

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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 analyzed rod position sequence ~~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, 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, 2.d and 2.e of Table 3.3.1.1-1 must be enforced and the approved control rod withdrawal sequence must be enforced by the RWM (LCO 3.3.2.1, Function 2, MODE 2), or must be verified by a second licensed operator or other qualified member of the technical staff. The SDM may be demonstrated during an in sequence control rod withdrawal, in which the highest worth control rod is analytically determined, or during local criticals, where the highest worth control rod is determined by analysis or testing.

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LCO (continued)

Local critical tests require the withdrawal of control rods in a sequence that is not in conformance with the analyzed rod position sequence~~BPWS~~. This testing would therefore require bypassing or reprogramming of the rod worth minimizer to allow the withdrawal of rods not in conformance with the analyzed rod position sequence~~BPWS~~, and therefore additional requirements must be met (see LCO 3.10.7, "Control Rod Testing – Operating").

Control rod withdrawals that do not conform to the analyzed rod position sequence~~banked position withdrawal sequence~~ specified in LCO 3.1.6, "Rod Pattern Control," (i.e., out of sequence control rod withdrawals) must be made in the individual notched withdrawal mode to minimize the potential reactivity insertion associated with each movement.

Coupling integrity of withdrawn control rods is required to minimize the probability of a CRDA and ensure proper functioning of the withdrawn control rods, if they are required to scram. Because the reactor vessel head may be removed during these tests, no other CORE ALTERATIONS may be in progress. Furthermore, since the control rod scram function with the RCS at atmospheric pressure relies solely on the CRD accumulator, it is essential that the CRD charging water header remain pressurized. This Special Operations LCO then allows changing the Table 1.1-1 reactor mode switch position requirements to include the startup/hot standby position, such that the SDM tests may be performed while in MODE 5.

APPLICABILITY

These SDM test Special Operations requirements are only applicable if the SDM tests performed in accordance with LCO 3.1.1, "SDM" are to be performed while in MODE 5 with the reactor vessel head removed or the head bolts not fully tensioned. Additional requirements during these tests to enforce control rod withdrawal sequences and restrict other CORE ALTERATIONS provide protection against potential reactivity excursions. Operations in all other MODES are unaffected by this LCO.