

REACTIVITY CONTROL SYSTEMS

BORON DILUTION

LIMITING CONDITION FOR OPERATION

3.1.2.9 Boron concentration shall be verified consistent with SHUTDOWN MARGIN requirements of Specifications 3.1.1.1, 3.1.1.2, and 3.9.1. Boron dilution events shall be precluded by:

- a. Either two boron dilution alarms (startup channel high neutron flux) shall be OPERABLE with the alarms set in accordance with Specification 4.1.2.9.5 or the primary makeup water flow path to the Reactor Coolant System shall be isolated, and
- b.
 1. When in Mode 5 with reactor coolant loops not filled and $0.98 \geq K_{eff} \geq 0.96$ isolate and remove power to at least two charging pumps; or
 2. When in Mode 5 with reactor coolant loops not filled and $0.96 \geq K_{eff} \geq 0.94$ isolate and remove power to at least one charging pump; or
 3. When in Mode 5 with reactor coolant loops not filled and three charging pumps are operable, maintain $K_{eff} < 0.94$; and
- c. When in Mode 6, isolate and remove power to at least two charging pumps.

APPLICABILITY: MODES 3, 4, 5, and 6.

ACTION:

- a. With the boron concentration not consistent with required SHUTDOWN MARGIN, initiate emergency boration.
- b. With one boron dilution alarm inoperable and the primary makeup water flow path to the Reactor Coolant System not isolated, determine Reactor Coolant System boron concentration within 1 hour and at least at the monitoring frequency specified in Tables 3.1-1 through 3.1-5.
- c. With both boron dilution alarms inoperable and the primary makeup water flow path to the Reactor Coolant System not isolated, determine the Reactor Coolant System boron concentration by two independent means within 1 hour and at least at the monitoring frequency specified in Tables 3.1-1 through 3.1-5; otherwise, immediately suspend all operations involving positive reactivity changes or CORE ALTERATIONS (if applicable).

REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- d. With the requirements of Specifications 3.1.2.9b and 3.1.2.9c not satisfied, immediately remove power from charging pumps to comply with the above requirement or isolate the primary makeup water flow path to the Reactor Coolant System.
- e. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

- 4.1.2.9.1 The provisions of Specification 4.0.4 are not applicable for entry into MODE 3 from MODE 2.
- 4.1.2.9.2 Each required boron dilution alarm shall be demonstrated OPERABLE by the performance of a CHANNEL CHECK at least once per 12 hours, a CHANNEL FUNCTIONAL TEST at least once per 31 days, and a CHANNEL CALIBRATION at least once per 18 months.
- 4.1.2.9.3 The required primary makeup water flow path to the Reactor Coolant System shall be verified to be isolated by either locked closed manual valves, deactivated automatic valves secured in the isolation position, or by power being removed from all charging pumps, at least once per 24 hours.
- 4.1.2.9.4 The requirements of Specification 3.1.2.9b and 3.1.2.9c shall be verified at least once per 24 hours when in Mode 5 with the reactor coolant loops not filled or when in Mode 6.
- 4.1.2.9.5 Each required boron dilution alarm setpoint shall be adjusted to less than or equal to twice (2x) the existing neutron flux (cps) at the following frequencies:
 - a. At least once per 5 hours if the reactor has been shut down less than 25 hours;
 - b. At least once per 24 hours if the reactor has been shut down greater than or equal to 25 hours but less than 7 days;
 - c. At least once per 7 days if the reactor has been shut down greater than or equal to 7 days.

TABLE 3.1-1

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} GREATER-THAN 0.98

$K_{eff} > 0.98$

| OPERATIONAL MODE | Number of Operating Charging Pumps* | | | |
|----------------------------|-------------------------------------|-------------------------|-------------------------|---|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 0.75 hours | Operation not allowed** | |
| 4 | 12 hours | 0.75 hours | Operation not allowed** | |
| 5 RCS filled | 8 hours | 0.75 hours | Operation not allowed** | |
| 5 RCS partially drained | 8 hours | Operation not allowed** | | |
| 6 | Operation not allowed** | | | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

TABLE 3.1-2

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} GREATER THAN 0.97 AND LESS THAN OR EQUAL TO 0.98

$$0.98 \geq K_{eff} > 0.97$$

| OPERATIONAL MODE | Number of Operating Charging Pumps* | | | |
|----------------------------|-------------------------------------|-------------------------|------------|-------------------------|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 1.5 hours | 0.75 hours | Operation not allowed** |
| 4 | 12 hours | 2.0 hours | 0.75 hours | 0.5 hours |
| 5 RCS filled | 8 hours | 2.0 hours | 0.75 hours | 0.5 hours |
| 5 RCS partially drained | 8 hours | Operation not allowed** | | |
| 6 | Operation not allowed** | | | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

TABLE 3.1-3

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
 DILUTION DETECTION AS A FUNCTION OF OPERATING
 CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} GREATER THAN 0.96 AND LESS THAN OR EQUAL TO 0.97

$$0.97 \geq K_{eff} > 0.96$$

| OPERATIONAL MODE | 0 | Number of Operating Charging Pumps* | | |
|----------------------------|-------------------------|-------------------------------------|-------------------------|------------|
| | | 1 | 2 | 3 |
| 3 | 12 hours | 2.5 hours | 1.25 hours | 0.75 hours |
| 4 | 12 hours | 3.0 hours | 1.25 hours | 0.75 hours |
| 5 RCS filled | 8 hours | 3.0 hours | 1.5 hours | 0.75 hours |
| 5 RCS partially drained | 8 hours | 0.75 hours | Operation not allowed** | |
| 6 | Operation not allowed** | | | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

TABLE 3.1-4

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} GREATER THAN 0.95 AND LESS THAN OR EQUAL TO 0.96

$$0.96 \geq K_{eff} > 0.95$$

| OPERATIONAL MODE | 0 | Number of Operating Charging Pumps* | | |
|----------------------------|-------------------------|-------------------------------------|-------------------------|-----------|
| | | 1 | 2 | 3 |
| 3 | 12 hours | 3.5 hours | 1.5 hours | 1.0 hours |
| 4 | 12 hours | 4.0 hours | 2.0 hours | 1.0 hours |
| 5 RCS filled | 8 hours | 4.5 hours | 2.0 hours | 1.0 hours |
| 5 RCS partially drained | 8 hours | 1.0 hours | Operation not allowed** | |
| 6 | Operation not allowed** | | | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

TABLE 3.1-5

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} LESS THAN OR EQUAL TO 0.95

$$K_{eff} \leq 0.95$$

| OPERATIONAL MODE | 0 | Number of Operating Charging Pumps* | | |
|----------------------------|----------|-------------------------------------|-------------------------|-------------------------|
| | | 1 | 2 | 3 |
| 3 | 12 hours | 4.5 hours | 2.0 hours | 1.0 hours |
| 4 | 12 hours | 5.0 hours | 2.5 hours | 1.5 hours |
| 5 RCS filled | 8 hours | 5.5 hours | 2.5 hours | 1.5 hours |
| 5 RCS partially drained | 8 hours | 1.0 hours | 0.5 hours | Operation not allowed** |
| 6 | 24 hours | 1.0 hours | Operation not allowed** | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

ATTACHMENT B

REACTIVITY CONTROL SYSTEMS

BORON DILUTION

LIMITING CONDITION FOR OPERATION

3.1.2.9 Boron concentration shall be verified consistent with SHUTDOWN MARGIN requirements of Specifications 3.1.1.1, 3.1.1.2, and 3.9.1. Boron dilution events shall be precluded by:


- DELETE*
- a. Either two boron dilution alarms (startup channel high neutron flux) shall be OPERABLE with the alarms set in accordance with Specification 4.1.2.9.5 or the primary makeup water flow path to the Reactor Coolant System shall be isolated, and
 - b.
 1. When in Mode 5 with reactor coolant loops not filled and $0.98 \geq K_{eff} \geq 0.96$ isolate and remove power to at least two charging pumps; or
 2. When in Mode 5 with reactor coolant loops not filled and $0.96 \geq K_{eff} \geq 0.94$ isolate and remove power to at least one charging pump; or
 3. When in Mode 5 with reactor coolant loops not filled and three charging pumps are operable, maintain $K_{eff} < 0.94$; and
 - c. When in Mode 6, isolate and remove power to at least two charging pumps.

APPLICABILITY: MODES 3, 4, 5, and 6.

SEE ATTACHED

ACTION:

- a. With the boron concentration not consistent with required SHUTDOWN MARGIN, initiate emergency boration.
- b. With one boron dilution alarm inoperable and the primary makeup water flow path to the Reactor Coolant System not isolated, determine Reactor Coolant System boron concentration within 1 hour and at least at the monitoring frequency specified in Tables 3.1-1 through 3.1-5.
- c. With both boron dilution alarms inoperable and the primary makeup water flow path to the Reactor Coolant System not isolated, determine the Reactor Coolant System boron concentration by two independent means within 1 hour and at least at the monitoring frequency specified in Tables 3.1-1 through 3.1-5; otherwise, immediately suspend all operations involving positive reactivity changes or CORE ALTERATIONS (if applicable).

INSERT 

- b. 1. When in MODE 4 isolate AND REMOVE power TO AT least ONE CHARGING pump;
2. When in MODE 5 with $K_{eff} \leq 0.97$ isolate AND REMOVE power TO AT least ONE CHARGING pump; OR
3. When in MODE 5 with $K_{eff} > 0.97$ isolate AND REMOVE power TO AT least TWO CHARGING pumps;
4. When in MODE 6 isolate AND REMOVE power TO AT least TWO CHARGING pumps.

REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- d. With the requirements of Specifications 3.1.2.9b and 3.1.2.9c not satisfied, immediately remove power from charging pumps to comply with the above requirement or isolate the primary makeup water flow path to the Reactor Coolant System. *DELETE* →
- e. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.1.2.9.1 The provisions of Specification 4.0.4 are not applicable for entry into MODE 3 from MODE 2.

4.1.2.9.2 Each required boron dilution alarm shall be demonstrated OPERABLE by the performance of a CHANNEL CHECK at least once per 12 hours, a CHANNEL FUNCTIONAL TEST at least once per 31 days, and a CHANNEL CALIBRATION at least once per 18 months.

4.1.2.9.3 The required primary makeup water flow path to the Reactor Coolant System shall be verified to be isolated by either locked closed manual valves, deactivated automatic valves secured in the isolation position, or by power being removed from all charging pumps, at least once per 24 hours.

4.1.2.9.4 The requirements of Specification 3.1.2.9b and 3.1.2.9c shall be verified at least once per 24 hours, when in Mode 5 with the reactor coolant loops not filled or when in Mode 6. *DELETE* →

4.1.2.9.5 Each required boron dilution alarm setpoint shall be adjusted to less than or equal to twice (2x) the existing neutron flux (cps) at the following frequencies:

- a. At least once per 5 hours if the reactor has been shut down less than 25 hours;
- b. At least once per 24 hours if the reactor has been shut down greater than or equal to 25 hours but less than 7 days;
- c. At least once per 7 days if the reactor has been shut down greater than or equal to 7 days.

ADD → If the primary makeup water flow path to the Reactor Coolant System is isolated to fulfill 3.1.2.9.2,

TABLE 3.1-1

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} GREATER-THAN 0.98

$K_{eff} > 0.98$

| OPERATIONAL MODE | Number of Operating Charging Pumps* | | | |
|----------------------------|-------------------------------------|-------------------------|-------------------------|---|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 0.75 hours | Operation not allowed** | |
| 4 | 12 hours | 0.75 hours | Operation not allowed** | |
| 5 RCS filled | 8 hours | 0.75 hours | Operation not allowed** | |
| 5 RCS partially drained | 8 hours | Operation not allowed** | | |
| 6 | Operation not allowed** | | | |

*Charging pump OPERABILITY for any period of time shall constitute OPEXIBILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

| Operational Mode | Number of Operating Charging Pumps* | | | |
|-------------------------|-------------------------------------|-------------------------|-------------------------|---|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 0.75 hours | Operation Not Allowed** | |
| 4 | 12 hours | Operation Not Allowed** | | |
| 5 RCS Filled | 8 hours | Operation Not Allowed** | | |
| 5 RCS Partially Drained | 8 hours | Operation Not Allowed** | | |
| 6 | Operation Not Allowed** | | | |

TABLE 3.1-2

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} GREATER THAN 0.97 AND LESS THAN OR EQUAL TO 0.98

$$0.98 \geq K_{eff} > 0.97$$

| OPERATIONAL MODE | Number of Operating Charging Pumps* | | | |
|----------------------------|-------------------------------------|-------------------------|------------|-------------------------|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 1.5 hours | 0.75 hours | Operation not allowed** |
| 4 | 12 hours | 2.0 hours | 0.75 hours | 0.5 hours |
| 5 RCS filled | 8 hours | 2.0 hours | 0.75 hours | 0.5 hours |
| 5 RCS partially drained | 8 hours | Operation not allowed** | | |
| 6 | Operation not allowed** | | | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

| OPERATIONAL MODE | Number of Operations Charging Pumps* | | | |
|----------------------------|--------------------------------------|------------|--------------------------|-----------------------------|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 2 hours | 0.5 hours | OPERATION NOT ALLOWED ** |
| 4 | 12 hours | 0.75 hours | OPERATION NOT ALLOWED ** | |
| 5 RCS Filled | 8 hours | 1.0 hours | OPERATION NOT ALLOWED ** | |
| 5 RCS PARTIALLY DRAINED | 8 hours | 0.75 hours | OPERATION NOT ALLOWED ** | |
| 6 | OPERATION NOT ALLOWED ** | | | |

TABLE 3.1-3

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} GREATER THAN 0.96 AND LESS THAN OR EQUAL TO 0.97

$$0.97 \geq K_{eff} > 0.96$$

| OPERATIONAL MODE | 0 | Number of Operating Charging Pumps* | | |
|----------------------------|-------------------------|-------------------------------------|-------------------------|------------|
| | | 1 | 2 | 3 |
| 3 | 12 hours | 2.5 hours | 1.25 hours | 0.75 hours |
| 4 | 12 hours | 3.0 hours | 1.25 hours | 0.75 hours |
| 5 RCS filled | 8 hours | 3.0 hours | 1.5 hours | 0.75 hours |
| 5 RCS partially drained | 8 hours | 0.75 hours | Operation not allowed** | |
| 6 | Operation not allowed** | | | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

| OPERATIONAL MODE | Number of OPERATING CHARGING PUMPS* | | | |
|----------------------------|-------------------------------------|------------|------------|-------------------------|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 3.0 hours | 1.25 hours | 0.5 hours |
| 4 | 12 hours | 1.5 hours | 0.5 hours | OPERATION NOT ALLOWED** |
| 5 RCS FILLED | 8 hours | 1.5 hours | 0.5 hours | OPERATION NOT ALLOWED** |
| 5 RCS PARTIALLY DRAINED | 8 hours | 0.75 hours | OPERATION | NOT ALLOWED** |
| 6 | OPERATION NOT ALLOWED** | | | |

TABLE 3.1-4

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} GREATER THAN 0.95 AND LESS THAN OR EQUAL TO 0.96

$$0.96 \geq K_{eff} > 0.95$$

| OPERATIONAL MODE | 0 | Number of Operating Charging Pumps* | | |
|----------------------------|-------------------------|-------------------------------------|-------------------------|-----------|
| | | 1 | 2 | 3 |
| 3 | 12 hours | 3.5 hours | 1.5 hours | 1.0 hours |
| 4 | 12 hours | 4.0 hours | 2.0 hours | 1.0 hours |
| 5 RCS filled | 8 hours | 4.5 hours | 2.0 hours | 1.0 hours |
| 5 RCS partially drained | 8 hours | 1.0 hours | Operation not allowed** | |
| 6 | Operation not allowed** | | | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

ADD

| OPERATIONAL MODE | Number of Operating Charging Pumps* | | | |
|----------------------------|-------------------------------------|------------|------------|-----------------------------|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 4 hours | 2 hours | 1 hour |
| 4 | 12 hours | 2.25 hours | 0.75 hours | OPERATION NOT ALLOWED ** |
| 5 RCS filled | 8 hours | 2.5 hours | 0.75 hours | OPERATION ** |
| 5 RCS PARTIALLY DRAINED | 8 hours | 2 hours | 0.5 hours | NOT ALLOWED OPERATION ** |
| 6 | OPERATION NOT ALLOWED | | | |

TABLE 3.1-5

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR
 K_{eff} LESS THAN OR EQUAL TO 0.95

$$K_{eff} \leq 0.95$$

DELETE

| OPERATIONAL MODE | Number of Operating Charging Pumps* | | | |
|----------------------------|-------------------------------------|-----------|-------------------------|-------------------------|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 4.5 hours | 2.0 hours | 1.0 hours |
| 4 | 12 hours | 5.0 hours | 2.5 hours | 1.5 hours |
| 5 RCS filled | 8 hours | 5.5 hours | 2.5 hours | 1.5 hours |
| 5 RCS partially drained | 8 hours | 1.0 hours | 0.5 hours | Operation not allowed** |
| 6 | 24 hours | 1.0 hours | Operation not allowed** | |

*Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

**The required charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

ADD

| OPERATIONAL MODE | Number of Operating Charging Pumps* | | | |
|----------------------------|-------------------------------------|------------|------------|-----------------------------|
| | 0 | 1 | 2 | 3 |
| 3 | 12 hours | 5 hours | 2 hours | 1.0 hour |
| 4 | 12 hours | 3 hours | 1 hours | 0.5 hour |
| 5 RCS filled | 8 hours | 3 hours | 1.25 hours | 0.5 hour |
| 5 RCS partially drained | 8 hours | 2.75 hours | 1.0 hour | OPERATION NOT ALLOWED ** |
| 6 | 24 hours | 2.25 hours | 0.75 hour | OPERATION NOT ALLOWED ** |