

## SAFETY LIMITS AND LIMITING SAFETY SYSTEM SETTINGS

### 2.2 LIMITING SAFETY SYSTEM SETTINGS

#### REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

2.2.1 The reactor protection system instrumentation setpoints shall be set consistent with the Trip Setpoint values shown in Table 2.2.1-1.

APPLICABILITY: As shown in Table 3.3.1-1.

#### ACTION:

With a reactor protection system instrumentation setpoint less conservative than the value shown in the Allowable Values column of Table 2.2.1-1, declare the channel inoperable\* and apply the applicable ACTION statement requirement of Specification 3.3.1 until the channel is restored to OPERABLE status with its setpoint adjusted consistent with the Trip Setpoint value.

\*The APRM Simulated Thermal Power - Upscale Functional Unit need not be declared inoperable upon entering single reactor recirculation loop operation provided that the flow-biased setpoints are adjusted within 6 hours per Specification 3.4.1.1.

TABLE 2.2.1-1REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

<u>FUNCTIONAL UNIT</u>	<u>TRIP SETPOINT</u>	<u>ALLOWABLE VALUES</u>
1. Intermediate Range Monitor, Neutron Flux-High	≤ 120/125 divisions of full scale	≤ 122/125 divisions of full scale
2. Average Power Range Monitor:		
a. Neutron Flux-Upscale (Setdown)	≤ 15.0% of RATED THERMAL POWER	≤ 20.0% of RATED THERMAL POWER
b. Simulated Thermal Power - Upscale:		
- Two Recirculation Loop Operation	≤ 0.66 W + 62.8% and ≤ 116.6% of RATED THERMAL POWER	≤ 0.66 W + 63.3% and ≤ 117.0% of RATED THERMAL POWER
- Single Recirculation Loop Operation	≤ 0.66 W + 57.8% and ≤ 116.6% of RATED THERMAL POWER	≤ 0.66 W + 58.3% and ≤ 117.0% of RATED THERMAL POWER
c. Neutron Flux - Upscale	118.3% of RATED THERMAL POWER	118.7% of RATED THERMAL POWER
d. Inoperative	N.A.	N.A.
e. 2-Out-Of-4 Voter	N.A.	N.A.
3. Reactor Vessel Steam Dome Pressure - High	≤ 1096 psig	≤ 1103 psig
4. Reactor Vessel Water Level - Low, Level 3	≥ 12.5 inches above instrument zero*	≥ 11.0 inches above instrument zero
5. Main Steam Line Isolation Valve - Closure	≤ 8% closed	≤ 12% closed
6. DELETED	DELETED	DELETED
7. Drywell Pressure - High	≤ 1.68 psig	≤ 1.88 psig
8. Scram Discharge Volume Water Level - High		
a. Level Transmitter	≤ 261' 1 1/4" elevation**	≤ 261' 9 1/4" elevation
b. Float Switch	≤ 261' 1 1/4" elevation**	≤ 261' 9 1/4" elevation

\* See Bases Figure B 3/4.3-1.

\*\* Equivalent to 25.58 gallons/scram discharge volume.

## 2.2 LIMITING SAFETY SYSTEM SETTINGS

### BASES

#### 2.2.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

The Reactor Protection System instrumentation setpoints specified in Table 2.2.1-1 are the values at which the reactor trips are set for each parameter. The Trip Setpoints have been selected to ensure that the reactor core and reactor coolant system are prevented from exceeding their Safety Limits during normal operation and design basis anticipated operational occurrences and to assist in mitigating the consequences of accidents. Operation with a trip set less conservative than its Trip Setpoint but within its specified Allowable Value is acceptable on the basis that the difference between each Trip Setpoint and the Allowable Value is equal to or less than the drift allowance assumed for each trip in the safety analyses.

##### 1. Intermediate Range Monitor, Neutron Flux - High

The IRM system consists of 8 chambers, 4 in each of the reactor trip systems. The IRM is a 5 decade 10 range instrument. The trip setpoint of 120 divisions of scale is active in each of the 10 ranges. Thus as the IRM is ranged up to accommodate the increase in power level, the trip setpoint is also ranged up. The IRM instruments provide for overlap with both the APRM and SRM systems.

The most significant source of reactivity changes during the power increase is due to control rod withdrawal. In order to ensure that the IRM provides the required protection, a range of rod withdrawal accidents have been analyzed. The results of these analyses are in Section 15.4 of the FSAR. The most severe case involves an initial condition in which THERMAL POWER is at approximately 1% of RATED THERMAL POWER. Additional conservatism was taken in this analysis by assuming the IRM channel closest to the control rod being withdrawn is bypassed. The results of this analysis show that the reactor is shutdown and peak power is limited to 21% of RATED THERMAL POWER with the peak fuel enthalpy well below the fuel failure threshold of 170 cal/gm. Based on this analysis, the IRM provides protection against local control rod errors and continuous withdrawal of control rods in sequence and provides backup protection for the APRM.

##### 2. Average Power Range Monitor

The APRM system is divided into four APRM channels and four 2-Out-Of-4 Voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. All four voters will trip (full scram) when any two APRM channels exceed their trip setpoints.

For operation at low pressure and low flow during STARTUP, the APRM Neutron Flux-Upscale (Setdown) scram setting of 15% of RATED THERMAL POWER provides adequate thermal margin between the setpoint and the Safety Limits. The margin accommodates the anticipated maneuvers associated with power plant startup. Effects of increasing pressure at zero or low void content are minor and cold water from sources available during startup is not much colder than that already in the system. Temperature coefficients are small and control rod patterns are constrained by the RWM. Of all the possible sources of reactivity input, uniform control rod withdrawal is the most probable cause of significant power increase.

## LIMITING SAFETY SYSTEM SETTINGS

### BASES

#### REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS (Continued)

##### Average Power Range Monitor (Continued)

Because the flux distribution associated with uniform rod withdrawals does not involve high local peaks and because several rods must be moved to change power by a significant amount, the rate of power rise is very slow. Generally the heat flux is in near equilibrium with the fission rate. In an assumed uniform rod withdrawal approach to the trip level, the rate of power rise is not more than 5% of RATED THERMAL POWER per minute and the APRM system would be more than adequate to assure shutdown before the power could exceed the Safety Limit. The 15% Neutron Flux - Upscale (Setdown) trip remains active until the mode switch is placed in the Run position.

The APRM trip system is calibrated using heat balance data taken during steady state conditions. Fission chambers provide the basic input to the system and therefore the monitors respond directly and quickly to changes due to transient operation for the case of the Neutron Flux - Upscale setpoint; i.e., for a power increase, the THERMAL POWER of the fuel will be less than that indicated by the neutron flux due to the time constants of the heat transfer associated with the fuel. For the Simulated Thermal Power - Upscale setpoint, a time constant of  $6 \pm 0.6$  seconds is introduced into the flow-biased APRM in order to simulate the fuel thermal transient characteristics. A more conservative maximum value is used for the flow-biased setpoint as shown in Table 2.2.1-1.

The APRM setpoints were selected to provide adequate margin for the Safety Limits and yet allow operating margin that reduces the possibility of unnecessary shutdown.

##### 3. Reactor Vessel Steam Dome Pressure-High

High pressure in the nuclear system could cause a rupture to the nuclear system process barrier resulting in the release of fission products. A pressure increase while operating will also tend to increase the power of the reactor by compressing voids thus adding reactivity. The trip will quickly reduce the neutron flux, counteracting the pressure increase. The trip setting is slightly higher than the operating pressure to permit normal operation without spurious trips. The setting provides for a wide margin to the maximum allowable design pressure and takes into account the location of the pressure measurement compared to the highest pressure that occurs in the system during a transient. This trip setpoint is effective at low power/flow conditions when the turbine stop valve and control fast closure trips are bypassed. For a turbine trip or load rejection under these conditions, the transient analysis indicated an adequate margin to the thermal hydraulic limit.

### 3/4.3 INSTRUMENTATION

#### 3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

##### LIMITING CONDITION FOR OPERATION

3.3.1 As a minimum, the reactor protection system instrumentation channels shown in Table 3.3.1-1 shall be OPERABLE with the REACTOR PROTECTION SYSTEM RESPONSE TIME as shown in Table 3.3.1-2.

APPLICABILITY: As shown in Table 3.3.1-1.

ACTION:

Note: Separate condition entry is allowed for each channel.

- a. With the number of OPERABLE channels in either trip system for one or more Functional Units less than the Minimum OPERABLE Channels per Trip System required by Table 3.3.1-1, within one hour for each affected functional unit either verify that at least one\* channel in each trip system is OPERABLE or tripped or that the trip system is tripped, or place either the affected trip system or at least one inoperable channel in the affected trip system in the tripped condition.
- b. With the number of OPERABLE channels in either trip system less than the Minimum OPERABLE Channels per Trip System required by Table 3.3.1-1, place either the inoperable channel(s) or the affected trip system\*\* in the tripped condition within 12 hours.
- c. With the number of OPERABLE channels in both trip systems for one or more Functional Units less than the Minimum OPERABLE Channels per Trip System required by Table 3.3.1-1, place either the inoperable channel(s) in one trip system or one trip system in the tripped condition within 6 hours\*\*.
- d. If within the allowable time allocated by actions a, b or c, it is not desired to place the inoperable channel or trip system in trip (e.g., full scram would occur), Then no later than expiration of that allowable time initiate the action identified in Table 3.3.1-1 for the applicable Functional Unit.

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\*For Functional Units 2.a, 2.b, 2.c, 2.d, at least two channels shall be OPERABLE or tripped. For Functional Unit 5, both trip systems shall have each channel associated with the MSIVs in three main steam lines (not necessarily the same main steam lines for both trip systems) OPERABLE or tripped. For Function 9, at least three channels per trip system shall be OPERABLE or tripped.

\*\*For Functional Units 2.a, 2.b, 2.c, 2.d, inoperable channels shall be placed in the tripped condition to comply with Action b. Action c does not apply for these Functional Units.

### 3/4.3 INSTRUMENTATION

#### 3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

##### SURVEILLANCE REQUIREMENTS

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4.3.1.1 Each reactor protection system instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION operations for the OPERATIONAL CONDITIONS and at the frequencies shown in Table 4.3.1.1-1.

4.3.1.2 LOGIC SYSTEM FUNCTIONAL TESTS and simulated automatic operation of all channels shall be performed at least once per 24 months, except Table 4.3.1.1-1 Functions 2.a, 2.b, 2.c, 2.d, and 2.e. Functions 2.a, 2.b, 2.c, and 2.d do not require separate LOGIC SYSTEM FUNCTIONAL TESTS. For Function 2.e, tests shall be performed at least once per 24 months. LOGIC SYSTEM FUNCTIONAL TEST for Function 2.e includes simulating APRM trip conditions at the APRM channel inputs to the voter channel to check all combinations of two tripped inputs to the 2-Out-Of-4 voter logic in the voter channels.

4.3.1.3 The REACTOR PROTECTION SYSTEM RESPONSE TIME of each reactor trip functional unit shown in Table 3.3.1-2 shall be demonstrated to be within its limit at least once per 24 months. Each test shall include at least one channel per trip system such that all channels are tested at least once every N times 24 months where N is the total number of redundant channels in a specific reactor trip system.

TABLE 3.3.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	APPLICABLE OPERATIONAL CONDITIONS	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (a)	ACTION
1. Intermediate Range Monitors <sup>(b)</sup> :			
a. Neutron Flux - High	2 5(i)	3 3(d)	1 3
b. Inoperative	2 5(i)	3 3(d)	1 3
2. Average Power Range Monitor <sup>(c)</sup> :			
a. Neutron Flux - Upscale (Setdown)	2	3(m)	1
b. Simulated Thermal Power - Upscale	1	3(m)	4
c. Neutron Flux - Upscale	1	3(m)	4
d. Inoperative	1, 2	3(m)	1
e. 2-Out-Of-4 Voter	1, 2	2	1
3. Reactor Vessel Steam Dome Pressure - High	1, 2(f)	2	1
4. Reactor Vessel Water Level - Low, Level 3	1, 2	2	1
5. Main Steam Line Isolation Valve-Closure	1(g)	1/valve	4

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TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

ACTION STATEMENTS

- ACTION 1 - Be in at least HOT SHUTDOWN within 12 hours.
- ACTION 2 - DELETED
- ACTION 3 - Suspend all operations involving CORE ALTERATIONS and insert all insertable control rods within 1 hour.
- ACTION 4 - Be in at least STARTUP within 6 hours.
- ACTION 5 - Be in STARTUP with the main steam line isolation valves closed within 6 hours or in at least HOT SHUTDOWN within 12 hours.
- ACTION 6 - Initiate a reduction in THERMAL POWER within 15 minutes and reduce turbine first stage pressure until the function is automatically bypassed, within 2 hours.
- ACTION 7 - Verify all insertable control rods to be inserted within 1 hour.
- ACTION 8 - Lock the reactor mode switch in the Shutdown position within 1 hour.
- ACTION 9 - Suspend all operations involving CORE ALTERATIONS, and insert all insertable control rods and lock the reactor mode switch in the SHUTDOWN position within 1 hour.



TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

TABLE NOTATIONS

- (a) A channel may be placed in an inoperable status for up to 6 hours for required surveillance without placing the trip system in the tripped condition provided at least one OPERABLE channel in the same trip system is monitoring that parameter.
- (b) This function shall automatically be bypassed when the reactor mode switch is in the Run position.
- (c) DELETED
- (d) The noncoincident NMS reactor trip function logic is such that all channels go to both trip systems. Therefore, when the "shorting links" are removed, the Minimum OPERABLE Channels Per Trip System is 6 IRMs.
- (e) An APRM channel is inoperable if there are less than 3 LPRM inputs per level or less than 20 LPRM inputs to an APRM channel, or if more than 9 LPRM inputs to the APRM channel have been bypassed since the last APRM calibration (weekly gain calibration).
- (f) This function is not required to be OPERABLE when the reactor pressure vessel head is removed per Specification 3.10.1.
- (g) This function shall be automatically bypassed when the reactor mode switch is not in the Run position.
- (h) This function is not required to be OPERABLE when PRIMARY CONTAINMENT INTEGRITY is not required.
- (i) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.
- (j) This function shall be automatically bypassed when turbine first stage pressure is equivalent to a THERMAL POWER of less than 30% of RATED THERMAL POWER.
- (k) Also actuates the EOC-RPT system.
- (l) DELETED
- (m) Each APRM channel provides inputs to both trip systems.
- (n) A channel or trip system which has been placed in the tripped condition to satisfy Action b. or Action c. may be returned to the untripped condition under administrative control for up to two hours solely to perform testing required to demonstrate its operability or the operability of other equipment provided Action a. continues to be satisfied.

TABLE 3.3.1-2

REACTOR PROTECTION SYSTEM RESPONSE TIMES

<u>FUNCTIONAL UNIT</u>	<u>RESPONSE TIME (Seconds)</u>
1. Intermediate Range Monitors:	
a. Neutron Flux - High	N.A.
b. Inoperative	N.A.
2. Average Power Range Monitor*:	
a. Neutron Flux - Upscale (Setdown)	N.A.
b. Simulated Thermal Power - Upscale	N.A.
c. Neutron Flux - Upscale	N.A.
d. Inoperative	N.A.
e. 2-Out-Of-4 Voter	≤0.05*
3. Reactor Vessel Steam Dome Pressure - High	≤0.55
4. Reactor Vessel Water Level - Low, Level 3	≤1.05#
5. Main Steam Line Isolation Valve - Closure	≤0.06
6. DELETED	DELETED
7. Drywell Pressure - High	N.A.
8. Scram Discharge Volume Water Level - High	
a. Level Transmitter	N.A.
b. Float Switch	N.A.
9. Turbine Stop Valve - Closure	≤0.06
10. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	≤0.08**
11. Reactor Mode Switch Shutdown Position	N.A.
12. Manual Scram	N.A.

\* Neutron detectors, APRM channel and 2-Out-Of-4 Voter channel digital electronics are exempt from response time testing. Response time shall be measured from activation of the 2-Out-Of-4 Voter output relay. For application of Specification 4.3.1.3, the redundant outputs from each 2-Out-Of-4 Voter channel are considered part of the same channel, so N = 4.

\*\* Measured from start of turbine control valve fast closure.

# Sensor is eliminated from response time testing for the RPS circuits. Response time testing and conformance to the administrative limits for the remaining channel including trip unit and relay logic are required.

TABLE 4.3.1.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

<u>FUNCTIONAL UNIT</u>	<u>CHANNEL CHECK</u>	<u>CHANNEL FUNCTIONAL TEST</u>	<u>CHANNEL CALIBRATION(a)</u>	<u>OPERATIONAL CONDITIONS FOR WHICH SURVEILLANCE REQUIRED</u>
1. Intermediate Range Monitors:				
a. Neutron Flux - High	S(b) S	W W(j)	R R	2 5(i)
b. Inoperative	N.A.	W(j)	N.A.	2, 5(i)
2. Average Power Range Monitor(f):				
a. Neutron Flux - Upscale (Setdown)	D(b)	SA(l)	R	2
b. Simulated Thermal Power - Upscale	D	SA(e)	W(d), R(g)	1
c. Neutron Flux - Upscale	D	SA	W(d), R	1
d. Inoperative	N.A.	SA	N.A.	1, 2
e. 2-Out-Of-4 Voter	D	SA	N.A.	1, 2
3. Reactor Vessel Steam Dome Pressure - High	S	Q	R	1, 2(h)
4. Reactor Vessel Water Level - Low, Level 3	S	Q	R	1, 2
5. Main Steam Line Isolation Valve - Closure	N.A.	Q	R	1
6. DELETED	DELETED	DELETED	DELETED	DELETED
7. Drywell Pressure - High	S	Q	R	1, 2
8. Scram Discharge Volume Water Level - High				
a. Level Transmitter	S	Q	R	1, 2, 5(i)
b. Float Switch	N.A.	Q	R	1, 2, 5(i)

TABLE 4.3.1.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

<u>FUNCTIONAL UNIT</u>	<u>CHANNEL CHECK</u>	<u>CHANNEL FUNCTIONAL TEST</u>	<u>CHANNEL CALIBRATION(a)</u>	<u>OPERATIONAL CONDITIONS FOR WHICH SURVEILLANCE REQUIRED</u>
9. Turbine Stop Valve - Closure	N.A.	Q	R	1
10. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	N.A.	Q	R	1
11. Reactor Mode Switch Shutdown Position	N.A.	R	N.A.	1, 2, 3, 4, 5
12. Manual Scram	N.A.	W	N.A.	1, 2, 3, 4, 5

(a) Neutron detectors may be excluded from CHANNEL CALIBRATION.

(b) The IRM and SRM channels shall be determined to overlap for at least 1/2 decades during each startup after entering OPERATIONAL CONDITION 2 and the IRM and APRM channels shall be determined to overlap for at least 1/2 decades during each controlled shutdown, if not performed within the previous 7 days.

(c) DELETED

(d) This calibration shall consist of the adjustment of the APRM channel to conform to the power values calculated by a heat balance during OPERATIONAL CONDITION 1 when THERMAL POWER  $\geq 25\%$  of RATED THERMAL POWER. Adjust the APRM channel if the absolute difference is greater than 2% of RATED THERMAL POWER.

(e) CHANNEL FUNCTIONAL TEST shall include the flow input function, excluding the flow transmitter.

(f) The LPRMs shall be calibrated at least once per 1000 effective full power hours (EFPH).

(g) Calibration includes the flow input function.

(h) This function is not required to be OPERABLE when the reactor pressure vessel head is removed per Specification 3.10.1.

(i) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

(j) If the RPS shorting links are required to be removed per Specification 3.9.2, they may be reinstalled for up to 2 hours for required surveillance. During this time, CORE ALTERATIONS shall be suspended, and no control rod shall be moved from its existing position.

(k) DELETED

(l) Not required to be performed when entering OPERATIONAL CONDITION 2 from OPERATIONAL CONDITION 1 until 12 hours after entering OPERATIONAL CONDITION 2.

## INSTRUMENTATION

### 3/4.3.6 CONTROL ROD BLOCK INSTRUMENTATION

#### LIMITING CONDITION FOR OPERATION

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3.3.6. The control rod block instrumentation channels shown in Table 3.3.6-1 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3.6-2.

APPLICABILITY: As shown in Table 3.3.6-1.

#### ACTION:

- a. With a control rod block instrumentation channel trip setpoint\*\* less conservative than the value shown in the Allowable Values column of Table 3.3.6-2, declare the channel inoperable until the channel is restored to OPERABLE status with its trip setpoint adjusted consistent with the Trip Setpoint value.
- b. With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip Function requirement, take the ACTION required by Table 3.3.6-1.

#### SURVEILLANCE REQUIREMENTS

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4.3.6 Each of the above required control rod block trip systems and instrumentation channels shall be demonstrated OPERABLE\* by the performance of the CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, and CHANNEL CALIBRATION operations for the OPERATIONAL CONDITIONS and at the frequencies shown in Table 4.3.6-1.

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\* A channel may be placed in an inoperable status for up to 6 hours for required surveillance without placing the trip system in the tripped condition, provided at least one other operable channel in the same trip system is monitoring that parameter.

\*\*The APRM Simulated Thermal Power - Upscale Functional Unit need not be declared inoperable upon entering single reactor recirculation loop operation provided that the flow-biased setpoints are adjusted within 6 hours per Specification 3.4.1.1.

TABLE 3.3.6-1

CONTROL ROD BLOCK INSTRUMENTATION

<u>TRIP FUNCTION</u>	<u>MINIMUM OPERABLE CHANNELS PER TRIP FUNCTION</u>	<u>APPLICABLE OPERATIONAL CONDITIONS</u>	<u>ACTION</u>
1. <u>ROD BLOCK MONITOR</u> <sup>(a)</sup>			
a. Upscale	2	1*	60
b. Inoperative	2	1*	60
c. Downscale	2	1*	60
2. <u>APRM</u>			
a. Simulated Thermal Power - Upscale	3	1	61
b. Inoperative	3	1, 2	61
c. Neutron Flux - Downscale	3	1	61
d. Simulated Thermal Power - Upscale (Setdown)	3	2	61
e. Recirculation Flow - Upscale	3	1	61
f. LPRM Low Count	3	1, 2	61
3. <u>SOURCE RANGE MONITORS</u> ***			
a. Detector not full in <sup>(b)</sup>	3	2	61
	2	5	61
b. Upscale <sup>(c)</sup>	3	2	61
	2	5	61
c. Inoperative <sup>(c)</sup>	3	2	61
	2	5	61
d. Downscale <sup>(d)</sup>	3	2	61
	2	5	61
4. <u>INTERMEDIATE RANGE MONITORS</u>			
a. Detector not full in	6	2, 5	61
b. Upscale	6	2, 5	61
c. Inoperative	6	2, 5	61
d. Downscale <sup>(e)</sup>	6	2, 5	61
5. <u>SCRAM DISCHARGE VOLUME</u>			
a. Water Level-High	2	1, 2, 5**	62
6. DELETED	DELETED	DELETED	DELETED
7. <u>REACTOR MODE SWITCH SHUTDOWN POSITION</u>	2	3, 4	63

TABLE 3.3.6-1 (Continued)

CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION

ACTION STATEMENTS

- ACTION 60 - Declare the affected RBM channel inoperable and take the ACTION required by Specification 3.1.4.3.
- ACTION 61 - With the number of OPERABLE Channels:
- a. One less than required by the Minimum OPERABLE Channels per Trip Function requirement, restore the inoperable channel to OPERABLE status within 12 hours or place the inoperable channel in the tripped condition.
  - b. Two or more less than required by the Minimum OPERABLE Channels per Trip Function requirement, place at least one inoperable channel in the tripped condition within one hour.
- ACTION 62 - With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip Function requirement, place the inoperable channel in the tripped condition within 12 hours.
- ACTION 63 - With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip Function requirement, initiate a rod block.

NOTES

- \* For OPERATIONAL CONDITION of Specification 3.1.4.3.
- \*\* With more than one control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.
- \*\*\* These channels are not required when sixteen or fewer fuel assemblies, adjacent to the SRMs, are in the core.
- (a) The RBM shall be automatically bypassed when a peripheral control rod is selected or the reference APRM channel indicates less than 30% of RATED THERMAL POWER.
- (b) This function shall be automatically bypassed if detector count rate is > 100 cps or the IRM channels are on range 3 or higher.
- (c) This function is automatically bypassed when the associated IRM channels are on range 8 or higher.
- (d) This function is automatically bypassed when the IRM channels are on range 3 or higher.
- (e) This function is automatically bypassed when the IRM channels are on range 1.
- (f) DELETED

TABLE 3.3.6-2  
CONTROL ROD BLOCK INSTRUMENTATION SETPOINTS  
TRIP SETPOINT

<u>TRIP FUNCTION</u>	<u>TRIP SETPOINT</u>	<u>ALLOWABLE VALUE</u>
1. <u>ROD BLOCK MONITOR</u>		
a. <u>Upscale<sup>(a)</sup></u>		
1) Low Trip Setpoint (LTSP)	*	*
2) Intermediate Trip Setpoint (ITSP)	*	*
3) High Trip Setpoint (HTSP)	*	*
b. Inoperative	N/A	N/A
c. Downscale (DTSP)	*	*
d. <u>Power Range Setpoint<sup>(b)</sup></u>		
1) Low Power Setpoint (LPSP)	28.1% RATED THERMAL POWER	28.4% RATED THERMAL POWER
2) Intermediate Power Setpoint (IPSP)	63.1% RATED THERMAL POWER	63.4% RATED THERMAL POWER
3) High Power Setpoint (HPSP)	83.1% RATED THERMAL POWER	83.4% RATED THERMAL POWER
2. <u>APRM</u>		
a. <u>Simulated Thermal Power - Upscale:</u>		
- Two Recirculation Loop Operation	≤ 0.66 W + 55.2% and ≤ 108.0% of RATED THERMAL POWER	≤ 0.66 W + 55.7% and ≤ 108.4% of RATED THERMAL POWER
- Single Recirculation Loop Operation	≤ 0.66 W + 50.2% and ≤ 108.0% of RATED THERMAL POWER	≤ 0.66 W + 50.7% and ≤ 108.4% of RATED THERMAL POWER
b. Inoperative	N.A.	N.A.
c. Neutron Flux - Downscale	≥ 3.2% of RATED THERMAL POWER	≥ 2.8% of RATED THERMAL POWER
d. Simulated Thermal Power - Upscale (Setdown)	≤ 12.0% of RATED THERMAL POWER	≤ 13.0% of RATED THERMAL POWER
e. Recirculation Flow - Upscale	*	*
f. LPRM Low Count	< 20 per channel < 3 per axial level	< 20 per channel < 3 per axial level
3. <u>SOURCE RANGE MONITORS</u>		
a. Detector not full in	N.A.	N.A.
b. Upscale	≤ 1 x 10 <sup>5</sup> cps	≤ 1.6 x 10 <sup>5</sup> cps
c. Inoperative	N.A.	N.A.
d. Downscale	≥ 3 cps**	≥ 1.8 cps**



TABLE 3.3.6-2 (Continued)

CONTROL ROD BLOCK INSTRUMENTATION SETPOINTS

<u>TRIP FUNCTION</u>	<u>TRIP SETPOINT</u>	<u>ALLOWABLE VALUE</u>
4. <u>INTERMEDIATE RANGE MONITORS</u>		
a. Detector not full in	N.A.	N.A.
b. Upscale	≤ 108/125 divisions of full scale	≤ 110/125 divisions of full scale
c. Inoperative	N.A.	N.A.
d. Downscale	≥ 5/125 divisions of full scale	≥ 3/125 divisions of full scale
5. <u>SCRAM DISCHARGE VOLUME</u>		
a. Water Level-High		
a. Float Switch	≤ 257' 7 3/8" elevation***	≤ 257' 9 3/8" elevation
6. DELETED	DELETED	DELETED
7. <u>REACTOR MODE SWITCH SHUTDOWN POSITION</u>	N.A.	N.A.

\* Refer to the COLR for these setpoints.

\*\* May be reduced, provided the Source Range Monitor has an observed count rate and signal-to-noise ratio on or above the curve shown in Figure 3.3.6-1.

\*\*\* Equivalent to 13.56 gallons/scram discharge volume.

(a) There are three upscale trip levels. Each is applicable only over its specified operating core thermal power range. All RBM trips are automatically bypassed below the low power setpoint (LPSP). The upscale LTSP is applied between the low power setpoint (LPSP) and the intermediate power setpoint (IPSP). The upscale ITSP is applied between the intermediate power setpoint and the high power setpoint (HPSP). The HTSP is applied above the high power setpoint.

(b) Power range setpoints control enforcement of appropriate upscale trips over the proper core thermal power ranges. The power signal to the RBM is provided by the APRM.

**TABLE 4.3.6-1**  
**CONTROL ROD BLOCK INSTRUMENTATION SURVEILLANCE REQUIREMENTS**

<u>TRIP FUNCTION</u>	<u>CHANNEL CHECK</u>	<u>CHANNEL FUNCTIONAL TEST</u>	<u>CHANNEL CALIBRATION<sup>(*)</sup></u>	<u>OPERATIONAL CONDITIONS FOR WHICH SURVEILLANCE REQUIRED</u>
<b>1. <u>ROD BLOCK MONITOR</u></b>				
a. Upscale	N.A.	Q <sup>(c)</sup>	SA	1*
b. Inoperative	N.A.	Q <sup>(c)</sup>	N.A.	1*
c. Downscale	N.A.	Q <sup>(c)</sup>	SA	1*
<b>2. <u>APRM</u></b>				
a. Simulated Thermal Power - Upscale	N.A.	SA	R	1
b. Inoperative	N.A.	SA	N.A.	1, 2
c. Neutron Flux - Downscale	N.A.	SA	R	1
d. Simulated Thermal Power - Upscale (Setdown)	N.A.	SA	R	2
e. Recirculation Flow - Upscale	N.A.	SA	R	1
f. LPRM Low Count	N.A.	SA	R	1, 2
<b>3. <u>SOURCE RANGE MONITORS</u></b>				
a. Detector not full in	N.A.	M <sup>(d)(e)</sup> , W <sup>(f)</sup>	N.A.	2, 5
b. Upscale	N.A.	M <sup>(d)(e)</sup> , W <sup>(f)</sup>	R	2, 5
c. Inoperative	N.A.	M <sup>(d)(e)</sup> , W <sup>(f)</sup>	N.A.	2, 5
d. Downscale	N.A.	M <sup>(d)(e)</sup> , W <sup>(f)</sup>	R	2, 5
<b>4. <u>INTERMEDIATE RANGE MONITORS</u></b>				
a. Detector not full in	N.A.	W	N.A.	2, 5
b. Upscale	N.A.	W	R	2, 5
c. Inoperative	N.A.	W	N.A.	2, 5
d. Downscale	N.A.	W	R	2, 5
<b>5. <u>SCRAM DISCHARGE VOLUME</u></b>				
a. Water Level - High	N.A.	Q	R	1, 2, 5**
<b>6. DELETED</b>	DELETED	DELETED	DELETED	DELETED
<b>7. <u>REACTOR MODE SWITCH SHUTDOWN POSITION</u></b>	N.A.	R <sup>(g)</sup>	N.A.	3, 4

TABLE 4.3.6-1 (Continued)

CONTROL ROD BLOCK INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

- (a) Neutron detectors may be excluded from CHANNEL CALIBRATION.
- (b) Deleted.
- (c) Includes reactor manual control multiplexing system input.
- \* For OPERATIONAL CONDITION of Specification 3.1.4.3.
- \*\* With more than one control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.
- \*\*\* Deleted.
- (d) When in OPERATIONAL CONDITION 2.
- (e) The provisions of Specification 4.0.4 are not applicable provided that the surveillance is performed within 12 hours after the IRMs are on Range 2 or below during a shutdown.
- (f) When in OPERATIONAL CONDITION 5.
- (g) The provisions of Specification 4.0.4 are not applicable provided that the surveillance is performed within 1 hour after the Reactor Mode Switch has been placed in the shutdown position.

REACTOR COOLANT SYSTEM

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

2. Within 6 hours:
    - Reduce the Average Power Range Monitor (APRM) Simulated Thermal Power - Upscale Scram and Rod Block Trip Setpoints and Allowable Values, to those applicable for single recirculation loop operation per Specifications 2.2.1 and 3.3.6, or declare the associated channel(s) inoperable and take the actions required by the referenced specifications, and,
  3. The provisions of Specification 3.0.4 are not applicable.
  4. Otherwise be in at least HOT SHUTDOWN within the next 12 hours.
- b. With no reactor coolant system recirculation loops in operation, immediately initiate action to reduce THERMAL POWER such that it is not within the restricted zone of Figure 3.4.1.1-1 within 2 hours, and initiate measures to place the unit in at least STARTUP within 6 hours and in HOT SHUTDOWN within the next 6 hours.
  - c. With one or two reactor coolant system recirculation loops in operation and total core flow less than 45% but greater than 39% of rated core flow and THERMAL POWER within the restricted zone of Figure 3.4.1.1-1:
    1. Determine the APRM and LPRM\*\* noise levels (Surveillance 4.4.1.1.3):
      - a. At least once per 8 hours, and
      - b. Within 30 minutes after the completion of a THERMAL POWER increase of at least 5% of RATED THERMAL POWER.
    2. With the APRM or LPRM\*\* neutron flux noise levels greater than three times their established baseline noise levels, within 15 minutes initiate corrective action to restore the noise levels within the required limits within 2 hours by increasing core flow or by reducing THERMAL POWER.
  - d. With one or two reactor coolant system recirculation loops in operation and total core flow less than or equal to 39% and THERMAL POWER within the restricted zone of Figure 3.4.1.1-1, within 15 minutes initiate corrective action to reduce THERMAL POWER to within the unrestricted zone of Figure 3.4.1.1-1 or increase core flow to greater than 39% within 4 hours.

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\*\*Detector levels A and C of one LPRM string per core octant plus detectors A and C of one LPRM string in the center of the core should be monitored.

### 3/4.3 INSTRUMENTATION

#### BASES

##### 3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

The reactor protection system automatically initiates a reactor scram to:

- a. Preserve the integrity of the fuel cladding.
- b. Preserve the integrity of the reactor coolant system.
- c. Minimize the energy which must be adsorbed following a loss-of-coolant accident, and
- d. Prevent inadvertent criticality.

This specification provides the limiting conditions for operation necessary to preserve the ability of the system to perform its intended function even during periods when instrument channels may be out of service because of maintenance. When necessary, one channel may be made inoperable for brief intervals to conduct required surveillance.

The reactor protection system is made up of two independent trip systems. There are usually four channels to monitor each parameter with two channels in each trip system. The outputs of the channels in a trip system are combined in a logic so that either channel will trip that trip system. The tripping of both trip systems will produce a reactor scram. The APRM system is divided into four APRM channels and four 2-Out-Of-4 Voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed.

The system meets the intent of IEEE-279 for nuclear power plant protection systems. Specified surveillance intervals and surveillance and maintenance outage times have been determined in accordance with NEDC-30851P-A, "Technical Specification Improvement Analyses for BWR Reactor Protection System" and NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function." The bases for the trip settings of the RPS are discussed in the bases for Specification 2.2.1.

Actions a, b and c define the action(s) required when RPS channels are discovered to be inoperable. For those actions, separate entry condition is allowed for each inoperable RPS channel. Separate entry means that the allowable time clock(s) for Actions a, b or c start upon discovery of inoperability for that specific channel. Restoration of an inoperable RPS channel satisfies only the action statements for that particular channel. Action statement(s) for remaining inoperable channel(s) must be met according to their original entry time.

Because of the diversity of sensors available to provide trip signals and the redundancy of the RPS design, an allowable out of service time of 12 hours has been shown to be acceptable (NEDC-30851P-A and NEDC-32410P-A) to permit restoration of any inoperable channel to OPERABLE status. However, this out of service time is only acceptable provided that the associated Function's (identified as a "Functional Unit" in Table 3.3.1-1) inoperable channel is in one trip system and the Function still maintains RPS trip capability.

### 3/4.3 INSTRUMENTATION

#### BASES

##### 3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION (continued)

The requirements of Action a are intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same trip system for the same Function result in the Function not maintaining RPS trip capability. A Function is considered to be maintaining RPS trip capability when sufficient channels are OPERABLE or in trip (or the associated trip system is in trip), such that both trip systems will generate a trip signal from the given Function on a valid signal. For the typical Function with one-out-of-two taken twice logic, including the IRM Functions and APRM Function 2.e (trip capability associated with APRM Functions 2.a, 2.b, 2.c, and 2.d are discussed below), this would require both trip systems to have one channel OPERABLE or in trip (or the associated trip system in trip).

For Function 5 (Main Steam Isolation Valve--Closure), this would require both trip systems to have each channel associated with the MSIVs in three main steam lines (not necessarily the same main steam lines for both trip systems) OPERABLE or in trip (or the associated trip system in trip).

For Function 9 (Turbine Stop Valve-Closure), this would require both trip systems to have three channels, each OPERABLE or in trip (or the associated trip system in trip).

The completion time to satisfy the requirements of Action a is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

With trip capability maintained, i.e., Action a satisfied, Actions b and c as applicable must still be satisfied. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Action b requires that the channel or the associated trip system must be placed in the tripped condition. Placing the inoperable channel in trip (or the associated trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue.

As noted, placing the trip system in trip is not applicable to satisfy Action b for APRM Functions 2.a, 2.b, 2.c, or 2.d. Inoperability of one required APRM channel affects both trip systems. For that condition, the Action b requirements can only be satisfied by placing the inoperable APRM channel in trip. Restoring OPERABILITY or placing the inoperable APRM channel in trip are the only actions that will restore capability to accommodate a single APRM channel failure. Inoperability of more than one required APRM channel of the same trip function results in loss of trip capability and the requirement to satisfy Action a.

The requirements of Action c must be satisfied when, for any one or more Functions, at least one required channel is inoperable in each trip system. In this condition, provided at least one channel per trip system is OPERABLE, normally the RPS still maintains trip capability for that Function, but cannot accommodate a single failure in either trip system (see additional bases discussion above related to loss of trip capability and the requirements of Action a, and special cases for Functions 2.a, 2.b, 2.c, 2.d, 5 and 9).

3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION (continued)

The requirements of Action c limit the time the RPS scram logic, for any Function, would not accommodate single failure in both trip systems (e.g., one-out-of-one and one-out-of-one arrangement for a typical four channel Function). The reduced reliability of this logic arrangement was not evaluated in NEDC-30851P-A for the 12 hour Completion Time. Within the 6 hour allowance, the associated Function must have all required channels OPERABLE or in trip (or any combination) in one trip system.

Completing the actions required by Action c restores RPS to a reliability level equivalent to that evaluated in NEDC-30851P-A, which justified a 12 hour allowable out of service time as allowed by Action b. To satisfy the requirements of Action c, the trip system in the more degraded state should be placed in trip or, alternatively, all the inoperable channels in that trip system should be placed in trip (e.g., a trip system with two inoperable channels could be in a more degraded state than a trip system with four inoperable channels if the two inoperable channels are in the same Function while the four inoperable channels are all in different Functions). The decision of which trip system is in the more degraded state should be based on prudent judgment and take into account current plant conditions (i.e., what OPERATIONAL CONDITION the plant is in). If this action would result in a scram or RPT, it is permissible to place the other trip system or its inoperable channels in trip.

The 6 hour allowable out of service time is judged acceptable based on the remaining capability to trip, the diversity of the sensors available to provide the trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of a scram.

As noted, Action c is not applicable for APRM Functions 2.a, 2.b, 2.c, or 2.d. Inoperability of an APRM channel affects both trip systems and is not associated with a specific trip system as are the APRM 2-Out-Of-4 voter and other non-APRM channels for which Action c applies. For an inoperable APRM channel, the requirements of Action b can only be satisfied by tripping the inoperable APRM channel. Restoring OPERABILITY or placing the inoperable APRM channel in trip are the only actions that will restore capability to accommodate a single APRM channel failure.

If it is not desired to place the channel (or trip system) in trip to satisfy the requirements of Action a, Action b or Action c (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), Action d requires that the Action defined by Table 3.3.1-1 for the applicable Function be initiated immediately upon expiration of the allowable out of service time.

The Two-Out-Of-Four Logic Module includes 2-out-of-4 voter hardware and APRM Interface hardware. The voter Function 2.e is accomplished by the 2-out-of-4 voter hardware which includes redundant outputs. The analysis in NEDC-32410P-A took credit for this redundancy in the justification for the 12-hour allowable out of service time, so the voter Function 2.e must be declared inoperable if any of the 2-out-of-4 voter hardware's functionality is inoperable. The voter Function 2.e does not need to be declared inoperable due to any failure affecting only the APRM Interface hardware portion of the Two-Out-Of-Four Logic Module.

### 3/4.3 INSTRUMENTATION

#### BASES

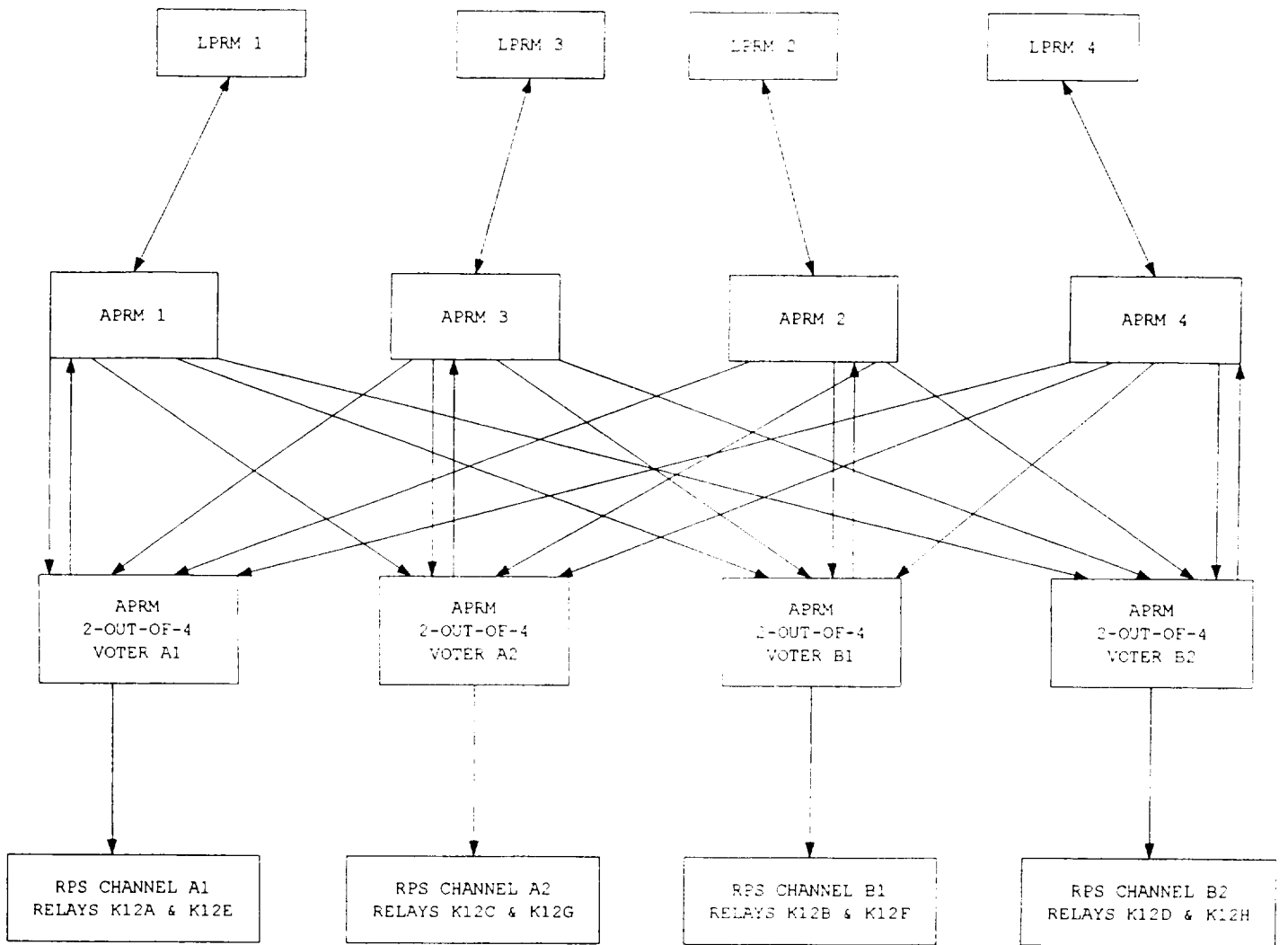
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#### 3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION (continued)

Automatic reactor trip upon receipt of a high-high radiation signal from the Main Steam Line Radiation Monitoring System was removed as the result of an analysis performed by General Electric in NEDO-31400A. The NRC approved the results of this analysis as documented in the SER (letter to George J. Beck, BWR Owner's Group from A.C. Thadani, NRC, dated May 15, 1991).

The measurement of response time at the specified frequencies provides assurance that the protective functions associated with each channel are completed within the time limit assumed in the safety analyses. No credit was taken for those channels with response times indicated as not applicable except for APRM Simulated Thermal Power - Upscale and Neutron Flux - Upscale trip functions (Table 3.3.1-2, Items 2.b and 2.c). Response time may be demonstrated by any series of sequential, overlapping or total channel test measurement, provided such tests demonstrate the total channel response time as defined. Sensor response time verification may be demonstrated by either (1) in-place, onsite or offsite test measurements, or (2) utilizing replacement sensors with certified response times. Response time testing for the sensors as noted in Table 3.3.1-2 is not required based on the analysis in NEDO-32291-A. Response time testing for the remaining channel components is required as noted. For the digital electronic portions of the APRM functions, performance characteristics that determine response time are checked by a combination of automatic self-test, calibration activities, and response time tests of the 2-Out-Of-4 Voter (Table 3.3.1-2, Item 2.e).





BASES FIGURE B 3/4.3-2

APRM CONFIGURATION