Enclosure 3

Edwin I. Hatch Nuclear Plant
Request to Revise Technical Specifications:
Rod Block Monitor Operability Requirements

Page Change Instructions

Unit 1

Page	Replace
3.3-19	3.3-19
5.0-19	5.0-19

Unit 2

Page	Replace
3.3-20	3.3-20
5.0-19	5.0-19

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range – Upscale	(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 115.5/125 divisions of full scale
b. Intermediate Power Range – Upscale	(b)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 109.7/125 divisions of full scale
c. High Power Range – Upscale	(c)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 105.9/125 divisions of full scale
d. Inop	(d)	2	SR 3.3.2.1.1	NA
e. Downscale	(d)	2	SR 3.3.2.1.1 SR 3.3.2.1.7	≥ 93/125 divisions of full scale
2. Rod Worth Minimizer	$1^{(e)}$, $2^{(e)}$	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
3. Reactor Mode Switch – Shutdown Position	(f)	2	SR 3.3.2.1.6	NA

(a) THERMAL POWER ≥ 29% and < 64% RTP.

(b) THERMAL POWER ≥ 64% and < 84% RTP.

(c) THERMAL POWER ≥ 84%.

(d) THERMAL POWER ≥ 29%.

(e) With THERMAL POWER < 10% RTP.

(f) Reactor mode switch in the shutdown position.

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range - Upscale	(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 115.5/125 divisions of full scale
b. Intermediate Power Range - Upscale	(b)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 109.7/125 divisions of full scale
c. High Power Range - Upscale	(c)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 105.9/125 divisions of full scale
d. Inop	(d)	2	SR 3.3.2.1.1	NA
e. Downscale	(d)	2	SR 3.3.2.1.1 SR 3.3.2.1.7	≥ 93/125 divisions of full scale
2. Rod Worth Minimizer	$1^{(e)}, 2^{(e)}$	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
3. Reactor Mode Switch - Shutdown Position	(f)	2	SR 3.3.2.1.6	NA

(a) THERMAL POWER ≥ 29% and < 64% RTP.

(b) THERMAL POWER ≥ 64% and < 84% RTP.

(c) THERMAL POWER ≥ 84%.

(d) THERMAL POWER ≥ 29%.

(e) With THERMAL POWER < 10% RTP.

(f) Reactor mode switch in the shutdown position.

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

   1) The Average Planar Linear Heat Generation Rate for Specification 3.2.1.

   2) The Minimum Critical Power Ratio for Specification 3.2.2.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

   1) NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," (applicable amendment specified in the COLR).

   2) "Safety Evaluation by the Office of Nuclear Reactor Regulation Supporting Amendment No. 157 to Facility Operating License DPR-57," dated September 12, 1988.

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits and accident analysis limits) of the safety analysis are met.

d. The COLR, including any mid-cycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

(continued)

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

   1) The Average Planar Linear Heat Generation Rate for Specification 3.2.1.

   2) The Minimum Critical Power Ratio for Specification 3.2.2.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

   1) NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," (applicable amendment specified in the COLR).

   2) "Safety Evaluation by the Office of Nuclear Reactor Regulation Supporting Amendment Nos. 151 and 89 to Facility Operating Licenses DPR-57 and NPF-5," dated January 22, 1988.

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits and accident analysis limits) of the safety analysis are met.

d. The COLR, including any mid-cycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

(continued)

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range – Upscale	(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 115.5/125 divisions of full scale
b. Intermediate Power Range – Upscale	(b)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 109.7/125 divisions of full scale
c. High Power Range – Upscale	(c),~~(d)~~	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 105.9/125 divisions of full scale
d. Inop	(d),~~(e)~~	2	SR 3.3.2.1.1	NA
e. Downscale	(d),~~(e)~~	2	SR 3.3.2.1.1 SR 3.3.2.1.7	≥ 93/125 divisions of full scale
2. Rod Worth Minimizer	$1^{(e)\,\cancel{(f)}},2^{(e)\,\cancel{(f)}}$	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
3. Reactor Mode Switch – Shutdown Position	(f) ~~(g)~~	2	SR 3.3.2.1.6	NA

(a) THERMAL POWER ≥ 29% and < 64% RTP ~~and MCPR < 1.70.~~

(b) THERMAL POWER ≥ 64% and < 84% RTP ~~and MCPR < 1.70.~~

(c) THERMAL POWER ≥ 84% ~~and < 90% RTP and MCPR < 1.70.~~

~~(d) THERMAL POWER ≥ 90% RTP and MCPR < 1.40.~~

(d) ~~(e)~~ THERMAL POWER ≥ 29% ~~and < 90% RTP and MCPR < 1.70~~.

(e) ~~(f)~~ With THERMAL POWER < 10% RTP.

(f) ~~(g)~~ Reactor mode switch in the shutdown position.

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

~~1) Control Rod Block Instrumentation - Rod Block Monitor for Specification 3.3.2.1.~~

1) ~~2)~~ The Average Planar Linear Heat Generation Rate for Specification 3.2.1.

2) ~~3)~~ The Minimum Critical Power Ratio for Specifications 3.2.2. ~~and 3.3.2.1.~~

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1) NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," (applicable amendment specified in the COLR).

2) "Safety Evaluation by the Office of Nuclear Reactor Regulation Supporting Amendment No. 157 to Facility Operating License DPR-57," dated September 12, 1988.

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits and accident analysis limits) of the safety analysis are met.

d. The COLR, including any mid-cycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

(continued)

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range – Upscale	(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 115.5/125 divisions of full scale
b. Intermediate Power Range – Upscale	(b)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 109.7/125 divisions of full scale
c. High Power Range – Upscale	(c)~~, (d)~~	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.7	≤ 105.9/125 divisions of full scale
d. Inop	(d)~~, (e)~~	2	SR 3.3.2.1.1	NA
e. Downscale	(d)~~, (e)~~	2	SR 3.3.2.1.1 SR 3.3.2.1.7	≥ 93/125 divisions of full scale
2. Rod Worth Minimizer	1 (e) ~~(f)~~, 2 (e) ~~(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
3. Reactor Mode Switch – Shutdown Position	(f) ~~(g)~~	2	SR 3.3.2.1.6	NA

(a) THERMAL POWER ≥ 29% and < 64% RTP ~~and MCPR < 1.70~~.

(b) THERMAL POWER ≥ 64% and < 84% RTP ~~and MCPR < 1.70~~.

(c) THERMAL POWER ≥ 84% ~~and < 90% RTP and MCPR < 1.70~~.

~~(d) THERMAL POWER ≥ 90% RTP and MCPR < 1.40.~~

(d) ~~(e)~~ THERMAL POWER ≥ 29% ~~and < 90% RTP and MCPR < 1.70~~.

(e) ~~(f)~~ With THERMAL POWER < 10% RTP.

(f) ~~(g)~~ Reactor mode switch in the shutdown position.

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

~~1) Control Rod Block Instrumentation - Rod Block Monitor for Specification 3.3.2.1.~~

1) ~~2)~~ The Average Planar Linear Heat Generation Rate for Specification 3.2.1.

2) ~~3)~~ The Minimum Critical Power Ratio for Specifications 3.2.2. ~~and 3.3.2.1.~~

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1) NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," (applicable amendment specified in the COLR).

2) "Safety Evaluation by the Office of Nuclear Reactor Regulation Supporting Amendment Nos. 151 and 89 to Facility Operating Licenses DPR-57 and NPF-5," dated January 22, 1988.

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits and accident analysis limits) of the safety analysis are met.

d. The COLR, including any mid-cycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

(continued)

Enclosure 4

Edwin I. Hatch Nuclear Plant
Request to Revise Technical Specifications:
Rod Block Monitor Operability Requirements

Bases Changes

Unit 1

Page	Replace
B 3.3-42	B 3.3-42
B 3.3-45	B 3.3-45

Unit 2

Page	Replace
B 3.3-42	B 3.3-42
B 3.3-45	B 3.3-45

B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

BACKGROUND

Control rods provide the primary means for control of reactivity changes. Control rod block instrumentation includes channel sensors, logic circuitry, switches, and relays that are designed to ensure that the fuel cladding integrity safety limit, and specified fuel design limits are not violated during postulated transients and accidents. During high power operation, the rod block monitor (RBM) provides protection for control rod withdrawal error events. During low power operations, control rod blocks from the rod worth minimizer (RWM) enforce specific control rod sequences designed to mitigate the consequences of the control rod drop accident (CRDA). During shutdown conditions, control rod blocks from the Reactor Mode Switch — Shutdown Position Function ensure that all control rods remain inserted to prevent inadvertent criticalities.

The purpose of the RBM is to limit control rod withdrawal if localized neutron flux exceeds a predetermined setpoint during control rod manipulations. It is assumed to function to block further control rod withdrawal to preclude a violation of the MCPR Safety Limit (SL) or a specified acceptable fuel design limit (SAFDL). The RBM supplies a trip signal to the Reactor Manual Control System (RMCS) to appropriately inhibit control rod withdrawal during power operation above the low power range setpoint. The RBM has two channels, either of which can initiate a control rod block when the channel output exceeds the control rod block setpoint. One RBM channel inputs into one RMCS rod block circuit and the other RBM channel inputs into the second RMCS rod block circuit.

The RBM channel signal is generated by averaging a set of local power range monitor (LPRM) signals at various core heights surrounding the control rod being withdrawn. A signal from one of the four redundant average power range monitor (APRM) channels supplies a reference signal for one of the RBM channels, and a signal from another of the APRM channels supplies the reference signal to the second RBM channel. This reference signal is used to determine which RBM range setpoint (low, intermediate, or high) is enabled. If the APRM is indicating less than the low power range setpoint, the RBM is automatically bypassed. The RBM

(continued)

BASES

BACKGROUND (continued)

is also automatically bypassed if a peripheral control rod is selected (Ref. 1). A rod block signal is also generated if an RBM Downscale trip or an Inoperable trip occurs. The Downscale trip will occur if the RBM channel signal decreases below the Downscale trip setpoint after the RBM signal has been normalized. The Inoperable trip will occur during the nulling (normalization) sequence, if: the RBM channel fails to null, too few LPRM inputs are available, a module is not plugged in, or the function switch is moved to any position other than "Operate."

The purpose of the RWM is to control rod patterns during startup and shutdown, such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to 10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. Prescribed control rod sequences are stored in the RWM, which will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the stored sequence. The RWM determines the actual sequence based position indication for each control rod. The RWM also uses feedwater flow and steam flow signals to determine when the reactor power is above the preset power level at which the RWM is automatically bypassed (Ref. 2). The RWM is a single channel system that provides input into both RMCS rod block circuits.

With the reactor mode switch in the shutdown position, a control rod withdrawal block is applied to all control rods to ensure that the shutdown condition is maintained. This Function prevents inadvertent criticality as the result of a control rod withdrawal during MODE 3 or 4, or during MODE 5 when the reactor mode switch is required to be in the shutdown position. The reactor mode switch has two channels, each inputting into a separate RMCS rod block circuit. A rod block in either RMCS circuit will provide a control rod block to all control rods.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1. Rod Block Monitor (continued)

effects (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The RBM is assumed to mitigate the consequences of an RWE event when operating ≥ 29% RTP. Below this power level, the consequences of an RWE event will not violate the MCPR SL or the 1% plastic strain design limit; therefore, the RBM is not required to be OPERABLE (Ref. 3).

2. Rod Worth Minimizer

The RWM enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, 6, and 7. In addition, the Reference 6 analysis (Generic BPWS analysis) may be modified by plant specific evaluations. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

The RWM Function satisfies Criterion 3 of the NRC Policy Statement (Ref. 10).

Since the RWM is a system designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE (Ref. 7). Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the BPWS. The

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B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

BACKGROUND

Control rods provide the primary means for control of reactivity changes. Control rod block instrumentation includes channel sensors, logic circuitry, switches, and relays that are designed to ensure that the fuel cladding integrity safety limit (SL), and the specified fuel design limits are not violated during postulated transients and accidents. During high power operation, the rod block monitor (RBM) provides protection for control rod withdrawal error events. During low power operations, control rod blocks from the rod worth minimizer (RWM) enforce specific control rod sequences designed to mitigate the consequences of the control rod drop accident (CRDA). During shutdown conditions, control rod blocks from the Reactor Mode Switch — Shutdown Position Function ensure that all control rods remain inserted to prevent inadvertent criticalities.

The purpose of the RBM is to limit control rod withdrawal if localized neutron flux exceeds a predetermined setpoint during control rod manipulations. It is assumed to function to block further control rod withdrawal to preclude a violation of the MCPR SL or a specified acceptable fuel design limit (SAFDL). The RBM supplies a trip signal to the Reactor Manual Control System (RMCS) to appropriately inhibit control rod withdrawal during power operation above the low power range setpoint. The RBM has two channels, either of which can initiate a control rod block when the channel output exceeds the control rod block setpoint. One RBM channel inputs into one RMCS rod block circuit and the other RBM channel inputs into the second RMCS rod block circuit.

The RBM channel signal is generated by averaging a set of local power range monitor (LPRM) signals at various core heights surrounding the control rod being withdrawn. A signal from one of the four redundant average power range monitor (APRM) channels supplies a reference signal for one of the RBM channels, and a signal from another of the RBM channels supplies the reference signal to the second RBM channel. This reference signal is used to determine which RBM range setpoint (low, intermediate, or high) is enabled. If the APRM is indicating less than the low power range setpoint, the RBM is automatically bypassed. The RBM is also automatically bypassed if a peripheral control rod is

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BASES

BACKGROUND (continued)

selected (Ref. 1). A rod block signal is also generated if an RBM Downscale trip or an Inoperable trip occurs. The Downscale trip willoccur if the RBM channel signal decreases below the Downscale trip setpoint after the RBM signal has been normalized. The Inoperable trip will occur during the nulling (normalization) sequence, if: the RBM channel fails to null, too few LPRM inputs are available, a module is not plugged in, or the function switch is moved to any position other than "Operate."

The purpose of the RWM is to control rod patterns during startup and shutdown, such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to 10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. Prescribed control rod sequences are stored in the RWM, which will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the stored sequence. The RWM determines the actual sequence based position indication for each control rod. The RWM also uses feedwater flow and steam flow signals to determine when the reactor power is above the preset power level at which the RWM is automatically bypassed (Ref. 2). The RWM is a single channel system that provides input into both RMCS rod block circuits.

With the reactor mode switch in the shutdown position, a control rod withdrawal block is applied to all control rods to ensure that the shutdown condition is maintained. This Function prevents inadvertent criticality as the result of a control rod withdrawal during MODE 3 or 4, or during MODE 5 when the reactor mode switch is required to be in the shutdown position. The reactor mode switch has two channels, each inputting into a separate RMCS rod block circuit. A rod block in either RMCS circuit will provide a control rod block to all control rods.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1. Rod Block Monitor (continued)

effects (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The RBM is assumed to mitigate the consequences of an RWE event when operating ≥ 29% RTP. Below this power level, the consequences of an RWE event will not violate the MCPR SL or the 1% plastic strain design limit; therefore, the RBM is not required to be OPERABLE (Ref. 3).

2. Rod Worth Minimizer

The RWM enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, 6, and 7. In addition, the Reference 6 analysis (Generic BPWS analysis) may be modified by plant specific evaluations. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

The RWM Function satisfies Criterion 3 of the NRC Policy Statement (Ref. 10).

Since the RWM is a system designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE (Ref. 7). Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the BPWS. The

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B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

BACKGROUND

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violated during

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a violation of the

OR a specified acceptable fuel design limit (SAFDL)

The purpose of the RBM is to limit control rod withdrawal if localized neutron flux exceeds a predetermined setpoint during control rod manipulations. It is assumed to function to block further control rod withdrawal to preclude ~~a~~ MCPR Safety Limit (SL) ~~violation~~. The RBM supplies a trip signal to the Reactor Manual Control System (RMCS) to appropriately inhibit control rod withdrawal during power operation above the low power range setpoint. The RBM has two channels, either of which can initiate a control rod block when the channel output exceeds the control rod block setpoint. One RBM channel inputs into one RMCS rod block circuit and the other RBM channel inputs into the second RMCS rod block circuit.

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(continued)

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BACKGROUND (continued)

generated if an RBM Downscale trip or an Inoperable trip occurs. The Downscale trip will occur if the RBM channel signal decreases below the Downscale trip setpoint after the RBM signal has been normalized. The Inoperable trip will occur during the nulling (normalization) sequence, if: the RBM channel fails to null, too few LPRM inputs are available, a module is not plugged in, or the function switch is moved to any position other than "Operate."

The purpose of the RWM is to control rod patterns during startup and shutdown, such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to 10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. Prescribed control rod sequences are stored in the RWM, which will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the stored sequence. The RWM determines the actual sequence based position indication for each control rod. The RWM also uses feedwater flow and steam flow signals to determine when the reactor power is above the preset power level at which the RWM is automatically bypassed (Ref. 2). The RWM is a single channel system that provides input into both RMCS rod block circuits.

With the reactor mode switch in the shutdown position, a control rod withdrawal block is applied to all control rods to ensure that the shutdown condition is maintained. This Function prevents inadvertent criticality as the result of a control rod withdrawal during MODE 3 or 4, or during MODE 5 when the reactor mode switch is required to be in the shutdown position. The reactor mode switch has two channels, each inputting into a separate RMCS rod block circuit. A rod block in either RMCS circuit will provide a control rod block to all control rods.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1. Rod Block Monitor (continued)

effects (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The RBM is assumed to mitigate the consequences of an RWE event when operating ≥ 29% RTP. Below this power level, the consequences of an RWE event will not ~~exceed~~ violate the MCPR SL ~~and,~~ or the 1% plastic strain design limit; therefore, the RBM is not required to be OPERABLE (Ref. 3). ~~When operating < 90% RTP, analyses (Ref. 3) have shown that with an initial MCPR ≥ 1.70, no RWE event will result in exceeding the MCPR SL. Also, the analyses demonstrate that when operating at ≥ 90% RTP with MCPR ≥ 1.40, no RWE event will result in exceeding the MCPR SL (Ref. 3). Therefore, under these conditions, the RBM is also not required to be OPERABLE.~~

2. Rod Worth Minimizer

The RWM enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, 6, and 7. In addition, the Reference 6 analysis (Generic BPWS analysis) may be modified by plant specific evaluations. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

The RWM Function satisfies Criterion 3 of the NRC Policy Statement (Ref. 10).

Since the RWM is a system designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE (Ref. 7). Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the BPWS. The

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B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

BACKGROUND

the fuel cladding integrity safety limit, and

violated during

Control rods provide the primary means for control of reactivity changes. Control rod block instrumentation includes channel sensors, logic circuitry, switches, and relays that are designed to ensure that specified fuel design limits are not ~~exceeded for~~ postulated transients and accidents. During high power operation, the rod block monitor (RBM) provides protection for control rod withdrawal error events. During low power operations, control rod blocks from the rod worth minimizer (RWM) enforce specific control rod sequences designed to mitigate the consequences of the control rod drop accident (CRDA). During shutdown conditions, control rod blocks from the Reactor Mode Switch — Shutdown Position Function ensure that all control rods remain inserted to prevent inadvertent criticalities.

a violation of the

or a specified acceptable fuel design limit (SAFDL)

The purpose of the RBM is to limit control rod withdrawal if localized neutron flux exceeds a predetermined setpoint during control rod manipulations. It is assumed to function to block further control rod withdrawal to preclude ~~a~~ MCPR Safety Limit (SL) ~~violation~~. The RBM supplies a trip signal to the Reactor Manual Control System (RMCS) to appropriately inhibit control rod withdrawal during power operation above the low power range setpoint. The RBM has two channels, either of which can initiate a control rod block when the channel output exceeds the control rod block setpoint. One RBM channel inputs into one RMCS rod block circuit and the other RBM channel inputs into the second RMCS rod block circuit.

The RBM channel signal is generated by averaging a set of local power range monitor (LPRM) signals at various core heights surrounding the control rod being withdrawn. A signal from one of the four redundant average power range monitor (APRM) channels supplies a reference signal for one of the RBM channels, and a signal from another of the APRM channels supplies the reference signal to the second RBM channel. This reference signal is used to determine which RBM range setpoint (low, intermediate, or high) is enabled. If the APRM is indicating less than the low power range setpoint, the RBM is automatically bypassed. The RBM is also automatically bypassed if a peripheral control rod is selected (Ref. 1). A rod block signal is also generated if

(continued)

BASES

BACKGROUND (continued)

selected (Ref. 1). A rod block signal is also generated if an RBM Downscale trip or an Inoperable trip occurs. The Downscale trip willoccur if the RBM channel signal decreases below the Downscale trip setpoint after the RBM signal has been normalized. The Inoperable trip will occur during the nulling (normalization) sequence, if: the RBM channel fails to null, too few LPRM inputs are available, a module is not plugged in, or the function switch is moved to any position other than "Operate."

The purpose of the RWM is to control rod patterns during startup and shutdown, such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to 10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. Prescribed control rod sequences are stored in the RWM, which will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the stored sequence. The RWM determines the actual sequence based position indication for each control rod. The RWM also uses feedwater flow and steam flow signals to determine when the reactor power is above the preset power level at which the RWM is automatically bypassed (Ref. 2). The RWM is a single channel system that provides input into both RMCS rod block circuits.

With the reactor mode switch in the shutdown position, a control rod withdrawal block is applied to all control rods to ensure that the shutdown condition is maintained. This Function prevents inadvertent criticality as the result of a control rod withdrawal during MODE 3 or 4, or during MODE 5 when the reactor mode switch is required to be in the shutdown position. The reactor mode switch has two channels, each inputting into a separate RMCS rod block circuit. A rod block in either RMCS circuit will provide a control rod block to all control rods.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1. Rod Block Monitor (continued)

effects (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

violate

or the 1% plastic strain design limit;

The RBM is assumed to mitigate the consequences of an RWE event when operating ≥ 29% RTP. Below this power level, the consequences of an RWE event will not ~~exceed~~ the MCPR SL ~~and,~~ therefore, the RBM is not required to be OPERABLE (Ref. 3). ~~When operating < 90% RTP, analyses (Ref. 3) have shown that with an initial MCPR ≥ 1.70, no RWE event will result in exceeding the MCPR SL. Also, the analyses demonstrate that when operating at ≥ 90% RTP with MCPR ≥ 1.40, no RWE event will result in exceeding the MCPR SL (Ref. 3). Therefore, under these conditions, the RBM is also not required to be OPERABLE.~~

2. Rod Worth Minimizer

The RWM enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, 6, and 7. In addition, the Reference 6 analysis (Generic BPWS analysis) may be modified by plant specific evaluations. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

The RWM Function satisfies Criterion 3 of the NRC Policy Statement (Ref. 10).

Since the RWM is a system designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE (Ref. 7). Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the BPWS. The

(continued)