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BWR Owners' Group
Licensing Topical Report

Improved BPWS Control Rod Insertion Process

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IMPORTANT NOTICE REGARDING THE CONTENTS OF THIS REPORT

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DISCLAIMER

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ACRONYMS AND ABBREVIATIONS

APRM	Average Power Range Monitor
BPWS	Banked Position Withdrawal Sequence
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owners Group
CRD	Control Rod Drive
CRDA	Control Rod Drop Accident
IRM	Intermediate Range Monitor
LCO	Limiting Condition of Operation
LPSP	Low Power Setpoint
LTR	Licensing Topical Report
NRC	Nuclear Regulatory Commission
OLTP	Original Licensed Thermal Power
RPC	Rod Pattern Controller
RPCS	Rod Pattern Control System
RSCS	Rod Sequence Control System
RTP	Rated Thermal Power
RWM	Rod Worth Minimizer
SDM	Shutdown margin
SOE	Single Operator Error
STS	Standard Technical Specifications
TS	Technical Specifications
TSTF	Technical Specification Task Force

EXECUTIVE SUMMARY

This generic Licensing Topical Report (LTR) presents an improved Banked Position Withdrawal Sequence (BPWS) for performing reactor shutdowns. This report justifies modifying the requirements of the Standard Technical Specifications (STS) relative to the applicability of the systems used to adhere to the BPWS during the reactor shutdown process (i.e., control rods are specifically being inserted to achieve shutdown at a power level less than the low power setpoint (LPSP)). The proposed improvement to the reactor shutdown process allows each control rod to be fully inserted to position 00 in one step instead of banking (e.g., 48-12-8-4-00) below the LPSP. To utilize this version of the BPWS process, it is required that control rods that have not been confirmed to be coupled, are fully inserted prior to reducing power below the LPSP. The BPWS control rod groups are unchanged.

The BPWS, as currently implemented, limits the potential reactivity increase from a postulated Control Rod Drop Accident (CRDA) during reactor startups and shutdowns below the LPSP (generically based on 10% of original licensed thermal power). During the reactor shutdown process, confirming that control rods are coupled prior to decreasing power below the LPSP eliminates the postulated scenario for a CRDA, and thus, the CRDA would no longer be a credible event.

Modifying plant Technical Specifications (TS) and/or their Bases to reflect the use of the improved BPWS process would allow control rods to be fully inserted in a single step during the reactor shutdown process below the LPSP. This provides the following benefits:

- Allows the plant to reach the all-rods-in condition prior to significant reactor cool down, which reduces the potential for a re-criticality as the reactor cools down;
- Reduces the potential for an operator reactivity control error by reducing the total number of control rod manipulations;
- Minimizes the need for manual scrams during plant shutdowns, resulting in less wear on Control Rod Drive (CRD) system components and CRD mechanisms; and
- Eliminates unnecessary control rod manipulations at low power, resulting in less wear on Reactor Manual Control and CRD system components.

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1. BACKGROUND

The design basis reactivity insertion event for the BWR is the Control Rod Drop Accident (CRDA). From Section S.2.2.3.1 of Reference 1, the CRDA scenario postulates the following:

(a) Reactor is at a control rod pattern corresponding to maximum incremental rod worth.

(b) Rod pattern control systems (Rod Worth Minimizer, Rod Sequence Control System or Rod Pattern Controller) or operators are functioning within the constraints of the Banked Position Withdrawal Sequence (BPWS). The control rod that results in the maximum incremental reactivity worth addition at any time in core life under any operating condition while employing the BPWS becomes decoupled from the control rod drive.

(c) Operator selects and withdraws the drive of the decoupled rod along with the other required control rods assigned to the Banked–position group such that the proper core geometry for the maximum incremental rod worth exists.

(d) Decoupled control rod sticks in the fully inserted position.

(e) Control rod becomes unstuck and drops at the maximum velocity determined from experimental data (3.11 feet per second).

(f) Reactor goes on a positive period and initial power burst is terminated by the Doppler reactivity feedback.

(g) APRM 120% power signal scrams reactor (conservative; in startup mode APRM scram would be operative + IRM).

(h) Scram terminates accident.

The use of the BPWS ensures that no CRDA could exceed the applicable event limits, by reducing the incremental control rod reactivity worth to acceptable values.

The BPWS is described in detail in the Reference 2 LTR. The control rods are divided into 10 groups, with the first four groups representing approximately 50% of the control rods in a checkerboard pattern. During the reactor startup process, starting from the all-rods-in condition, the BPWS allows each control rod in the first 25% of the control rods (i.e., first two control rod groups) to be fully withdrawn (in a predetermined group sequence) from notch 00 to notch 48. The second 25% of the controls rods (i.e., second two control rod groups) to be withdrawn are then banked to notch positions $00 \rightarrow N_1 \rightarrow N_2 \rightarrow N_3 \rightarrow N_4 \rightarrow 48$, where all control rods within a group must be withdrawn to each designated bank position before proceeding to the next bank position (where N_i represents an intermediate notch position, e.g., 04, 08 or 12.). After 50% of the control rods are completely withdrawn, the remaining control rod groups are withdrawn in a similar manner until the reactor exceeds the LPSP (generically based on 10% of original licensed thermal power (OLTP)).

The CRDA is primarily of concern during reactor startups, because the act of withdrawing a control rod can cause the rod to become decoupled from its drive assembly. It is impossible to drop a coupled control rod or a coupled control rod that is in the process of being inserted.

During normal operations, routine control rod coupling checks are performed, and these ensure that the fully withdrawn control rods are coupled. During the shutdown process, for the withdrawn control rods that are confirmed to be coupled, the possibility of a CRDA is eliminated, and thus, banking withdrawn control rods in to the BPWS intermediate positions is not needed.

Predetermined control rod withdrawal sequences control the power distribution in the core, and minimize control rod worth. From the all-rods-in condition to the LPSP, either the Rod Pattern Controller (RPC), Rod Sequence Control System (RSCS), or the Rod Worth Minimizer (RWM) (depending on the plant design) enforces the BPWS constraints on control rod movements. Above the LPSP, inherent feedback mechanisms, primarily in the form of steam voids, limit the control rod worth such that a CRDA does not exceed the applicable event limits.

The BPWS is required by the STS to be applied to both reactor startup and shutdown processes. Because of the delay caused by the use of the Reference 2 version of the BPWS in achieving shutdown, some plants perform manual scrams instead of going through the multiple-step BPWS shutdown process (approximately 400 steps for a medium sized reactor).

2. INTRODUCTION

Reference 2 conservatively applies the BPWS intermediate steps to both startups and shutdowns, without regard to the fact that compensatory operator actions could eliminate the possibility of a CRDA during the reactor shutdown process. The improved BPWS control rod insertion process, described herein, provides the compensatory operator actions that allow control rods to be fully inserted in a single step.

This report addresses changes to the shutdown process which currently constrains the control rod insertion sequence. The proposed changes:

1. Require control rod coupling confirmations, which eliminate any Single Operator Error (SOE) with respect to assuring if the withdrawn control rods are coupled.
2. Require each control rod that has not been confirmed coupled (since its last withdrawal) to be fully inserted prior to reducing power below the LPSP. (These rods are usually partially inserted rods at high power.)
3. Allow each remaining (i.e., coupled) control rod to be fully inserted in a single step below the LPSP, instead of requiring each control rod to be banked at intermediate positions. (For some plants, this requires the Rod Worth Minimizer (RWM) or Rod Pattern Controller (RPC) to be bypassed.)

All other control rod operability requirements are unchanged and continue to apply. Allowing each control rod to be fully inserted in a single step reduces the total rod manipulation steps to shutdown a reactor from ~400 for a medium sized reactor to ~150 steps. This reduction would result in:

- Less chance of a re-criticality as the reactor cools down,
- Reducing the potential for operator errors,
- Fewer manual scrams and less wear on control and CRD system components, and
- Eliminates unnecessary control rod manipulations.

In this report, Section 3 addresses the current BPWS, RWM and RPC requirements in the Standard Technical Specifications (STS), Section 4 provides the technical justification for the elimination of the intermediate (banked) steps of the BPWS during the reactor shutdown process, Section 5 provides guidance for plant procedural checks, Section 6 provides proposed STS changes, and Section 7 discusses the effects on plant equipment and benefits.

3. STANDARD TECHNICAL SPECIFICATIONS ADDRESSING BPWS AND RWM/RPC

This section summarizes the current Standard Technical Specifications (STS) with respect to the use of the BPWS, and RWM (or RPC for a BWR/6). Generic examples of the requirements for applicability of the BPWS and RWM/RPC are contained in the BWR/4 STS (NUREG 1433 - Reference 3) and BWR/6 STS (NUREG 1434 - Reference 4). The potentially affected STS locations are listed below.

BWR/4 NUREG 1433 Locations	**BWR/6 NUREG 1434 Locations**
STS 3.1.3; CONDITION D and REQUIRED ACTION D.1	STS 3.1.3; CONDITION D and REQUIRED ACTION D.1
STS 3.1.6; LCO 3.1.6, CONDITIONS A and B, REQUIRED ACTIONS A.1 and B.1, and SR 3.1.6.1	STS 3.1.6; LCO 3.1.6, CONDITIONS A and B, and SR 3.1.6.1
STS 3.3.2.1; CONDITION C, REQUIRED ACTIONS C.2.2 and D.1, and SR 3.3.2.1.8	STS Table 3.3.2.1-1, FUNCTION 1.b and note (c)
STS Table 3.3.2.1-1, FUNCTION 2 and note (f)	

In all of the above cases the BPWS and RWM/RPC are applicable in MODES 1 and 2 when power is ≤ 10% RTP (i.e., below the LPSP), for both reactor startup and shutdown.

For completeness, the above STS are provided in Appendix A.

This LTR documents an acceptable alternate approach for complying with the BPWS. After this LTR is NRC approved, it is expected that plant-specific TS BASES will be updated to reference this LTR and incorporate the operating recommendations herein, for using this alternate BPWS approach during the reactor shutdown process. With the TS Bases appropriately updated, most of the TS locations (listed above) do not need to be changed. The STS locations that are subjected to change are provided in Section 6.

4. SAFETY AND TECHNICAL EVALUATIONS

The BPWS was originally focused on application to reactor startups; however, it was also applied to reactor shutdowns, because of the potential for high worth rod patterns during the shutdown process. However, confirming that control rods are coupled prior to decreasing power below the LPSP eliminates the potential for a CRDA during the reactor shutdown process, and thus, the need for banking. This section addresses steps to ensure control rod coupling integrity for the control rods not fully inserted prior to reaching the LPSP, which will then permit control rods to be fully inserted in a single step, when the reactor is below the LPSP.

The function of the banking steps of the BPWS is to minimize the potential reactivity increase from a postulated CRDA at low power levels. Therefore, if the possibility for a control rod to drop can be eliminated, then the banking steps at low power levels are not needed to ensure the applicable event limits cannot be exceeded. It is not possible to drop a control rod that is coupled to or in contact with its CRD, and thus, if the controls specified herein are applied, a CRDA is not a credible event for this situation while inserting control rods during the reactor shutdown process. The following discusses how control rod coupling is confirmed prior to reaching the STS BPWS applicability limit during the reactor shutdown process, thereby eliminating the need for the control rod banking steps.

The STS from NUREG 1433 and NUREG 1434 require coupling checks be performed any time a control rod is fully withdrawn. Coupling is confirmed by a continuous indication of position "48" on the control rod position indication display while the operator attempts to withdraw the control rod past position 48. If the control rod is not coupled, the position 48 indication will extinguish, the over travel light will light, and an alarm sounds. Based on STS, the following statements are deduced:

- If a rod has been fully withdrawn during the cycle and then determined to be coupled, and the rod has not been moved from position 48, then coupling integrity is assured, because of the improbability of a control rod becoming decoupled when it has not been moved.
- If after a coupling check is performed for a control rod, the rod is inserted and then withdrawn to the full out position, it again requires a coupling check. However, if the rod is withdrawn to an intermediate position, coupling integrity is not assured for this rod.
- If a rod has been checked for coupling at notch position 48 and the rod has since only been moved inward, no subsequent coupling check is required, because control rod insertion maintains contact between the control rod and the drive.

To ensure that control rods are not stuck and are not decoupled, the surveillances within STS 3.1.3 (Control Rod OPERABILITY) require stuck rod and coupling checks to be routinely performed. For stuck rod checks, the fully withdrawn rods are usually inserted one notch and withdrawn one notch. For a coupling check, an operator typically attempts to withdraw the control rod past notch position 48, when the rod position is indicated at notch position 48. If no over travel indication is observed, then the coupling check is satisfactory. The routine CRD coupling checks ensure control rod coupling integrity for the fully withdrawn rods, and are typically performed every seven days.

After startup, 80 to 90% of control rods would have been checked for coupling, because they would be fully withdrawn during power operation. The remaining control rods would be checked at some time during the cycle as control rods are alternated in and out of the core. For an end of cycle shutdown, all rods are typically fully withdrawn, and therefore, checked for coupling. To eliminate the possibility of a CRDA, the proposed controls require that any partially inserted control rods, which have not been confirmed to be coupled since their last withdrawal, be fully inserted prior to reaching the LPSP.

However, if a rod has been checked for coupling at notch position 48 and the rod has since only been moved inward, this rod is in contact with its drive and thus is not required to be fully inserted prior to reaching the LPSP. However, if only inward movement cannot be confirmed for a partially inserted control rod, the control rod shall be fully inserted prior to reaching the LPSP.

Based on the discussion above, it is concluded that partially inserted rods that are not assured to be in contact with their drives would be required to be fully inserted before the power is reduced to the LPSP. The remaining rods are not susceptible to a CRDA, making the banking steps during the reactor shutdown process below the LPSP unnecessary.

If a plant is required to be shutdown and all rods not confirmed of coupling cannot be fully inserted prior to the power reaching the LPSP (e.g., shortly after a startup), then the proposed changes to the shutdown process may not be implemented. However, after all rods that are not confirmed of coupling are fully inserted, the proposed shutdown process is allowed. When there is a withdrawn rod that is not confirmed to be coupled, the standard (e.g., Reference 2) BPWS steps must be followed below the LPSP or a scram is required to protect against the CRDA.

Additionally, if a plant is in the process of shutting down while using the improved BPWS control rod insertion process below the LPSP, no control rod shall be withdrawn unless the control rod pattern is in compliance with the standard BPWS requirements (e.g., at about 75% or higher control rod density). This assures that rod withdrawals comply with standard BPWS withdrawal requirements.

To be allowed to continue operating with a stuck withdrawn or partially inserted control rod, the CRD must be inserted as much as possible and then disarmed, an evaluation of adequate (per TS requirements) cold shutdown margin (SDM) is required, and an evaluation that justifies (consistent with STS 3.1.3) operating with a stuck rod has been approved. The SDM must be evaluated (by measurement or analysis) with the stuck control rod at its stuck position and the highest worth OPERABLE control rod assumed to be fully withdrawn. The SDM evaluation demonstrates adequate SDM and that MODE 4 can be obtained. Inserting the CRD as much as possible and disarming it assures that no SOE can cause the stuck rod to drop, and the stuck rod can then be considered as coupled. In this case, both SDM and CRDA concerns are alleviated, and thus, use of the improved BPWS control rod insertion process does not affect plant safety and is permitted.

5. PLANT IMPLEMENTATION

To implement the proposed change to the shutdown process, the following guidance should be reflected in plant procedures.

A. Actions Prior to Reducing Power to the LPSP

Fully Withdrawn Control Rods

Before reducing power below the LPSP, operations shall confirm control rod coupling integrity for all rods that are fully withdrawn. (If rod coupling has been checked twice or has been verified, and the rod has not been subsequently inserted and withdrawn, the coupling check need not be repeated prior to reducing power below the LPSP.)

Note: The coupling confirmation check is unchanged. This check is performed by withdrawing the CRD to position "48" (full-out) and attempting to withdraw the control rod past position 48. Coupling is confirmed by a continuous indication of "48" on the rod position indication display. An over travel would indicate the CRD has traveled beyond the full-out position which is indicative of a decoupled control rod. Existence of an over travel condition is by: (1) position 48 indication extinguished, (2) lighting of the over travel light: and (3) sounding of the over travel alarm.

A rod coupling is considered confirmed when there have been two documented coupling checks or one verified and documented coupling check. (This step ensures that no SOE can result in an incorrect coupling check.)

Control Rods In Intermediate Positions

Control rods that have not been confirmed coupled (at notch position 48 since they were last withdrawn) must be fully inserted prior to power reduction to the LPSP. However, if a rod has been checked for coupling at position 48 and the rod has since only been moved inward, this rod does not need to be inserted prior to reaching the LPSP.

Fully Inserted Control Rods

No action is required.

After power is reduced to the LPSP and all rods that were not confirmed coupled have been fully inserted, the RWM/RPC may be bypassed (if needed).

If shutdown is required and all rods, which are not confirmed coupled, cannot be fully inserted prior to the power dropping below the LPSP (such as shortly after a startup), then the standard (e.g., Reference 2) BPWS must be observed below the LPSP or a scram is required. However, during the shutdown process using the standard BPWS and after all rods, which were not confirmed coupled, have been fully inserted, the improved BPWS control rod insertion process may be used.

B. Actions Below the LPSP

As much as reasonably possible, the control rod groups should be inserted in the same order as specified for the standard BPWS. (This is considered a matter of good practice, because it allows for a faster restart, if the reactor shutdown is aborted.) All the control rods in a group should be fully inserted prior to inserting rods in the next group.

The rods may be inserted from notch position 48 to notch position 00 without stopping at intermediate positions.

Note: This sequence may be programmed into the RWM/PRCS/RSCS, if a plant's design provides this capability.

C. Control Rod Withdrawal Below LPSP

When a plant is in the process of shutting down while fully inserting control rods in a single step below the LPSP, no control rod shall be withdrawn unless the control rod pattern is in compliance with standard BPWS requirements.

D. Inoperable and Stuck Control Rods

If a plant has only one stuck control rod with its drive inserted as much as possible and disarmed, and continuous operation has been allowed per STS 3.1.3, then use of the improved BPWS control rod insertion process is allowed. In all other cases with stuck control rods, the improved BPWS control rod insertion process is not applicable, and the current requirements for inoperable and stuck rods shall be followed.

6. PROTOTYPICAL TECHNICAL SPECIFICATIONS CHANGES

6.1 NUREG 1433 BWR/4 STS Change

If needed on a plant-specific basis, qualify note (f) of Table 3.3.2.1-1 by adding "*, except during the reactor shutdown process if the coupling of each withdrawn control rod has been confirmed"* to the end of the note.

(f) With THERMAL POWER ≤ [10]% RTP[*, except during the reactor shutdown process if the coupling of each withdrawn control rod has been confirmed*].

It is envisioned that the above change "if needed" would be necessary only for those plants that do not have the ability to readily modify or reprogram their RWM. If a plant is not able to revise their RWM, the above TS change would allow the RWM to be bypassed, and thus, the shutdown sequence described herein could be utilized. For most, if not all, plants with TS based upon NUREG 1433, the above change to their plant-specific TS would not be warranted.

6.2 NUREG 1434 BWR/6 STS Change

If needed on a plant-specific basis, qualify note (c) of Table 3.3.2.1-1 by adding "*, except during the reactor shutdown process if the coupling of each withdrawn control rod has been confirmed"* to the end of the note.

(c) With THERMAL POWER ≤ [10]% RTP[*, except during the reactor shutdown process if the coupling of each withdrawn control rod has been confirmed]*.

It is envisioned that the above change "if needed" would be necessary for most of the BWR/6 plants, because they do not have the ability to readily modify or reprogram their RPC. If a plant is not able to revise their RPC, the above TS change would allow the RPC to be bypassed, and thus, the shutdown sequence described herein could be utilized. For most plants with TS based upon NUREG 1434, the above change to their plant-specific TS would be warranted. Following submittal of this LTR to the NRC, it is envisioned that a Technical Specification Task Force (TSTF) submittal will be generated to capture the above change to NUREG 1434.

7. SAFETY AND PLANT BENEFITS

The following section discusses benefits for the elimination of control rod banking during the reactor shutdown process. Aspects addressed include reactivity management, human factors, scram avoidance and equipment duty.

7.1 Reactivity Management

By eliminating the banking steps during the reactor shutdown process, negative reactivity can be more rapidly inserted into the core. Unlike startup in which positive reactivity insertions must be slow and controlled, it is acceptable to rapidly insert negative reactivity while shutting down.

A faster reactor shutdown achieves the All Rods In condition prior to significant reactor cool down. Because core reactivity normally increases with decreasing reactor coolant temperature, achieving All Rods In faster reduces the potential for re-criticality during the control rod insertion process. That is, if the negative reactivity insertion rate due to control rod movements is more than the positive reactivity insertion rate due to cool down, then a re-criticality cannot occur.

7.2 Human Performance

Eliminating banking during reactor shutdown decreases the number of steps from about 400 to 150 for a medium size reactor. This reduces the number of potential reactivity control errors that could occur, because it reduces the number of operator actions below the LPSP to achieve reactor shutdown.

7.3 Scram Avoidance

The ability to achieve a faster shutdown by fully inserting control rods in a single step helps eliminate the need to manually scram the reactor. Using the improved BPWS control rod insertion process reduces the potential for improperly entering into a control rod pattern in which rods cannot be moved, and thus, requiring a scram.

7.4 Equipment Duty

The reduction in the number of control rod positioning steps prevents unnecessary control rod manipulations. This reduces the duty on the Reactor Manual Control System and CRD hardware, which improves equipment reliability because it reduces the number of operations to achieve reactor shutdown. In addition, avoiding scrams results in less duty on the CRD system components, and thus, also improves CRD component reliability.

8. REFERENCES

1. GE Nuclear Energy, "GESTAR II General Electric Standard Application for Reactor Fuel," US Supplement NEDE-24011-P-A-14-US, Class III (Proprietary), June 2000.
2. General Electric Co., Licensing Topical Report, "Banked Position Withdrawal Sequence," NEDO-21231, Class I (non-proprietary), January 1977.
3. USNRC, "Standard Technical Specifications General Electric Plants, BWR/4," NUREG-1433, Rev. 2, June 2001.
4. USNRC, "Standard Technical Specifications General Electric Plants, BWR/6," NUREG-1434, Rev. 2, June 2001.

APPENDIX A

APPLICABLE STANDARD TECHNICAL SPECIFICATIONS

For completeness, the current Standard Technical Specifications (STS) from NUREG 1433 (Reference 3) and NUREG 1434 (Reference 4), which address the subjects discussed in this report, are provided below.

A.1 NUREG 1433 BWR/4 STS

STS 3.1.3; CONDITION D and REQUIRED ACTION D.1:

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. <u>OR</u> D.2 Restore control rod to OPERABLE status.

STS 3.1.6; LCO 3.1.6:

OPERABLE control rods shall comply with the requirements of the [banked position withdrawal sequence (BPWS)].

STS 3.1.6; CONDITIONS A and B, and REQUIRED ACTIONS A.1 and B.1:

CONDITION	REQUIRED ACTION
A. One or more OPERABLE control rods not in compliance with [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.

B. Nine or more OPERABLE control rods not in compliance with [BPWS].	B.1 -- **- NOTE -** Rod worth minimizer (RWM) may be bypassed as allowed by LCO 3.3.2.1. -- Suspend withdrawal of control rods.

STS SR 3.1.6.1:

SR 3.1.6.1 Verify all OPERABLE control rods comply with [BPWS].

STS 3.3.2.1, CONDITION C:

C. Rod worth minimizer (RWM) inoperable during reactor startup

STS 3.3.2.1, REQUIRED ACTION C.2.2:

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.

STS 3.3.2.1, CONDITION D and REQUIRED ACTION D.1:

D. RWM inoperable during Reactor shutdown	D.1 Verify movement of control rods is in compliance with BPWS by a second licensed operator or other qualified member of the technical staff.

STS SR 3.3.2.1.8:

SR 3.3.2.1.8 Verify control rod sequences input to the RWM are in conformance with BPWS.

STS Table 3.3.2.1-1, FUNCTION 2 and note (f):

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Rod Worth Minimizer	1(f), 2(f)	[1]	SR 3.3.2.1.2 SR 3.3.2.1.3 SR 3.3.2.1.5 SR 3.3.2.1.8	NA

(f) With THERMAL POWER ≤ [10]% RTP.

A.2 NUREG 1434 BWR/6 STS

STS 3.1.3; CONDITION D and REQUIRED ACTION D.1:

(Same as for NUREG 1433.)

STS 3.1.6; LCO 3.1.6:

(Same as for NUREG 1433.)

STS 3.1.6; CONDITION A:

(Same as for NUREG 1433.)

STS 3.1.6; CONDITION B:

(Same as for NUREG 1433.)

STS SR 3.1.6.1:

(Same as for NUREG 1433.)

STS Table 3.3.2.1-1, FUNCTION 1.a and note (c):

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS
1.b. Rod pattern controller	1(c), 2(c)	[1]	SR 3.3.2.1.3 SR 3.3.2.1.4 SR 3.3.2.1.5 SR 3.3.2.1.7 SR 3.3.2.1.9

(c) With THERMAL POWER ≤ [10]% RTP.