3.3 INSTRUMENTATION

3.3.2.1 Control Rod Block Instrumentation

TLCO 3.3.2.1 The control rod block instrumentation for each Function in Table 3.3.2.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.2.1-1

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ----------NOTE---------- Only applicable to Functions 1, 2, 3 and 5. ---------- One or more Functions with one required channel inoperable.	A.1 Restore channel to OPERABLE status.	7 days
B. ----------NOTE---------- Only applicable to Functions 1, 2, 3, and 5. ---------- One or more Functions with two required channels inoperable.	B.1 Place channel in the tripped condition. OR B.2 Suspend control rod withdrawal.	Immediately Immediately
C. One or more required Function 4 channels inoperable.	C.1 Place channel in the tripped condition. OR C.2 Suspend control rod withdrawal.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

----------NOTE----------

1. Refer to Table 3.3.2.1-1 to determine which TSRs apply for each Control Rod Block Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillance, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains control rod block capability.

SURVEILLANCE		FREQUENCY
TSR 3.3.2.1.1	Perform CHANNEL CHECK.	12 hours
TSR 3.3.2.1.2	----------NOTE---------- 1. For Function 1.b, not required to be performed if SRM detectors are secured in the full-in position. 2. For Function 2.a and 2.b, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. ---------- Perform CHANNEL FUNCTIONAL TEST.	7 days
TSR 3.3.2.1.3	Perform CHANNEL FUNCTIONAL TEST.	92 days
TSR 3.3.2.1.4	Perform CHANNEL CALIBRATION.	12 months
TSR 3.3.2.1.5	----------NOTE---------- 1. Neutron detectors are excluded. 2. For Function 2.a and 2.b, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. ---------- Perform CHANNEL CALIBRATION.	24 months
TSR 3.3.2.1.6	Perform CHANNEL CALIBRATION.	24 months
TSR 3.3.2.1.7	Perform CHANNEL FUNCTIONAL TEST.	184 days

Table 3.3.2.1-1 (Page 1 of 2)
Control Rod Block Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1.	Source Range Monitors				
	a. Upscale	2[(a)], 5	1	TSR 3.3.2.1.1 TSR 3.3.2.1.2 TSR 3.3.2.1.5	$\leq 1.16 \times 10^5$cps
	b. Detector Not Fully Inserted	2[(b)], 5[(b)]	1	TSR 3.3.2.1.2 TSR 3.3.2.1.5	NA
2.	Intermediate Range Monitors				
	a. Downscale	2[(c)], 5[(c)]	2[(d)]	TSR 3.3.2.1.1 TSR 3.3.2.1.2 TSR 3.3.2.1.5	≥ 3/125 divisions of full scale
	b. Upscale	2, 5	2[(d)]	TSR 3.3.2.1.1 TSR 3.3.2.1.2 TSR 3.3.2.1.5	≤ 109.5/125 divisions of full scale
3.	Average Power Range Monitors				
	a. Simulated Thermal Power – High	1	3[(f)]	TSR 3.3.2.1.6 TSR 3.3.2.1.7	≤ 0.61W + 61.2% RTP[(e)] and < 110% RTP
	b. Downscale	1	3[(f)]	TSR 3.3.2.1.6 TSR 3.3.2.1.7	≥ 2/125 divisions of full scale
	c. Neutron Flux – High (Setdown)	2	3[(f)]	TSR 3.3.2.1.6 TSR 3.3.2.1.7	≤ 15%
4.	Scram Discharge Volume				
	a. East Water Level High	1, 2	1	TSR 3.3.2.1.3 TSR 3.3.2.1.4	≤ 40 gal
	b. West Water Level High	1, 2	1	TSR 3.3.2.1.3 TSR 3.3.2.1.4	≤ 40 gal

(a) With IRMs on Range 6 or below.

(b) With SRM channel count rate < 100 cps and IRMs on Range 2 or below.

(c) With IRMs on Range 2 or above.

(d) There must be at least one OPERABLE IRM channel monitoring each core quadrant.

(e) ≤ 0.55(W - Delta W) + 55.5% when Technical Specification 3.3.1.1 Function 2.b, is reset for single loop operation per LCO 3.4.1, “Recirculation Loops Operating.” The value of Delta W is defined in the COLR. Single loop operation is not permitted while operating in the MELLLA+ operating domain.

(f) Each APRM channel provides input to both trip systems.

Table 3.3.2.1-1 (Page 2 of 2)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. Average Power Range Monitors (Automated Backup Stability Protection (BSP))				
a. Slope	1[(g)]	3[(f)]	TSR 3.3.2.1.6 TSR 3.3.2.1.7	≤ 1.3
b. Constant Power Line	1[(g)]	3[(f)]	TSR 3.3.2.1.6 TSR 3.3.2.1.7	≤ 30% RTP
c. Constant Flow Line	1[(g)]	3[(f)]	TSR 3.3.2.1.6 TSR 3.3.2.1.7	≥ 58.8% Rated Drive Flow (RDF)
d. Flow Breakpoint	1[(g)]	3[(f)]	TSR 3.3.2.1.6 TSR 3.3.2.1.7	≥ 34.5% RDF

(f) Each APRM channel provides input to both trip systems.

(g) Required only when the Automated BSP Scram Region is implemented in accordance with Technical Specification 3.3.1.1.

3.8 ELECTRICAL POWER SYSTEMS

3.8.1 Northern States Power (NSP) Transmission Lines

TLCO 3.8.1 Two NSP transmission lines and associated switchgear shall be OPERABLE to supply power to the offsite circuits required by LCO 3.8.1, "AC Sources - Operating."

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required NSP transmission line and associated switchgear inoperable.	A.1 Verify, by administrative means, both emergency diesel generators (EDGs) are OPERABLE. AND A.2 Restore required NSP transmission line and associated switchgear to OPERABLE status.	Immediately 7 days
B. Required Action and associated Completion Time of Condition A not met. OR Two required NSP transmission lines and associated switchgear inoperable.	B.1 Enter TLCO 3.0.3	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.8.1.1	The following Substation Switchyard Battery measurements shall be taken: a. Pilot cell specific gravity and voltage; b. Temperature of cells adjacent to the pilot cell; and c. Overall battery voltage.	7 days
TSR 3.8.1.2	The following Substation Switchyard Battery measurements shall be taken: a. Voltage of each cell (to the nearest 0.01 volt); b. Specific gravity of each cell; and c. Temperature of every fifth cell.	92 days

B 3.3 INSTRUMENTATION

B 3.3.2.1 Control Rod Block Instrumentation

BASES

The control rod block functions are provided to prevent excessive control rod withdrawal so that MCPR remains above the Safety Limit (Technical Specification 2.1.1). The trip logic for this function is 1 out of n; e.g., any trip on one of the four APRM's, eight IRM's, four SRM's, or two scram discharge volume water level channels will result in a rod block. For each Control Rod Block Function, there are two trip systems, with the exception of the scram discharge volume water level trip function, which only feeds one trip system. The scram discharge volume water level instrumentation includes one sensor on each of the two scram discharge volumes. This assures that no control rod is withdrawn unless enough capacity is available in either scram discharge volume to accommodate a scram. The setting is selected to initiate a rod block no later than the scram that is initiated on scram discharge volume high water level.

The minimum instrument channel requirements for the IRM may be reduced by one for a short period of time to allow for maintenance, testing, or calibration. See Section 7.3 FSAR.

The APRM Simulated Thermal Power – High rod block (Refs. 3 and 4) is referenced to flow and prevents operation significantly above the licensing basis power level especially during operation at reduced flow. For operation at low power (i.e., MODE 2), the APRM Neutron Flux – High (Setdown) Function (Ref. 3) is capable of generating a rod block to prevent fuel damage resulting from abnormal operating transients in this power range. The APRMs provides gross core protection; i.e., limits the gross core power increase from withdrawal of control rods in the normal withdrawal sequence. The operator will set the APRM rod block trip settings no greater than that stated in Table 3.3.2.1-1. However, the actual setpoint can be as much as 3% greater than that stated in Table 3.3.2.1-1 for recirculation driving flows less than 50% of design and 2% greater than that shown for recirculation driving flows greater than 50% of design due to the deviations that could be caused by inherent instrument error, operator setting error, drift of the setpoint, etc.

The APRM Backup Stability Protection (BSP) Flow-Bias rod blocks are active when the Automated Backup Stability Protection (ABSP) function is enabled. The BSP Flow-Bias rod blocks provide a rod block for reactivity transients when operating at low recirculation flows with the OPRMs out of service. These rod blocks provide a warning of potential ABSP scrams. The constant flow line and flow breakpoint are in terms of rated (recirculation) drive flow or RDF (see Ref. 5). Addition of these rod block functions was approved by Amendment No. 180 (Ref. 6).

The IRM rod block function provides local as well as gross core protection. The scaling arrangement is such that trip setting is less than a factor of 10 above the indicated level. Analysis of the worst case accident results in rod block action before MCPR approaches the Safety Limit (Technical Specification 2.1.1).

A downscale indication of an IRM is an indication the instrument has failed or the instrument is not sensitive enough. In either case the instrument will not respond to changes in control rod motion and thus control rod motion is prevented. The downscale IRM rod block assures that there will be proper overlap between the neutron monitoring systems and thus, that adequate coverage is provided for all ranges of reactor operation. The downscale IRM rod block is set at 3/125 of full scale.

BASES

Although the operator will set the setpoints within the trip settings specified in Table 3.3.2.1-1, the actual values of the various set points can differ appreciably from the value the operator is attempting to set. The deviations could be caused by inherent instrument error, operator setting error, drift of the set point, etc. Therefore, these deviations have been accounted for in the various transient analyses.

Trip Function	Deviation
IRM Downscale	- 2/125 of Scale
IRM Upscale	+ 2/125 of Scale
APRM Downscale	- 2/125 of Scale
APRM Upscale	+ 3% for recirculation driving flows < 50% of design + 2% for recirculation driving flows > 50% of design
Scram Discharge Volume-High Level	+ 1 gallon

The instrumentation in this section will be functionally tested and calibrated at regularly scheduled intervals. The 184 day CHANNEL FUNCTIONAL TEST and 24 month CHANNEL CALIBRATION surveillance frequencies for the APRM Simulated Thermal Power – High, APRM Downscale, and APRM Neutron Flux – High (Setdown) rod block functions are consistent with the NUMAC PRNMS design assumptions (Refs. 1 and 2). Although this instrumentation is not generally considered to be as important to plant safety as the Reactor Protection System, the same design reliability goals are applied. Where applicable, sensor checks are specified on a once/12 hours basis.

REFERENCES

1. NEDC-32410P-A, “Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function,” October 1995.

2. NEDC-32410P-A, Supplement 1, “Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function,” November 1997.

3. Amendment No. 159, “Issuance of Amendment Re: Request to Install Power Range Neutron Monitoring System,” dated February 3, 2009. (ADAMS Accession No. ML083440681)

4. Calculation 08-052, “Instrument Setpoint Calculation – Average Power Range Monitor (APRM) Flow Biased PRNM Setpoints for EPU,” Revision 2.

5. Calculation 12-043 “Average Power Range Monitor NUMAC PRNM Setpoints – MELLLA+ Automatic Backup Stability Protection (ABSP),” Revision 0.

6. Amendment No. 180, “Monticello Nuclear Generating Plant – Issuance of Amendment No. 180 to Renewed Facility Operating License Regarding MELLLA+,” dated March 28, 2014. (ADAMS Accession No. ML14035A248)