

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - ANY FULL LENGTH CEA WITHDRAWN

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to that specified in the COLR.

APPLICABILITY: MODES 1, 2*, 3, 4, and 5 with any full length CEA fully or partially withdrawn.

ACTION:

With the SHUTDOWN MARGIN less than that required above, immediately initiate and continue boration at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 With any full length CEA fully or partially withdrawn, the SHUTDOWN MARGIN shall be determined to be greater than or equal to that specified in the COLR:

- a. Within 1 hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is immovable or untrippable, the above required SHUTDOWN MARGIN shall be verified acceptable with an increased allowance for the withdrawn worth of the immovable or untrippable CEA(s).
- b. When in MODE 1 or MODE 2 with K_{eff} greater than or equal to 1.0, at least once per 12 hours by verifying that CEA group withdrawal is within the Transient Insertion Limits of Specification 3.1.3.6.
- c. When in MODE 2 with K_{eff} less than 1.0, within 4 hours prior to achieving reactor criticality by verifying that the predicted critical CEA position is within the limits of Specification 3.1.3.6.

* See Special Test Exception 3.10.1.

REACTIVITY CONTROL SYSTEMS

SHUTDOWN MARGIN - ALL FULL LENGTH CEAS FULLY INSERTED

LIMITING CONDITION FOR OPERATION

3.1.1.2 The SHUTDOWN MARGIN shall be greater than or equal to that specified in the COLR.

APPLICABILITY: MODES 3, 4 and 5 with all full length CEAs fully inserted.

ACTION:

With the SHUTDOWN MARGIN less than that specified in the COLR, immediately initiate and continue boration at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.2 With all full length CEAs fully inserted, the SHUTDOWN MARGIN shall be determined to be greater than or equal to that specified in the COLR, at least once per 24 hours by consideration of the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

REQUIRED STORED BORIC ACID VOLUME AS A FUNCTION OF CONCENTRATION

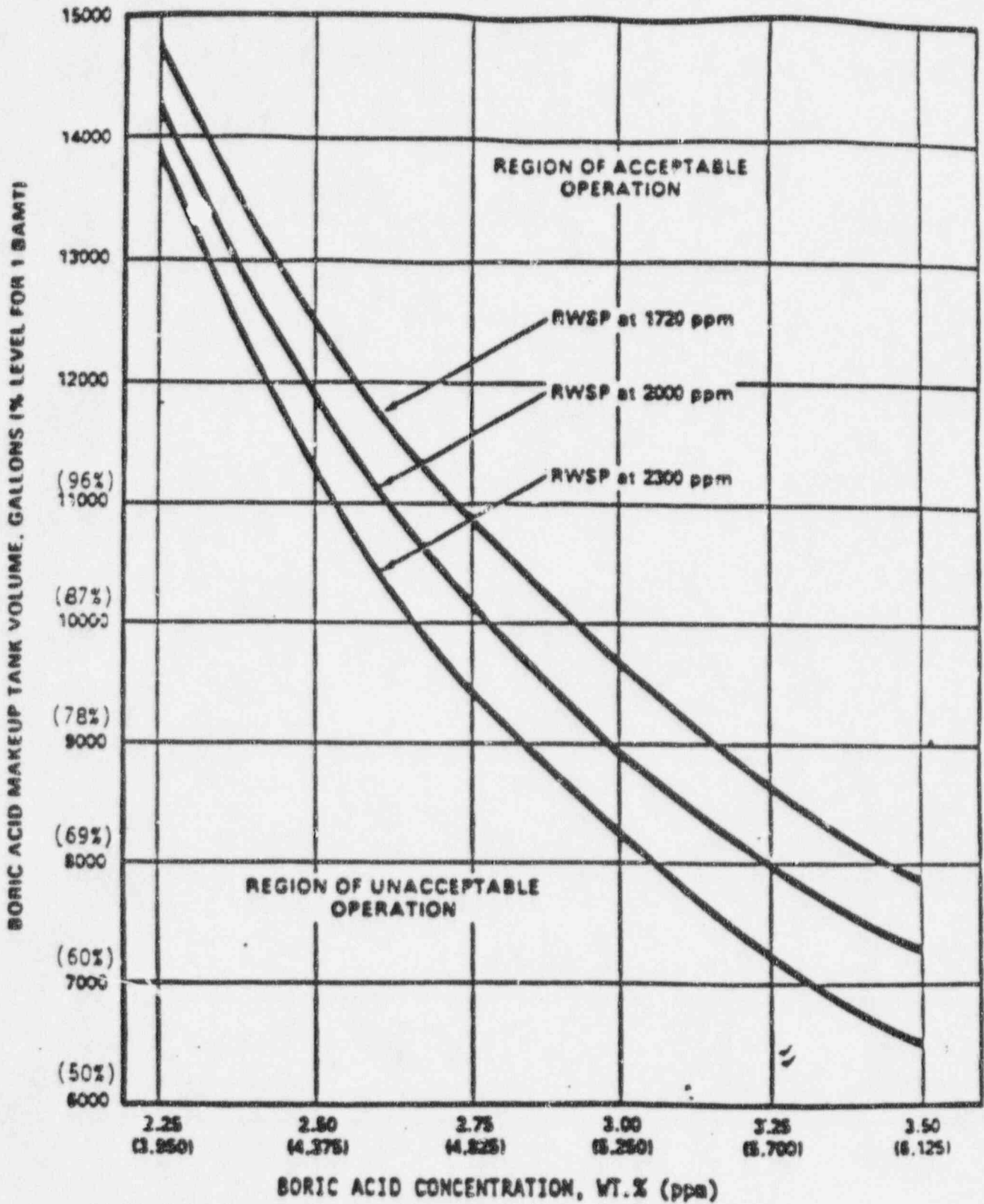


FIGURE 3.1-1

3/4.10 SPECIAL TEST EXCEPTIONS

* 3/4.10.1 SHUTDOWN MARGIN

LIMITING CONDITION FOR OPERATION

3.10.1 The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 or 3.1.1.2 may be suspended for measurement of CEA worth and SHUTDOWN MARGIN provided reactivity equivalent to at least the highest estimated CEA worth is available for trip insertion from OPERABLE CEA(s).

APPLICABILITY: MODES 2 AND 3*.

ACTION:

- a. With any full-length CEA not fully inserted and with less than the above reactivity equivalent available for trip insertion, immediately initiate and continue boration at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or its equivalent until the SHUTDOWN MARGIN required by Specification 3.1.1.1 is restored.
- b. With all full-length CEAs fully inserted and the reactor subcritical by less than the above reactivity equivalent, immediately initiate and continue boration at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or its equivalent until the SHUTDOWN MARGIN required by Specification 3.1.1.2 is restored.

SURVEILLANCE REQUIREMENTS

4.10.1.1 The position of each full-length and part-length CEA required either partially or fully withdrawn shall be determined at least once per 2 hours.

4.10.1.2 Each CEA not fully inserted shall be demonstrated capable of full insertion when tripped from at least the 50% withdrawn position within 7 days prior to reducing the SHUTDOWN MARGIN to less than the limits of Specification 3.1.1.1.

*Operation in MODE 3 shall be limited to 6 consecutive hours.

3/4.1 REACTIVITY CONTROL SYSTEMS

.BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

SHUTDOWN MARGIN is the amount by which the core is subcritical, or would be subcritical immediately following a reactor trip, considering a single malfunction resulting in the highest worth CEA failing to insert.

The function of SHUTDOWN MARGIN is to ensure that the reactor remains subcritical following a design basis accident or anticipated operational occurrence. During operation in MODES 1 and 2, with k_{eff} greater than or equal to 1.0, the transient insertion limits of Specification 3.1.3.6 ensure that sufficient SHUTDOWN MARGIN is available.

SHUTDOWN MARGIN requirements vary throughout the core life as a function of fuel depletion and reactor coolant system (RCS) cold leg temperature (T_{cold}). The most restrictive condition occurs at EOL, with (T_{cold}) at no-load operating temperature, and is associated with a postulated steam line break accident and the resulting uncontrolled RCS cooldown. In the analysis of this accident, the specified SHUTDOWN MARGIN is required to control the reactivity transient and ensure that the fuel performance and offsite dose criteria are satisfied. As (initial) T_{cold} decreases, the potential RCS cooldown and the resulting reactivity transient are less severe and, therefore, the required SHUTDOWN MARGIN also decreases. Below T_{cold} of about 200°F, the inadvertent deboration event becomes limiting with respect to the SHUTDOWN MARGIN requirements. Below 200°F, the specified SHUTDOWN MARGIN ensures that sufficient time for operator actions exists between the initial indication of the deboration and the total loss of SHUTDOWN MARGIN. Accordingly, the SHUTDOWN MARGIN requirements are based upon these limiting conditions.

Additional events considered in establishing requirements on SHUTDOWN MARGIN are single CEA withdrawal and startup of an inactive reactor coolant pump.

Other technical specifications that reference the Specifications on SHUTDOWN MARGIN are: 3/4.1.2, BORATION SYSTEMS, 3/4.1.3, MOVABLE CONTROL ASSEMBLIES, 3/4.9.1, REFUELING OPERATIONS - BORON CONCENTRATION, and 3/4.10.1, SHUTDOWN MARGIN.

3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT

The limitations on moderator temperature coefficient (MTC) are provided to ensure that the assumptions used in the accident and transient analysis remain valid through each fuel cycle. The Surveillance Requirements for measurement of the MTC during each fuel cycle are adequate to confirm the MTC value since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup. The confirmation that the measured MTC value is within its limit provides assurances that the coefficient will be maintained within acceptable values throughout each fuel cycle.

NPF-38-196

ATTACHMENT B

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - ANY FULL LENGTH CEA WITHDRAWN

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to that specified in COLR.

APPLICABILITY: MODES 1, 2*, 3 and 4, and 5 with any full length CEA fully or partially withdrawn.

ACTION:

With the SHUTDOWN MARGIN less than that required above specified in the COLR, immediately initiate and continue boration at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or equivalent until the required to restore SHUTDOWN MARGIN is restored to within limit.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 With any full length CEA fully or partially withdrawn, the SHUTDOWN MARGIN shall be determined to be greater than or equal to specified in the COLR:

- a. Within 1 hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is immovable or untrippable, the above required SHUTDOWN MARGIN shall be verified acceptable with an increased allowance for the withdrawn worth of the immovable or untrippable CEA(s).
- b. When in MODE 1 or MODE 2 with K_{eff} greater than or equal to 1.0, at least once per 12 hours by verifying that CEA group withdrawal is within the Transient Insertion Limits of Specification 3.1.3.6.
- c. When in MODE 2 with K_{eff} less than 1.0, within 4 hours prior to achieving reactor criticality by verifying that the predicted critical CEA position is within the limits of Specification 3.1.3.6.

*See Special Test Exception 3.10.1.

REACTIVITY CONTROL SYSTEMS

SHUTDOWN MARGIN - ALL FULL LENGTH CEAS FULLY INSERTED

LIMITING CONDITION FOR OPERATION

3.1.1.2 The SHUTDOWN MARGIN shall be greater than or equal to that specified in the COLR.

APPLICABILITY: MODE 3, 4 and 5 with all CEAs fully inserted.

ACTION:

With the SHUTDOWN MARGIN less than that specified in the COLR, immediately initiate and continue boration at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or equivalent until the required to restore SHUTDOWN MARGIN is restored to within limit.

SURVEILLANCE REQUIREMENTS

4.1.1.2.1 With all full length CEAs fully inserted, the SHUTDOWN MARGIN shall be determined to be greater than or equal to specified in the COLR, at least once per 24 hours by consideration of the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

REQUIRED STORED BORIC ACID VOLUME AS A FUNCTION OF CONCENTRATION

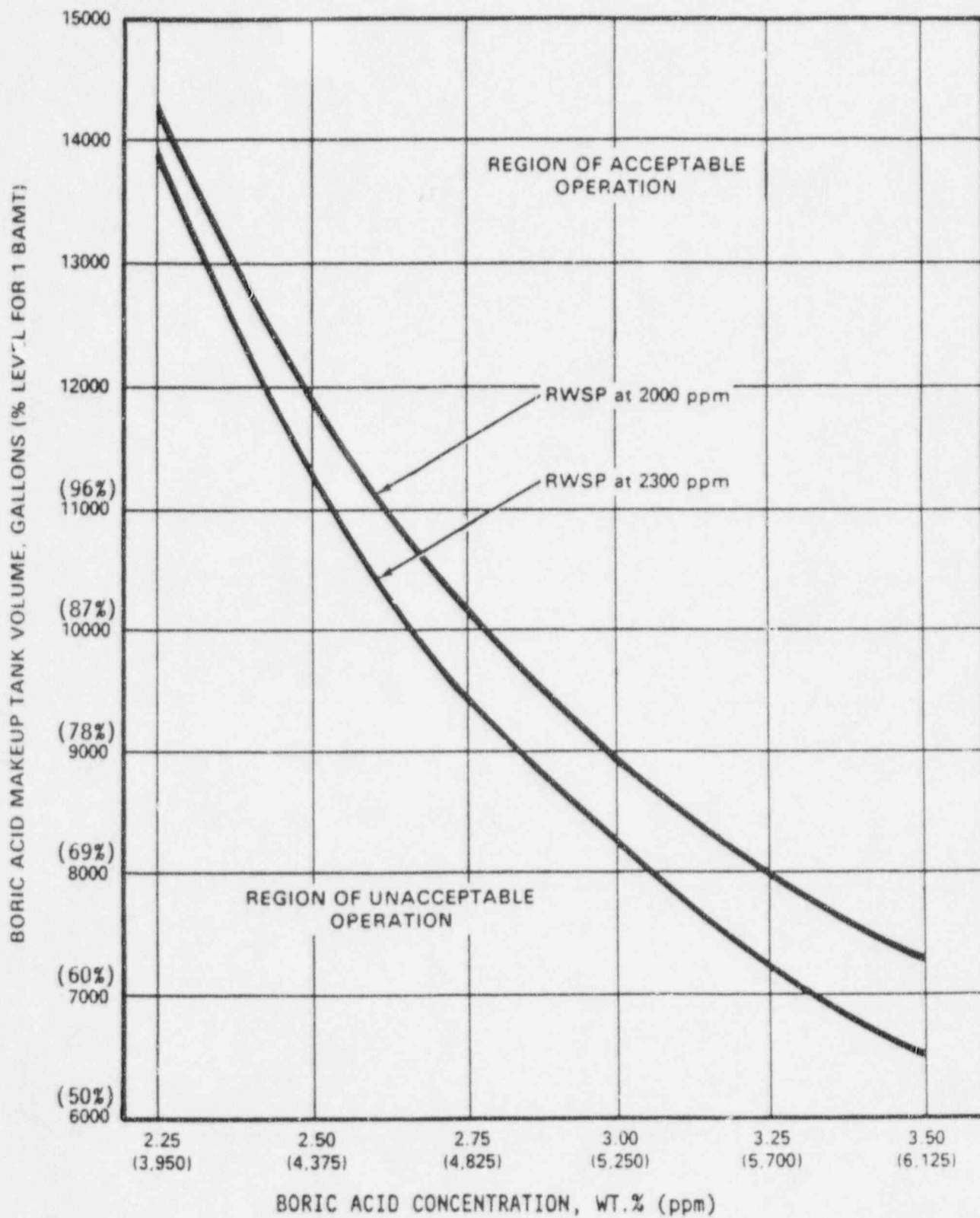


FIGURE 3.1-1

3/4.10 SPECIAL TEST EXCEPTIONS

3/4.10.1 SHUTDOWN MARGIN

LIMITING CONDITION FOR OPERATION

3.10.1 The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 or 3.1.1.2 may be suspended for measurement of CEA worth and SHUTDOWN MARGIN provided reactivity equivalent to at least the highest estimate of CEA worth is available for trip insertion from OPERABLE CEA(s).

APPLICABILITY: Modes 2 and 3*.

ACTION:

- a. With any full-length CEA not fully inserted and with less than the above reactivity equivalent available for trip insertion, immediately initiate ~~and continue~~ boration ~~at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or its equivalent until the~~ to restore the SHUTDOWN MARGIN required by Specification 3.1.1.1 is restored.
- b. With all full-length CEAs fully inserted and the reactor subcritical by less than the above reactivity equivalent, immediately initiate ~~and continue~~ boration ~~at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or its equivalent until the~~ to restore the SHUTDOWN MARGIN required by Specification 3.1.1.2 is restored.

SURVEILLANCE REQUIREMENTS

4.10.1.1 The position of each full-length and part-length CEA required either partially or fully withdrawn shall be determined at least once per 2 hours.

4.10.1.2 Each CEA not fully inserted shall be demonstrated capable of full insertion when tripped from at least the 50% withdrawn position within 7 days prior to reducing the SHUTDOWN MARGIN to less than the limits of Specification 3.1.1.1.

*Operation in MODE 3 shall be limited to 6 consecutive hours.

3/4.1 REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

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SHUTDOWN MARGIN requirements vary throughout the core life as a function of fuel depletion and reactor coolant system (RCS) cold leg temperature (T_{cold}). The most restrictive condition occurs at EOL, with T_{cold} at no-load operating temperature, and is associated with a postulated steam line break accident and the resulting uncontrolled RCS cooldown. In the analysis of this accident, the specified SHUTDOWN MARGIN is required to control the reactivity transient and ensure that the fuel performance and offsite dose criteria are satisfied. As (initial) T_{cold} decreases, the potential RCS cooldown and the resulting reactivity transient are less severe and, therefore, the required SHUTDOWN MARGIN also decreases. Below T_{cold} of about 200°F, the inadvertent deboration event becomes limiting with respect to the SHUTDOWN MARGIN requirements. Below 200°F, the specified SHUTDOWN MARGIN ensures that sufficient time for operator actions exists between the initial indication of the deboration and the total loss of SHUTDOWN MARGIN. Accordingly, the SHUTDOWN MARGIN requirements are based upon these limiting conditions.

Additional events considered in establishing requirements on SHUTDOWN MARGIN are single CEA withdrawal and startup of an inactive reactor coolant pump.

If the SHUTDOWN MARGIN requirements are not met, boration must be initiated immediately. Boration will continue until the SHUTDOWN MARGIN requirements are met.

In the determination of the required combination of boration flow rate and boron concentration, there is no unique requirement that must be satisfied provided the boration source is sufficient to achieve the SHUTDOWN MARGIN. Since it is imperative to raise the boron concentration of the RCS as soon as possible, the boron concentration should be a highly concentrated solution, such as that normally found in the boric acid makeup tanks or the refueling water storage pool. The Operator should borate with the best source available for the plant conditions.

Other technical specifications that reference the Specifications on SHUTDOWN MARGIN ARE: 3/4.1.2, BORATION SYSTEMS, 3/4.1.3, MOVABLE CONTROL ASSEMBLIES, 3/4.9.1, REFUELING OPERATIONS - BORON CONCENTRATION, and 3/4.10.1, SHUTDOWN MARGIN.

3/4.1 REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT

The limitations on moderator temperature coefficient (MTC) are provided to ensure that the assumptions used in the accident and transient analysis remain valid through each fuel cycle. The Surveillance Requirements for measurement of the MTC during each fuel cycle are adequate to confirm the MTC value since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup. The confirmation that the measured MTC value is within its limit provides assurances that the coefficient will be maintained within acceptable values throughout each fuel cycle.