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REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

2. If the inoperable control rod(s) is inserted:
 - a) Within one hour disarm the associated directional control valves either:
 - 1) Electrically, or
 - 2) Hydraulically by closing the drive water and exhaust water isolation valves.
 - b) Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.
- c. With more than 8 control rods inoperable, be in at least HOT SHUTDOWN within 12 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The scram discharge volume drain and vent valves shall be demonstrated OPERABLE at least once per 31 days by:*

- a. Verifying each valve to be open.
- b. Cycling each valve at least one complete cycle of full travel.

4.1.3.1.2 All withdrawn control rods not required to have their directional control valves disarmed electrically or hydraulically shall be demonstrated OPERABLE by moving each control rod at least one notch:

- a. At least once per 7 days when above the preset power level of the RWM and
- b. At least once per 24 hours when above the preset power level of the RWM and any control rod is immovable as a result of excessive friction or mechanical interference.

4.1.3.1.3 All withdrawn control rods shall be determined OPERABLE by demonstrating the scram discharge volume drain and vent valves OPERABLE, when the reactor protection system logic is tested per Specification 4.3.1.2, by verifying that the drain and vent valves:

- a. Close within 30 seconds after receipt of a signal for control rods to scram, and
- b. Open when the scram signal is reset or the scram discharge volume trip is bypassed.

*These valves may be closed intermittently for testing under administrative control.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD MAXIMUM SCRAM INSERTION TIMES

LIMITING CONDITION FOR OPERATION

3.1.3.2 The maximum scram insertion time of each control rod from the fully withdrawn position to notch position 6, based on de-energization of the scram pilot valve solenoids as time zero, shall not exceed 7.0 seconds.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2.

ACTION:

With the maximum scram insertion time of one or more control rods exceeding 7.0 seconds, operation may continue and the provisions of Specification 3.0.4 are not applicable provided that:

- a. The control rod with the slow insertion time is declared inoperable,
- b. The requirements of Specification 3.1.3.1 are satisfied, and
- c. If within the preset power level of the RWM, the requirements of Specification 3.1.4.1.d are also satisfied, and
- d. The Surveillance Requirements of Specification 4.1.3.2.c are performed at least once per 92 days when operation is continued with three or more control rods with slow scram insertion times;

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.2 The maximum scram insertion time of the control rods shall be demonstrated through measurement:

- a. For all control rods prior to THERMAL POWER exceeding 40% of RATED THERMAL POWER following CORE ALTERATIONS or after a reactor shutdown that is greater than 120 days,
- b. For specifically affected individual control rods following maintenance on or modification to the control rod or rod drive system which could affect the scram insertion time of those specific control rods, and
- c. For 10% of the control rods, on a rotating basis, at least once per 120 days of operation.

REACTIVITY CONTROL SYSTEMS

FOUR CONTROL ROD GROUP SCRAM INSERTION TIMES

LIMITING CONDITION FOR OPERATION

3.1.3.4 The average scram insertion time, from the fully withdrawn position, for the three fastest control rods in each group of four control rods arranged in a two-by-two array, based on deenergization of the scram pilot valve solenoids as time zero, shall not exceed any of the following:

<u>Position Inserted From Fully Withdrawn</u>	<u>Average Scram Insertion Time (Seconds)</u>
46	0.33
36	1.12
26	1.93
6	3.58

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2.

ACTION:

With the average scram insertion times of control rods exceeding the above limits, operation may continue and the provisions of Specification 3.0.4 are not applicable provided:

- The control rods with the slower than average scram insertion times are declared inoperable,
- The requirements of Specification 3.1.3.1 are satisfied, and
- If within the preset power level of the RWM, the requirements of Specification 3.1.4.1.d are also satisfied, and
- The Surveillance Requirements of Specification 4.1.3.2.c are performed at least once per 92 days when operation is continued with three or more control rods with slow scram insertion times.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.4 All control rods shall be demonstrated OPERABLE by scram time testing from the fully withdrawn position as required by Surveillance Requirement 4.1.3.2.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD SCRAM ACCUMULATORS

LIMITING CONDITION FOR OPERATION

3.1.3.5 All control rod scram accumulators shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, and 5*.

ACTION:

- a. In OPERATIONAL CONDITION 1 or 2 with one control rod scram accumulator inoperable, the provisions of Specification 3.0.4 are not applicable and operation may continue, provided that within 8 hours:
 1. The inoperable accumulator is restored to OPERABLE status, or
 2. The control rod associated with the inoperable accumulator is declared inoperable, and the requirements of Specification 3.1.3.1 are satisfied.
 3. And, if within the preset power level of the RWM, the requirements of Specification 3.1.4.1.d are also satisfied.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

- b. In OPERATIONAL CONDITION 5* with a withdrawn control rod scram accumulator inoperable, fully insert the affected control rod and electrically disarm the directional control valves within one hour. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.1.3.5 The control rod scram accumulators shall be determined OPERABLE:

- a. At least once per 7 days by verifying that the pressure and leak detectors are not in the alarmed condition, and
- b. At least once per 18 months by performance of a:
 1. CHANNEL FUNCTIONAL TEST of the leak detectors, and
 2. CHANNEL CALIBRATION of the pressure detectors.

*At least the accumulator associated with each withdrawn control rod. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD DRIVE COUPLING

LIMITING CONDITION FOR OPERATION

3.1.3.6 All control rods shall be coupled to their drive mechanisms.

APPLICABILITY: CONDITIONS 1, 2, and 5*.

ACTION:

- a. In CONDITION 1 or 2 with one control rod not coupled to its associated drive mechanism, the provisions of Specification 3.0.4 are not applicable and operation may continue provided:
 1. Within the preset power level of the RWM, the control rod is declared inoperable and fully inserted until recoupling can be attempted with THERMAL POWER above the preset power level of the RWM and the requirements of Specification 3.1.4.1.d are satisfied.
 2. Above the preset power level of the RWM, the control rod drive is inserted to accomplish recoupling. If recoupling is not accomplished on the first attempt, declare the control rod inoperable, fully insert the control rod, and electrically disarm the directional control valves.
 3. The requirements of Specification 3.1.3.1 are satisfied.
- b. In CONDITION 5*, with a withdrawn control rod not coupled to its associated drive mechanism, insert the control rod to accomplish recoupling. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.1.3.6 The coupling integrity of a control rod shall be demonstrated by withdrawing the control rod to the fully withdrawn position and verifying that the rod does not go to the overtravel position:

- a. Prior to reactor criticality after completing CORE ALTERATIONS that could have affected the control rod drive coupling integrity,

*At least each withdrawn control rod. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD POSITION INDICATION

LIMITING CONDITION FOR OPERATION

3.1.3.7 All control rod reed switch position indicators shall be OPERABLE.

APPLICABILITY: CONDITIONS 1, 2, and 5*.

ACTION:

- a. In CONDITION 1 or 2: With one or more control rod reed switch position indicators inoperable, including "Full-in" or "Full-out" indication, the provisions of Specification 3.0.4 are not applicable and operation may continue, provided that within one hour:
 - 1) The position of the control rod is determined by an alternate method, or
 - 2) The control rod is moved to a position with an OPERABLE reed switch position indicator, or
 - 3) The control rod with the inoperable reed switch position indicator is declared inoperable and the requirements of Specification 3.1.3.1 are satisfied;
 - 4) And, if within the preset power level of the RWM, the requirements of Specification 3.1.4.1.d are satisfied;Otherwise, be in at least HOT SHUTDOWN within 12 hours.
- b. In CONDITION 5* with a withdrawn control rod reed switch position indicator inoperable, fully insert the withdrawn control rod. The provisions of Specification 3.0.3 are not applicable.

*At least each withdrawn control rod. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS

4.1.3.7 The control rod reed switch position indicators shall be determined OPERABLE by verifying:

- a. At least once per 24 hours, that the position of the control rod is indicated,
- b. That the indicated control rod position changes during the movement of the control rod when performing Surveillance Requirement 4.1.3.1.2, and
- c. That the control rod reed switch position indicator corresponds to the control rod position indicated by the "Full-out" reed switches when performing Surveillance Requirement 4.1.3.6.b.

REACTIVITY CONTROL SYSTEMS

3/4 1.4 CONTROL ROD PROGRAM CONTROLS

ROD WORTH MINIMIZER

LIMITING CONDITION FOR OPERATION

3.1.4.1 The Rod Worth Minimizer (RWM) shall be OPERABLE when THERMAL POWER is less than 10% of RATED THERMAL POWER.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2*.

ACTION:

- a. With the RWM inoperable after the first 12 control rods have been fully withdrawn on a startup, operation may continue provided that control rod movement and compliance with the prescribed BPWS control rod pattern are verified by a second licensed operator or qualified member of the plant technical staff.
- b. With the RWM inoperable before the first 12 control rods are withdrawn on a startup, one startup per calendar year may be performed provided that control rod movement and compliance with the prescribed BPWS control rod pattern are verified by a second licensed operator or qualified member of the plant technical staff.
- c. With RWM inoperable on a shutdown, shutdown may continue provided that control rod movement and compliance with the prescribed BPWS control rod pattern are verified by a second licensed operator or qualified member of the plant technical staff.
- d. With RWM operable but individual control rod(s) declared inoperable, operation and control rod movement below the present power level of the RWM may continue provided:
 1. No more than three (3) control rods are declared inoperable in any one BWS group, and,
 2. The inoperable control rod(s) is bypassed on the RWM and control rod movement of the bypassed rod(s) is verified by a second licensed operator or qualified member of the plant technical staff.
- e. With RWM inoperable, the provisions of Specification 3.0.4 are not applicable.

*Entry into OPERATIONAL CONDITION 2 and withdrawal of selected control rods is permitted for the purpose of determining the OPERABILITY of the RWM prior to withdrawal of control rods for the purpose of bringing the reactor to criticality.

REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS

4.1.4.1.1 The RWM shall be demonstrated OPERABLE in OPERATIONAL CONDITION 2, prior to withdrawal of control rods for the purpose of making the reactor critical and in OPERATIONAL CONDITION 1 when the RWM is initiated during control rod insertion when reducing THERMAL POWER by:

- a. Verifying proper annunciation of the selection error of at least one out-of-sequence control rod, and
- b. Verifying the rod block function of the RWM by moving an out-of-sequence control rod.

4.1.4.1.2 The RWM shall be demonstrated OPERABLE by verifying the control rod Banked Position Withdrawal Sequence input to the RWM computer is correct following any loading of the sequence program into the computer.

REACTIVITY CONTROL SYSTEMS

ROD SEQUENCE CONTROL SYSTEM

LIMITING CONDITION FOR OPERATION

3.1.4.2 (DELETED)

SURVEILLANCE REQUIREMENTS

4.1.4.2 (DELETED)

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SPECIAL TEST EXCEPTIONS

3/4.10.2 ROD SEQUENCE CONTROL SYSTEM

LIMITING CONDITION FOR OPERATION

3.10.2 (DELETED)

SURVEILLANCE REQUIREMENTS

4.10.2 (DELETED)

REACTIVITY CONTROL SYSTEM

BASES

CONTROL RODS (Continued)

on a scram than has been analyzed even though control rods with inoperable accumulators may still be inserted with normal drive water pressure. Operability of the accumulator is not a problem as long as there is a means available to insert the control rods even under the most unfavorable depressurization of the reactors.

Control rod coupling integrity is required to ensure compliance with the analysis of the rod drop accident in the FSAR. The overtravel position feature provides the only positive means of determining that a rod is properly coupled and, therefore, this check must be performed prior to achieving criticality after each refueling. The subsequent check is performed as a backup to the initial demonstration.

In order to ensure that the control rod patterns can be followed and therefore that other parameters are within their limits, the control rod position indication system must be OPERABLE.

The control rod housing support restricts the outward movement of a control rod to less than 3 inches in the event of a housing failure. The amount of rod reactivity which could be added by this small amount of rod withdrawal is less than a normal withdrawal increment and will not contribute to any damage to the primary coolant system. The support is not required when there is no pressure to act as a driving force to rapidly eject a drive housing.

The required surveillance intervals are adequate to determine that the rods are OPERABLE and not so frequent as to cause excessive wear on the system components.

3/4.1.4 CONTROL ROD PROGRAM CONTROLS

Control rod withdrawal and insertion sequences are established to assure that the maximum in sequence individual control rod or control rod segments which are withdrawn at any time during the fuel cycle could not be worth enough to result in a peak fuel enthalpy greater than 280 cal/gm in the event of a control rod drop accident. The specified sequences are characterized by homogeneous, scattered patterns of control rod withdrawal. When THERMAL POWER is greater than or equal to 10% of RATED THERMAL POWER, there is no possible rod worth which, if dropped at the design rate of the velocity limiter, could result in a peak enthalpy of 280 cal/gm. Thus, requiring the RWM to be OPERABLE when THERMAL POWER is less than 10% of RATED THERMAL POWER provides adequate control.

Use of the Banked Position Withdrawal Sequence (BPWS) ensures that in the event of a control rod drop accident the peak fuel enthalpy will not be greater than 280 cal/gm (Reference 4).

REACTIVITY CONTROL SYSTEM

BASES

CONTROL ROD PROGRAM CONTROLS (Continued)

The RWM as a backup to procedural control provides an automatic control rod pattern monitoring function to ensure adherence to the BPWS control movement sequences from 100% control rod density to 10% RATED THERMAL POWER and, thus, eliminates the postulated control rod drop accident from resulting in a peak fuel enthalpy greater than 280 cal/gm (Reference 5).

The requirement that RWM be operable for the withdrawal of the first 12 control rods on a startup is to ensure that the RWM system maintains a high degree of availability.

Deviation from the BPWS control rod pattern may be allowed for the performance of Shutdown Martin Demonstration tests.

The analysis of the rod drop accident is presented in Section 15.4.6 of the Updated FSAR and the techniques of the analysis are presented in a topical report (Reference 1) and two supplements (References 2 and 3).

The RBM is designed to automatically prevent fuel damage in the event of erroneous rod withdrawal from locations of high power density during high power operation. Two channels are provided. Tripping one of the channels will block erroneous rod withdrawal soon enough to prevent fuel damage. This system backs up the written sequence used by the operator for withdrawal of control rods.

3/4.1.5 STANDBY LIQUID CONTROL SYSTEM

The standby liquid control system provides a backup capability for maintaining the reactor subcritical in the event that insufficient rods are inserted in the core when a scram is called for. The volume and weight percent of poison material in solution is based on being able to bring the reactor to the subcritical condition as the plant cools to ambient condition. The temperature requirement is necessary to keep the sodium pentaborate in solution. Checking the volume and temperature once each 24 hours assures that the solution is available for use.

With redundant pumps and a highly reliable control rod scram system, operation of the reactor is permitted to continue for short periods of time with the system inoperable or for longer periods of time with one of the redundant components inoperable.

Surveillance requirements are established on a frequency that assures a high reliability of the system. Once the solution is established, boron concentration will not vary unless more boron or water is added, thus a check on the temperature and volume once each 24 hours assures that the solution is available for use.

Replacement of the explosive charges in the valves at regular intervals will assure that these valves will not fail because of deterioration of the charges.

REACTIVITY CONTROL SYSTEM

BASES

References:

1. C. J. Paone, R. C. Stirn, and J. A. Woodley, "Rod Drop Accident Analysis for Large BWRs " G. E. Topical Report NEDO-10527, March 1972.
2. C. J. Paone, R. C. Stirn, and R. M. Yound, Supplement 1 to NEDO-10527, July 1972.
3. J. A. Haum, C. J. Paone, and R. C. Stirn, addendum 2 "Exposed Cores" supplement 2 to NEDO-10527, January 1973.
4. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," Revision 6, Amendment 12.
5. NEDE-20411-P-A, "General Electric Standard Application for Reactor Fuel," Revision 8, Amendment 17.

3/4.10 SPECIAL TEST EXCEPTIONS

BASES

3/4.10.1 PRIMARY CONTAINMENT INTEGRITY

The requirement for PRIMARY CONTAINMENT INTEGRITY is removed during the period when open vessel tests are being performed during low power PHYSICS TESTS.

3/4.10.2 ROD SEQUENCE CONTROL SYSTEM (DELETED)

3/4.10.3 SHUTDOWN MARGIN DEMONSTRATIONS

Performance of shutdown margin demonstrations with the vessel head removed requires additional restrictions in order to ensure that criticality does not occur. These additional restrictions are specified in this LCO.

3/4.10.4 RECIRCULATION LOOPS

This special test exception permits reactor criticality under no flow conditions and is required to perform certain start-up and PHYSICS TESTS while at low THERMAL POWER levels.

3/4.10.5 PLANT SERVICE WATER

This Special Test Exception permits securing the Service Water System conventional header when the nuclear header is out of service and is required to permit flange installation in service water system header cross-connect piping.

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REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

2. If the inoperable control rod(s) is inserted:
 - a) Within one hour disarm the associated directional control valves either:
 - 1) Electrically, or
 - 2) Hydraulically by closing the drive water and exhaust water isolation valves.
 - b) Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.
- c. With more than 8 control rods inoperable, be in at least HOT SHUTDOWN within 12 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The scram discharge volume drain and vent valves shall be demonstrated OPERABLE at least once per 31 days by:*

- a. Verifying each valve to be open.
- b. Cycling each valve at least one complete cycle of full travel.

4.1.3.1.2 All withdrawn control rods not required to have their directional control valves disarmed electrically or hydraulically shall be demonstrated OPERABLE by moving each control rod at least one notch:

- a. At least once per 7 days when above the preset power level of the RWM and
- b. At least once per 24 hours when above the preset power level of the RWM and any control rod is immovable as a result of excessive friction or mechanical interference.

4.1.3.1.3 All withdrawn control rods shall be determined OPERABLE by demonstrating the scram discharge volume drain and vent valves OPERABLE, when the reactor protection system logic is tested per Specification 4.3.1.2, by verifying that the drain and vent valves:

- a. Close within 30 seconds after receipt of a signal for control rods to scram, and
- b. Open when the scram signal is reset or the scram discharge volume trip is bypassed.

*These valves may be closed intermittently for testing under administrative control.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD MAXIMUM SCRAM INSERTION TIMES

LIMITING CONDITION FOR OPERATION

3.1.3.2 The maximum scram insertion time of each control rod from the fully withdrawn position to notch position 6, based on de-energization of the scram pilot valve solenoids at time zero, shall not exceed 7.0 seconds.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2.

ACTION:

With the maximum scram insertion time of one or more control rods exceeding 7.0 seconds, operation may continue and the provisions of Specification 3.0.4 are not applicable provided that:

- a. The control rod with the slow insertion time is declared inoperable,
- b. The requirements of Specification 3.1.3.1 are satisfied, and
- c. If within the preset power level of the RWM, the requirements of Specification 3.1.4.1.d are also satisfied, and
- d. The Surveillance Requirements of Specification 4.1.3.2.c are performed at least once per 92 days when operation is continued with three or more control rods with slow scram insertion times;

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.2 The maximum scram insertion time of the control rods shall be demonstrated through measurement:

- a. For all control rods prior to THERMAL POWER exceeding 40% of RATED THERMAL POWER following CORE ALTERATIONS or after a reactor shutdown that is greater than 120 days,
- b. For specifically affected individual control rods following maintenance on or modification to the control rod or rod drive system which could affect the scram insertion time of those specific control rods, and
- c. For 10% of the control rods, on a rotating basis, at least once per 120 days of operation.

REACTIVITY CONTROL SYSTEMS

FOUR CONTROL ROD GROUP SCRAM INSERTION TIMES

LIMITING CONDITION FOR OPERATION

3.1.3.4 The average scram insertion time, from the fully withdrawn position, for the three fastest control rods in each group of four control rods arranged in a two-by-two array, based on deenergization of the scram pilot valve solenoids as time zero, shall not exceed any of the following:

<u>Position Inserted From</u> <u>Fully Withdrawn</u>	<u>Average Scram Insertion Time (Seconds)</u>
46	0.33
36	1.12
26	1.93
6	3.58

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2.

ACTION:

With the average scram insertion times of control rods exceeding the above limits, operation may continue and the provisions of Specification 3.0.4 are not applicable provided:

- The control rods with the slower than average scram insertion times are declared inoperable,
- The requirements of Specification 3.1.3.1 are satisfied, and
- If within the preset power level of the RWM, the requirements of Specification 3.1.4.1.d are also satisfied, and
- The Surveillance Requirements of Specification 4.1.3.2.c are performed at least once per 92 days when operation is continued with three or more control rods with slow scram insertion times.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.4 All control rods shall be demonstrated OPERABLE by scram time testing from the fully withdrawn position as required by Surveillance Requirement 4.1.3.2.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD SCRAM ACCUMULATORS

LIMITING CONDITION FOR OPERATION

3.1.3.5 All control rod scram accumulators shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, and 5*.

ACTION:

- a. In OPERATIONAL CONDITION 1 or 2 with one control rod scram accumulator inoperable, the provisions of Specification 3.0.4 are not applicable and operation may continue, provided that within 8 hours:
 1. The inoperable accumulator is restored to OPERABLE status, or
 2. The control rod associated with the inoperable accumulator is declared inoperable, and the requirements of Specification 3.1.3.1 are satisfied.
 3. And, if within the preset power level of the RWM, the requirements of Specification 3.1.4.1.d are also satisfied.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

- b. In OPERATIONAL CONDITION 5* with a withdrawn control rod scram accumulator inoperable, fully insert the affected control rod and electrically disarm the directional control valves within one hour. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.1.3.5 The control rod scram accumulators shall be determined OPERABLE:

- a. At least once per 7 days by verifying that the pressure and leak detectors are not in the alarmed condition, and
- b. At least once per 18 months by performance of a:
 1. CHANNEL FUNCTIONAL TEST of the leak detectors, and
 2. CHANNEL CALIBRATION of the pressure detectors.

*At least the accumulator associated with each withdrawn control rod. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD DRIVE COUPLING

LIMITING CONDITION FOR OPERATION

3.1.3.6 All control rods shall be coupled to their drive mechanisms.

APPLICABILITY: CONDITIONS 1, 2, and 5*.

ACTION:

- a. In CONDITION 1 or 2 with one control rod not coupled to its associated drive mechanism, the provisions of Specification 3.0.4 are not applicable and operation may continue provided:
 1. Within the preset power level of the RWM, the control rod is declared inoperable and fully inserted until recoupling can be attempted with THERMAL POWER above the preset power level of the RWM and the requirements of Specification 3.1.4.1.d are satisfied.
 2. Above the preset power level of the RWM, the control rod drive is inserted to accomplish recoupling. If recoupling is not accomplished on the first attempt, declare the control rod inoperable, fully insert the control rod, and electrically disarm the directional control valves.
 3. The requirements of Specification 3.1.3.1 are satisfied.
- b. In CONDITION 5*, with a withdrawn control rod not coupled to its associated drive mechanism, insert the control rod to accomplish recoupling. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.1.3.6 The coupling integrity of a control rod shall be demonstrated by withdrawing the control rod to the fully withdrawn position and verifying that the rod does not go to the overtravel position:

*At least each withdrawn control rod. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD POSITION INDICATION

LIMITING CONDITION FOR OPERATION

3.1.3.7 All control rod reed switch position indicators shall be OPERABLE.

APPLICABILITY: CONDITIONS 1, 2, and 5*.

ACTION:

- a. In CONDITION 1 or 2: With one or more control rod reed switch position indicators inoperable, including "Full-in" or "Full-out" indication, the provisions of Specification 3.0.4 are not applicable and operation may continue, provided that within one hour:
 - 1) The position of the control rod is determined by an alternate method, or
 - 2) The control rod is moved to a position with an OPERABLE reed switch position indicator, or
 - 3) The control rod with the inoperable reed switch position indicator is declared inoperable and the requirements of Specification 3.1.3.1 are satisfied;
 - 4) And, if within the preset power level of the RWM, the requirements of Specification 3.1.4.1.d are also satisfied;Otherwise, be in at least HOT SHUTDOWN within 12 hours.
- b. In CONDITION 5* with a withdrawn control rod reed switch position indicator inoperable, fully insert the withdrawn control rod. The provisions of Specification 3.0.3 are not applicable.

*At least each withdrawn control rod. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS

4.1.3.7 The control rod reed switch position indicators shall be determined OPERABLE by verifying:

- a. At least once per 24 hours, that the position of the control rod is indicated,
- b. That the indicated control rod position changes during the movement of the control rod when performing Surveillance Requirement 4.1.3.1.2, and
- c. That the control rod reed switch position indicator corresponds to the control rod position indicated by the "Full-out" reed switches when performing Surveillance Requirement 4.1.3.6.b.

REACTIVITY CONTROL SYSTEMS

3/4 1.4 CONTROL ROD PROGRAM CONTROLS

R WORTH MINIMIZER

1. MITING CONDITION FOR OPERATION

3.1.4.1 The Rod Worth Minimizer (RWM) shall be OPERABLE when THERMAL POWER is less than 10% of RATED THERMAL POWER.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2*.

ACTION:

- a. With the RWM inoperable after the first 12 control rods have been fully withdrawn on a startup, operation may continue provided that control rod movement and compliance with the prescribed BPWS control rod pattern are verified by a second licensed operator or qualified member of the plant technical staff.
- b. With the RWM inoperable before the first 12 control rods are withdrawn on a startup, one startup per calendar year may be performed provided that control rod movement and compliance with the prescribed BPWS control rod pattern are verified by a second licensed operator or qualified member of the plant technical staff.
- c. With RWM inoperable on a shutdown, shutdown may continue provided that control rod movement and compliance with the prescribed BPWS control rod pattern are verified by a second licensed operator or qualified member of the plant technical staff.
- d. With RWM operable but individual control rod(s) declared inoperable, operation and control rod movement below the preset power level of the RWM may continue provided:
 1. No more than three (3) control rods are declared inoperable in any one BWS group, and,
 2. The inoperable control rod(s) is bypassed on the RWM and control rod movement of the bypassed rod(s) is verified by a second licensed operator or qualified member of the plant technical staff.
- e. With RWM inoperable, the provisions of Specification 3.0.4 are not applicable.

*Entry into OPERATIONAL CONDITION 2 and withdrawal of selected control rods is permitted for the purpose of determining the OPERABILITY of the RWM prior to withdrawal of control rods for the purpose of bringing the reactor to criticality.

REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS

4.1.4.1.1 The RWM shall be demonstrated OPERABLE in OPERATIONAL CONDITION 2, prior to withdrawal of control rods for the purpose of making the reactor critical and in OPERATIONAL CONDITION 1 when the RWM is initiated during control rod insertion when reducing THERMAL POWER by:

- a. Verifying proper annunciation of the selection error of at least one out-of-sequence control rod, and
- b. Verifying the rod block function of the RWM by moving an out-of-sequence control rod.

4.1.4.1.2 The RWM shall be demonstrated OPERABLE by verifying the control rod Banked Position Withdrawal Sequence input to the RWM computer is correct following any loading of the sequence program into the computer.

REACTIVITY CONTROL SYSTEMS

ROD SEQUENCE CONTROL SYSTEM

LIMITING CONDITION FOR OPERATION

3.1.4.2 (DELETED)

SURVEILLANCE REQUIREMENTS

4.1.4.2 (DELETED)

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SPECIAL TEST EXCEPTIONS

3/4.10.2 ROD SEQUENCE CONTROL SYSTEM

LIMITING CONDITION FOR OPERATION

3.10.2 (DELETED)

SURVEILLANCE REQUIREMENTS

4.10.2 (DELETED)

REACTIVITY CONTROL SYSTEM

BASES

CONTROL RODS (Continued)

on a scram than has been analyzed even though control rods with inoperable accumulators may still be inserted with normal drive water pressure. Operability of the accumulator ensures that there is a means available to insert the control rods even under the most unfavorable depressurization of the reactors.

Control rod coupling integrity is required to ensure compliance with the analysis of the rod drop accident in the FSAR. The overtravel position feature provides the only positive means of determining that a rod is properly coupled and therefore this check must be performed prior to achieving criticality after each refueling. The subsequent check is performed as a backup to the initial demonstration.

In order to ensure that the control rod patterns can be followed and therefore that other parameters are within their limits, the control rod position indication system must be OPERABLE.

The control rod housing support restricts the outward movement of a control rod to less than 3 inches in the event of a housing failure. The amount of rod reactivity which could be added by this small amount of rod withdrawal is less than a normal withdrawal increment and will not contribute to any damage to the primary coolant system. The support is not required when there is no pressure to act as a driving force to rapidly eject a drive housing.

The required surveillance intervals are adequate to determine that the rods are OPERABLE and not so frequent as to cause excessive wear on the system components.

3/4.1.4 CONTROL ROD PROGRAM CONTROLS

Control rod withdrawal and insertion sequences are established to assure that the maximum in sequence individual control rod or control rod segments which are withdrawn at any time during the fuel cycle could not be worth enough to result in a peak fuel enthalpy greater than 280 cal/gm in the event of a control rod drop accident. The specified sequences are characterized by homogeneous, scattered patterns of control rod withdrawal. When THERMAL POWER is greater than or equal to 10% of RATED THERMAL POWER, there is no possible rod worth which, if dropped at the design rate of the velocity limiter, could result in a peak enthalpy of 280 cal/gm. Thus, requiring the RWM to be OPERABLE when THERMAL POWER is less than 10% of RATED THERMAL POWER provides adequate control.

Use of the Banked Position Withdrawal Sequence (BPWS) ensures that in the event of a control rod drop accident the peak fuel enthalpy will not be greater than 280 cal/gm (Reference 4).

REACTIVITY CONTROL SYSTEM

BASES

CONTROL ROD PROGRAM CONTROLS (Continued)

The RWM as a backup to procedural control provides an automatic control rod pattern monitoring function to ensure adherence to the BPWS control movement sequences from 100% control rod density to 10% RATED THERMAL POWER and, thus, eliminates the postulated control rod drop accident from resulting in a peak fuel enthalpy greater than 280 cal/gm (Reference 5).

The requirement that RWM be operable for the withdrawal of the first 12 control rods on a startup is to ensure that the RWM system maintains a high degree of availability.

Deviation from the BPWS control rod pattern may be allowed for the performance of Shutdown Martin Demonstration tests.

The analysis of the rod drop accident is presented in Section 15.4.6 of the Updated FSAR and the techniques of the analysis are presented in a topical report (Reference 1) and two supplements (References 2 and 3).

The RBM is designed to automatically prevent fuel damage in the event of erroneous rod withdrawal from locations of high power density during high power operation. The RBM is only required to be operable when the limiting condition described in Specification 3.1.4.3 exists. Two channels are provided. Tripping one of the channels will block erroneous rod withdrawal soon enough to prevent fuel damage. This system backs up the written sequence used by the operator for withdrawal of control rods. Further discussion of the RBM system is provided in Reference 5.

3/4.1.5 STANDBY LIQUID CONTROL SYSTEM

The standby liquid control system provides a backup capability for maintaining the reactor subcritical in the event that insufficient rods are inserted in the core when a scram is called for. The volume and weight percent of poison material in solution is based on being able to bring the reactor to the subcritical condition as the plant cools to ambient condition. The temperature requirement is necessary to keep the sodium pentaborate in solution. Checking the volume and temperature once each 24 hours assures that the solution is available for use.

With redundant pumps and a highly reliable control rod scram system, operation of the reactor is permitted to continue for short periods of time with the system inoperable or for longer periods of time with one of the redundant components inoperable.

Surveillance requirements are established on a frequency that assures a high reliability of the system. Once the solution is established, boron concentration will not vary unless more boron or water is added, thus a check on the temperature and volume once each 24 hours assures that the solution is available for use.

Replacement of the explosive charges in the valves at regular intervals will assure that these valves will not fail because of deterioration of the charges.

REACTIVITY CONTROL SYSTEM

BASES

References:

1. C. J. Paone, R. C. Stirn, and J. A. Woodley, "Rod Drop Accident Analysis for Large BWRs " G. E. Topical Report NEDO-10527, March 1972.
2. C. J. Paone, R. C. Stirn, and R. M. Yound, Supplement 1 to NEDO-10527, July 1972.
3. J. A. Haum, C. J. Paone, and R. C. Stirn, addendum 2 "Exposed Cores" supplement 2 to NEDO-10527, January 1973.
4. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," Revision 6, Amendment 12.
5. NEDC-31654P, "Maximum Extended Operating Domain Analysis for Brunswick Steam Electric Plant, " February 1989.
6. NEDE-20411-P-A, "General Electric Standard Application for Reactor Fuel," Revision 8, Amendment 17.

3/4.10 SPECIAL TEST EXCEPTIONS

BASES

3/4.10.1 PRIMARY CONTAINMENT INTEGRITY

The requirement for PRIMARY CONTAINMENT INTEGRITY is removed during the period when open vessel tests are being performed during low power PHYSICS TESTS.

3/4.10.2 ROD SEQUENCE CONTROL SYSTEM (DELETED)

3/4.10.3 SHUTDOWN MARGIN DEMONSTRATIONS

Performance of shutdown margin demonstrations with the vessel head removed requires additional restrictions in order to ensure that criticality does not occur. These additional restrictions are specified in this LCO.

3/4.10.4 RECIRCULATION LOOPS

This special test exception permits reactor criticality under no flow conditions and is required to perform certain start-up and PHYSICS TESTS while at low THERMAL POWER levels.

3/4.10.5 PLANT SERVICE WATER

This Special Test Exception permits securing the Service Water System conventional header when the nuclear header is out of service and is required to permit flange installation in service water system header cross-connect piping.