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TALEN ENERGY

January 10, 2023

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

10 CFR 50.90

**SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED EMERGENCY AMENDMENT TO
LICENSE NPF-22: TEMPORARY ADDITION OF
ANALYZED ROD POSITION SEQUENCE
PLA-8042**

Docket No. 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]).*

Pursuant to 10 CFR 50.90, Susquehanna Nuclear, LLC (Susquehanna), is submitting a request for an emergency amendment to the Technical Specifications (TS) for the Susquehanna Steam Electric Station (SSES), Unit 2, Facility Operating License number NPF-22. The proposed amendment would modify TS 3.1.3, Control Rod Operability, TS 3.1.6, Rod Pattern Control, and TS 3.3.2.1, Control Rod Block Instrumentation. The proposed amendment is considered a one-time only change that would be in effect through the remainder of Unit 2, Cycle 21, and expire on April 15, 2023.

The proposed amendment would modify TS 3.1.3, 3.1.6, and 3.3.2.1 to add reference to "the analyzed rod position sequence" to allow for greater flexibility in rod manipulation during various stages of reactor power operation. The change allows the use of alternate 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 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 Unit 2 TS 5.6, Administrative Controls.

The proposed amendment adds a notation to TS 3.1.6 Limiting Condition of Operation (LCO), Condition A, Condition B, and Surveillance Requirement (SR) 3.1.6.1 to allow for operable control rods to comply with the analyzed rod position sequence in lieu of only banked position withdrawal sequence (BPWS) through the remainder of Unit 2, Cycle 21. The proposed amendment modifies TS 3.1.3 Conditions D and E Required Actions to allow for compliance with the analyzed rod position sequence in lieu of BPWS. The changes are being requested to align the plant startup sequences with the calculated control rod reactivity worths, based on the analyzed rod position sequence, during the control rod withdrawal process. This change utilizes the flexibility allowed under the NRC approved methodology contained in Framatome Topical Report ANP-10333P-A to meet the requirements for fuel cladding failure thresholds and allow more flexibility during plant startups. The proposed amendment also modifies TS 3.3.2.1 Required Actions C.2.2 and D.1 with a footnote to allow for compliance with the analyzed rod position sequence in lieu of only BPWS through the remainder of Unit 2, Cycle 21. Similarly, SR 3.3.2.1.8 is modified with a footnote to allow for compliance with the analyzed rod position sequence in lieu of only BPWS through the remainder of Unit 2, Cycle 21.

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 hazards 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 under emergency circumstances as defined in 10 CFR 50.91(a)(5). Susquehanna will be performing a maintenance outage which will require placing the reactor in shutdown. Upon completion of the required maintenance, Unit 2 is expected to resume power operations until its regularly scheduled refuel outage in spring 2023. However, due to control cell friction issues and no viable alternative options, Susquehanna does not expect to be able to withdraw control rods in a manner which complies with the BPWS and support entry into Mode 1. Susquehanna is requesting this temporary license amendment to allow for an alternate rod withdrawal sequence to allow Unit 2 to resume power operations. Therefore, issuance of the requested license amendment is requested by January 15, 2023, to support the current restart schedule. Once approved, the amendment shall be implemented as soon as practicable.

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 Susquehanna 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 January 10, 2023.

D. Jones
Acting Site Vice President

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-8042

Description and Assessment

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SUSQUEHANNA ASSESSMENT

1. Summary Description

Pursuant to 10 CFR 50.90, Susquehanna Nuclear, LLC (Susquehanna), is submitting a request for an emergency temporary amendment to the Technical Specifications (TS) for the Susquehanna Steam Electric Station (SSES), Unit 2, Facility Operating License number NPF-22. The proposed amendment would modify TS 3.1.3, Control Rod Operability, TS 3.1.6, Rod Pattern Control, and TS 3.3.2.1, Control Rod Block Instrumentation. The proposed amendment is being considered a one-time only change that would be in effect through the remainder of Unit 2, Cycle 21, and expire on April 15, 2023.

The proposed amendment would modify TS 3.1.3, 3.1.6, and 3.3.2.1 to add reference to "the analyzed rod position sequence" to allow for greater flexibility in rod manipulation during various stages of reactor power operation. The change allows the use of alternate 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 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 Unit 2 TS 5.6, Administrative Controls.

The proposed amendment adds notation to TS 3.1.6 Limiting Condition of Operation (LCO), Condition A, Condition B, and Surveillance Requirement (SR) 3.1.6.1 to allow for operable control rods to comply with the analyzed rod position sequence in lieu of only banked position withdrawal sequence (BPWS) through the remainder of Unit 2, Cycle 21. The proposed amendment modifies TS 3.1.3 Conditions D and E Required Actions to allow for compliance with the analyzed rod position sequence in lieu of BPWS. The changes are being requested to align the plant startup sequences with the calculated control rod reactivity worths, based on the analyzed rod position sequence, during the control rod withdrawal process. This change utilizes the flexibility allowed under the NRC approved methodology contained in Framatome Topical Report ANP-10333P-A to meet the requirements for fuel cladding failure thresholds and allow more flexibility during plant startups. The proposed amendment also modifies TS 3.3.2.1 Required Actions C.2.2 and D.1 with a footnote to allow for compliance with the analyzed rod position sequence in lieu of only BPWS through the remainder of Unit 2, Cycle 21. Similarly, SR 3.3.2.1.8 is modified with a footnote to allow for compliance with the analyzed rod position sequence in lieu of only BPWS through the remainder of Unit 2, Cycle 21.

2. Detailed Description

2.1 Emergency Circumstances

Susquehanna will be performing a maintenance outage that will require placing the reactor in shutdown. Due to control cell friction, SSES has identified a challenge to comply with the BPWS, which would prevent startup following the maintenance outage without significantly expanding the scope of the maintenance outage.

Susquehanna Unit 2 has been monitoring control rod friction during the current operating cycle (Cycle 21). This friction issue has been identified and evaluated through the station corrective action program and it has been determined that the friction is a result of fuel channel deformation on high exposure ATRIUM 10 fuel assemblies. Channel deformation increases with exposure, with third cycle fuel assemblies being most susceptible. These assemblies are primarily located on the periphery of the core, where multiple high exposure assemblies are loaded into the same control cell. In the startup range below the low power setpoint (LPSP) control rod friction may complicate rod withdrawal, requiring some rods to remain fully inserted out of sequence. This presents a challenge to comply with the BPWS requirements, which limits rod worths below the low power setpoint by providing rod pull sequence limitations. In prior startups, Susquehanna has been able to manage rods that must remain fully inserted during the startup range by reordering the pull sequence, in accordance with BPWS rules, to mitigate the impacts of these out of sequence fully inserted rods. Based on the rods in the friction monitoring program for Unit 2, viable start-up sequences that comply with the BPWS are limited. These viable sequences may become unavailable if additional friction rods are identified during shutdown for the maintenance outage.

In order to eliminate control cell friction and preclude the need for an emergent License Amendment Request, ATRIUM 10 fuel assemblies require discharge from the core or require rechanneling. Susquehanna and industry operating experience has demonstrated that irradiated ATRIUM 10 fuel assemblies cannot be reliably rechanneled due to binding of the fuel channels with the fuel bundle spacers. Susquehanna Unit 2 is near the end of its first cycle using ATRIUM 11 fuel, with Framatome's proprietary Z4B fuel channel material, which has demonstrated improved performance at high exposures in other reactors. Therefore, the friction issues are expected to be eliminated with transition to a full core of ATRIUM 11 fuel. Unit 2 will have a full core of ATRIUM 11 fuel following the spring 2025 outage.

Development of a withdrawal sequence to comply with the BPWS, discharge of all high exposure fuel, and/or rechanneling are not viable options at this point in the operating cycle. Therefore, Susquehanna is requesting a one-time only change to identified technical specifications to allow for the use of an analyzed rod position sequence in lieu of BPWS. This change will ensure compliance with the CRDA, while allowing for flexibility to address friction during startup of Unit 2 prior to the refuel outage in spring 2023. The use of an analyzed rod

position sequence is compliant with NRC approved methods and meets the acceptance criteria of the CRDA.

Allowance of the analyzed rod position sequence through the end of Unit 2, Cycle 21 allows for startup in a CRDA-compliant manner while maintaining rods inserted for friction. Extension beyond Unit 2, Cycle 21 is not required, as during the upcoming refueling outage, most high-exposure ATRIUM 10 fuel will be discharged and replaced with ATRIUM 11 fuel.

2.2 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 the result of 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.

2.3 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.

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. SR 3.1.6.1 requires all operable control rods 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 the RWM inoperable during reactor shutdown, that movement of control rods is in accordance with BPWS 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 RWM.

2.4 Reason for the Proposed Change

As currently required in the identified TS sections, all control rod manipulations 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 reference to only 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 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 under Reference 1 and Reference 2, respectively.

2.5 Description of the Proposed Change

TS 3.1.6 LCO, Conditions A and B, and SR 3.1.6.1 are modified to allow for operable control rods to comply with the analyzed rod position sequence in lieu of only BPWS. To align with this note, TS 3.1.3 is modified to include new Required Actions D.3 and E.2 to “Confirm compliance with the analyzed rod position sequence” within 4 hours. TS 3.3.2.1 Required

Actions C.2.2 and D.1 and SR 3.3.2.1.8 are modified by footnotes to verify compliance with the analyzed rod position sequence in lieu of only BPWS.

All notations are modified by footnotes which state the new requirements are only applicable to Unit 2, Cycle 21 and will expire on April 15, 2023.

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 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 – Addition of Analyzed Rod Position Sequence

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 identified fuel channel deformation. 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 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 3.1.6 requires that “OPERABLE control rods shall comply with the requirements of the banked position withdrawal sequence (BPWS).” The addition of “analyzed rod position sequence” to 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 3.1.3 Condition D and Condition E Required Actions are necessary to permit compliance with the analyzed rod position sequence, in the event the analyzed rod position sequence is not BPWS compliant.

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 and Required Actions D.1, "Restore compliance with BPWS" OR D.2, "Restore control rod to OPERABLE status," are being modified to include alternate Required Action D.3, "Ensure compliance with the analyzed rod position sequence." The completion time of 4 hours is identical to the existing completion times of Required Action D.1 and D.2. 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 modification to 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 and Required Action E.1 to "Restore control rod to OPERABLE status" within 4 hours, are being modified to include alternate Required Action E.2, "Ensure compliance with the analyzed rod position sequence," with the same completion time of 4 hours. These modifications are consistent with the use of the analyzed rod position sequence and provide the same assurance that CRDA requirements will be met based on inoperable control rod(s) with the same completion times. 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 modification to TS 3.1.3, Condition E 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 the event the analyzed rod position sequence is not BPWS compliant.

TS 3.3.2.1 enforces the use of the BPWS via the RWM. In lieu of exclusive 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 and verified 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 by a second licensed operator or other qualified member of the technical staff. Required Actions C.2.2 and D.1 are being modified by a footnote that states "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." This modification ensures consistency between TS requirements and ensures the use of the RWM to enforce control rod movement under alternate 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.

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 3, the NRC granted approval to Exelon Generation Company, LLC, to permanently revise the TS of Peach Bottom Unit 2 and 3 to replace reference to “banked position withdrawal sequence” with refence 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, Susquehanna proposes applying NRC approved CRDA methodology for development of these control rod position sequences, albeit on a temporary basis.

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), Unit 2. The proposed amendment would modify TS 3.1.3, Control Rod Operability, TS 3.1.6, Rod Pattern Control, and TS 3.3.2.1, Control Rod Block Instrumentation, 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 modify the current reference to "Banked Position Withdrawal Sequence (BPWS)" and add 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, and 3.3.2.1.

   The proposed change would temporarily modify the current references to "Banked Position Withdrawal Sequence (BPWS)" and add 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) (LCO 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 Reference 1 NRC approved 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. 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).

4. General Electric Company Topical Report NEDO-21231, “Banked Position Withdrawal Sequence, General Electric Company,” dated January 1977.

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Marked-Up Technical Specification Pages

Revised Technical Specifications Pages

Unit 2 TS Pages
3.1-8, 3.1-9, 3.1-18, 3.1-19, 3.3-17, 3.3-18, 3.3-19, and 3.3-20

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.3 Perform SR 3.1.3.3 for each withdrawn OPERABLE control rod. AND	24 hours from discovery of Condition A concurrent with THERMAL POWER greater than the low power setpoint (LPSP) of the RWM.
	A.4 Perform SR 3.1.1.1.	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	3 hours
	C.2 Disarm the associated CRD.	4 hours

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
F. Required Action and associated Completion Time of Condition A, C, D, or E not met. OR Nine or more control rods inoperable.	F.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.

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 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 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 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 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 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 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.

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 > 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 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.

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Revised (Clean) Technical Specification Pages

Revised Technical Specifications Pages

Unit 2 TS Pages
3.1-8, 3.1-9, 3.1-18, 3.1-19, 3.3-17, 3.3-18, 3.3-19, and 3.3-20

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.3 Perform SR 3.1.3.3 for each withdrawn OPERABLE control rod. AND	24 hours from discovery of Condition A concurrent with THERMAL POWER greater than the low power setpoint (LPSP) of the RWM.
	A.4 Perform SR 3.1.1.1.	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	 3 hours
	C.2 Disarm the associated CRD.	4 hours

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
F. Required Action and associated Completion Time of Condition A, C, D, or E not met. OR Nine or more control rods inoperable.	F.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.

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 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 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 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 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 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 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.

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 > 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 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.

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Marked-Up Technical Specification Bases Pages

Revised Technical Specification Bases Pages

Unit 2 TS Bases Pages
3.1-18, 3.1-19, 3.1-21, 3.1-36, 3.1-37, 3.1-38, 3.3-52, 3.3-53, 3.3-54b, and 3.3-54d

(Provided for Information Only)

BASES

ACTIONS (continued)

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

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 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

BASES

ACTIONS (continued)

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

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.

F.1

If any Required Action and associated Completion Time of Condition A, 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.3.4 (continued)

LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," and the functional testing of SDV vent and drain valves in LCO 3.1.8, "Scram Discharge Volume (SDV) Vent and Drain Valves," overlap this Surveillance to provide complete testing of the assumed safety function. The associated Frequencies are acceptable, considering the more frequent testing performed to demonstrate other aspects of control rod OPERABILITY and operating experience, which shows scram times do not significantly change over an operating cycle.

SR 3.1.3.5

Coupling verification is performed to ensure the control rod is connected to the CRDM and will perform its intended function when necessary. The Surveillance requires verifying a control rod does not go to the withdrawn overtravel position. The overtravel position feature provides a positive check on the coupling integrity since only an uncoupled CRD can reach the overtravel position. The verification is required to be performed any time a control rod is withdrawn to the "full out" position (notch position 48) or prior to declaring the control rod OPERABLE after work on the control rod or CRD System that could affect coupling. This includes control rods inserted one notch and then returned to the "full out" position during the performance of SR 3.1.3.3. This Frequency is acceptable, considering the low probability that a control rod will become uncoupled when it is not being moved and operating experience related to uncoupling events.

REFERENCES

1. 10 CFR 50, Appendix A GDC 26, GDC 27, GDC 28, and GDC 29.
2. FSAR, Section 4.3.2
3. FSAR, Section 4.6
4. FSAR, Section 15.
5. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).
6. 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

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 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 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 ≤ 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 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.

BASES

ACTIONS (continued)

A.1 and A.2 (continued)

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 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 requirement.

BASES

ACTIONS (continued)

B.1 and B.2 (continued)

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 ~~BPWS~~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 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.

REFERENCES

1. 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

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

BASES

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.

BASES

REFERENCES (continued)

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).