

## 3/4.1 REACTIVITY CONTROL SYSTEMS

### 3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN -  $T_{avg} > 200^{\circ}\text{F}$

#### LIMITING CONDITION FOR OPERATION

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3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 1.3% delta k/k.

APPLICABILITY: MODES 1, 2\*, 3, and 4.

ACTION:

With the SHUTDOWN MARGIN less than 1.3% delta k/k, immediately initiate and continue boration at  $\geq 33$  gpm of a solution containing  $\geq 6,560$  ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

#### SURVEILLANCE REQUIREMENTS

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4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be greater than or equal to 1.3% delta k/k:

- a. Within 1 hour after detection of an inoperable control rod(s) and at least once per 12 hours thereafter while the rod(s) is inoperable. If the inoperable control rod is immovable or untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable control rod(s).
- b. When in MODE 1 or MODE 2 with  $K_{eff}$  greater than or equal to 1.0, in accordance with the Surveillance Frequency Control Program by verifying that control banks are within the limits in the COLR per Specification 3.1.3.5.
- 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 control rod position is within the limits in the COLR per Specification 3.1.3.5.

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\*See Special Test Exception 3.10.1

## REACTIVITY CONTROL SYSTEMS

### SURVEILLANCE REQUIREMENTS (Continued)

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- d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e below, with the control banks at the maximum insertion limit in the COLR per Specification 3.1.3.5.
- e. When in MODES 3 or 4, in accordance with the Surveillance Frequency Control Program by consideration of the following factors:
  - 1. Reactor coolant system boron concentration,
  - 2. Control rod position,
  - 3. Reactor coolant system average temperature,
  - 4. Fuel burnup based on gross thermal energy generation,
  - 5. Xenon concentration, and
  - 6. Samarium concentration.

4.1.1.1.2 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within  $\pm 1\%$  delta k/k in accordance with the Surveillance Frequency Control Program. This comparison shall consider at least those factors stated in Specification 4.1.1.1.1.e, above. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 Effective Full Power Days after each fuel loading.

## REACTIVITY CONTROL SYSTEMS

### SHUTDOWN MARGIN - $T_{avg} \leq 200^{\circ}\text{F}$

#### LIMITING CONDITION FOR OPERATION

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3.1.1.2 The SHUTDOWN MARGIN shall be greater than or equal to 1.0% delta k/k.

APPLICABILITY: MODE 5.

ACTION:

With the SHUTDOWN MARGIN less than 1.0% delta k/k, immediately initiate and continue boration at  $\geq 33$  gpm of a solution containing  $\geq 6,560$  ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

#### SURVEILLANCE REQUIREMENTS

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4.1.1.2 The SHUTDOWN MARGIN shall be determined to be greater than or equal to 1.0% delta k/k:

- a. Within 1 hour after detection of an inoperable control rod(s) and at least once per 12 hours thereafter while the rod(s) is inoperable. If the inoperable control rod is immovable or untrippable, the SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable control rod(s).
- b. In accordance with the Surveillance Frequency Control Program by consideration of the following factors:
  1. Reactor coolant system boron concentration,
  2. Control rod position,
  3. Reactor coolant system average temperature,
  4. Fuel burnup based on gross thermal energy generation,
  5. Xenon concentration, and
  6. Samarium concentration.

REACTIVITY CONTROL SYSTEMS

MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

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3.1.1.3 The moderator temperature coefficient (MTC) shall be within the limits specified in the CORE OPERATING LIMITS REPORT (COLR). The maximum upper limit shall be less positive than or equal to 0  $\Delta k/k/^{\circ}F$ .

APPLICABILITY: Beginning of Cycle Life (BOL) Limit - MODES 1 and 2\* only#  
End of Cycle Life (EOL) Limit - MODES 1, 2 and 3 only#

ACTION:

- a. With the MTC more positive than the BOL limit specified in the COLR, operations in MODES 1 and 2 may proceed provided:
  1. Control rod withdrawal limits are established and maintained sufficient to restore the MTC to less positive than the BOL limit specified in the COLR within 24 hours or be in HOT STANDBY within the next 6 hours. These withdrawal limits shall be in addition to the insertion limits in the COLR per Specification 3.1.3.5.
  2. The control rods are maintained within the withdrawal limits established above until a subsequent calculation verifies that the MTC has been restored to within its limit for the all rods withdrawn condition.
  3. In lieu of any other report required by Specification 6.9.1, a Special Report is prepared and submitted to the Commission pursuant to Specification 6.9.2 within 10 days, describing the value of the measured MTC, the interim control rod withdrawal limits and the predicted average core burnup necessary for restoring the positive MTC to within its limit for the all rods withdrawn condition.
- b. With the MTC more negative than the EOL limit specified in the COLR, be in HOT SHUTDOWN within 12 hours.

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\*With  $K_{eff}$  greater than or equal to 1.0

#See Special Test Exception 3.10.3

REACTIVITY CONTROL SYSTEMS

MODERATOR TEMPERATURE COEFFICIENT

SURVEILLANCE REQUIREMENTS

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4.1.1.3 The MTC shall be determined to be within its limits during each fuel cycle as follows:

- a. The MTC shall be measured and compared to the BOL limit specified in the COLR prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.
- b. The MTC shall be measured at any THERMAL POWER and compared to the 300 ppm surveillance limit specified in the COLR (all rods withdrawn, RATED THERMAL POWER condition) within 7 EFPD after reaching an equilibrium boron concentration of 300 ppm. In the event this comparison indicates the MTC is more negative than the 300 ppm surveillance limit specified in the COLR, the MTC shall be remeasured, and compared to the EOL MTC limit specified in the COLR at least once per 14 EFPD during the remainder of the fuel cycle.

## REACTIVITY CONTROL SYSTEMS

### MINIMUM TEMPERATURE FOR CRITICALITY

#### LIMITING CONDITION FOR OPERATION

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3.1.1.4 The Reactor Coolant System lowest operating loop temperature ( $T_{avg}$ ) shall be greater than or equal to 541°F.

APPLICABILITY: MODES 1 and 2<sup>#\*</sup>.

ACTION:

With a Reactor Coolant System operating loop temperature ( $T_{avg}$ ) less than 541°F, restore  $T_{avg}$  to within its limit within 15 minutes or be in HOT STANDBY within the next 15 minutes.

#### SURVEILLANCE REQUIREMENTS

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4.1.1.4 The Reactor Coolant System temperature ( $T_{avg}$ ) shall be determined to be greater than or equal to 541°F:

- a. Within 15 minutes prior to achieving reactor criticality, and
- b. At least once per 30 minutes when the reactor is critical and the Reactor Coolant System  $T_{avg}$  is less than 551°F with the  $T_{avg} - T_{ref}$  Deviation Alarm not reset.

#With  $K_{eff}$  greater than or equal to 1.0.

\*See Special Test Exception 3.10.3.