

3.1 REACTIVITY CONTROL SYSTEMS

3.1.1 SHUTDOWN MARGIN (SDM) - $T_{avg} > 200^{\circ}\text{F}$

LCO 3.1.1 SDM shall be $\geq 1.6\% \Delta k/k$.

APPLICABILITY: MODE 2 with $k_{eff} < 1.0$,
MODES 3 and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SDM not within limit.	A.1 Initiate boration to restore SDM to within limit.	15 minutes

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$.	24 hours

$$\text{SDM} - T_{\text{avg}} \leq 200^{\circ}\text{F}$$

3.1.2

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3.1.2 SHUTDOWN MARGIN (SDM) - $T_{\text{avg}} \leq 200^{\circ}\text{F}$

LCO 3.1.2 The SDM shall be $\geq 1.0\% \Delta k/k$.

APPLICABILITY: MODE 5.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SDM not within limit.	A.1 Initiate boration to restore SDM to within limit.	15 minutes

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.2.1 Verify SDM is $\geq 1.0\% \Delta k/k$.	24 hours

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3.1.3 Core Reactivity

LCO 3.1.3 The measured core reactivity shall be within $\pm 1\% \Delta k/k$ of predicted values.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Measured core reactivity not within limit.	A.1	Re-evaluate core design and safety analysis, and determine that the reactor core is acceptable for continued operation.	72 hours
	<u>AND</u>		
	A.2	Establish appropriate operating restrictions and SRs.	72 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.3.1 -----NOTE----- The predicted reactivity values may be adjusted (normalized) to correspond to the measured core reactivity prior to exceeding a fuel burnup of 60 effective full power days (EFPD) after each fuel loading. ----- Verify measured core reactivity is within $\pm 1\% \Delta k/k$ of predicted values.	Once prior to entering MODE 1 after initial fuel loading and each refueling <u>AND</u> -----NOTE----- Only required after 60 EFPD ----- 31 EFPD thereafter

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3.1.4 Moderator Temperature Coefficient (MTC)

LCO 3.1.4 The MTC shall be maintained within the limits specified in the COLR. The maximum upper limit shall be $\leq 0 \Delta k/k^{\circ}F$ at hot zero power.

APPLICABILITY: MODE 1 and MODE 2 with $k_{eff} \geq 1.0$ for the upper MTC limit, MODES 1, 2, and 3 for the lower MTC limit.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. MTC not within upper limit.	A.1 Establish administrative withdrawal limits for control banks to maintain MTC within limit.	24 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 2 with $k_{eff} < 1.0$.	6 hours
C. MTC not within lower limit.	C.1 Be in MODE 4.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.4.1	Verify MTC is within upper limit	Once prior to entering MODE 1 after initial fuel loading and each refueling
SR 3.1.4.2	Verify MTC is within 300 ppm Surveillance limit specified in the COLR.	-----NOTE----- Not required to be performed until 7 effective full power days (EFPD) after reaching the equivalent of an equilibrium RTP all rods out (ARO) boron concentration of 300 ppm ----- Once each cycle
SR 3.1.4.3	-----NOTES----- 1. If the MTC is more negative than the 300 ppm Surveillance limit (not LCO limit) specified in the COLR, SR 3.1.4.3 shall be repeated once per 14 EFPD during the remainder of the fuel cycle. 2. SR 3.1.4.3 need not be repeated if the MTC measured at the equivalent of equilibrium RTP-ARO boron concentration of ≤ 60 ppm is less negative than the 60 ppm Surveillance limit specified in the COLR. ----- Verify MTC is within lower limit.	-----NOTE----- Not required to be performed until 7 EFPD after reaching the equivalent of an equilibrium RTP-ARO boron concentration of 300 ppm ----- Once each cycle

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3.1.5 Rod Group Alignment Limits

LCO 3.1.5 All shutdown and control rods shall be OPERABLE, with all individual indicated rod positions within 12 steps of their group step counter demand position.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more rod(s) untrippable.	A.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$.	1 hour
	<u>OR</u>	
	A.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.2 Be in MODE 3.	6 hours
B. One rod not within alignment limits.	B.1 Restore rod to within alignment limits.	1 hour
	<u>OR</u>	
	B.2.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$.	1 hour
	<u>OR</u>	
	B.2.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.2.2 Reduce THERMAL POWER to $\leq 75\%$ RTP.	2 hours
	<u>AND</u>	
	B.2.3 Verify SDM is $\geq 1.6\% \Delta k/k$.	Once per 12 hours
	<u>AND</u>	
	B.2.4 Perform SR 3.2.1.1.	72 hours
	<u>AND</u>	
C. Required Action and associated Completion Time of Condition B not met.	B.2.5 Perform SR 3.2.2.1.	72 hours
	<u>AND</u>	
	B.2.6 Re-evaluate safety analyses and confirm results remain valid for duration of operation under these conditions	5 days
D. More than one rod not within alignment limit.	C.1 Be in MODE 3.	6 hours
	D.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$.	1 hour
	<u>OR</u>	
	D.1.2 Initiate boration to restore required SDM to within limit.	1 hour
	<u>AND</u>	
	D.2 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.5.1	Verify individual rod positions within alignment limit.	12 hours <u>AND</u> Once within 4 hours and every 4 hours thereafter when the rod position deviation monitor is inoperable
SR 3.1.5.2	Verify rod freedom of movement (tripability) by moving each rod not fully inserted in the core ≥ 10 steps in either direction.	92 days
SR 3.1.5.3	Verify rod drop time of each rod, from the fully withdrawn position, is ≤ 2.7 seconds from the beginning of decay of stationary gripper coil voltage to dashpot entry, with: a. $T_{avg} \geq 551^{\circ}\text{F}$; and b. All reactor coolant pumps operating.	Prior to reactor criticality after initial fuel loading and each removal of the reactor head

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3.1.6 Shutdown Bank Insertion Limits

LCO 3.1.6 Each shutdown bank shall be within insertion limits specified in the COLR.

APPLICABILITY: MODE 1,
MODE 2 with any control bank not fully inserted.

-----NOTE-----
This LCO is not applicable while performing SR 3.1.5.2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more shutdown banks not within limits.	A.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$.	1 hour
	<u>OR</u>	
	A.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.2 Restore shutdown banks to within limits.	2 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.6.1	Verify each shutdown bank is within the limits specified in the COLR	12 hours

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3.1.7 Control Bank Insertion Limits

LCO 3.1.7 Control banks shall be within the insertion, sequence, and overlap limits specified in the COLR

APPLICABILITY: MODE 1,
 MODE 2 with $k_{\text{eff}} \geq 1.0$.

-----NOTE-----
This LCO is not applicable while performing SR 3.1.5.2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Control bank insertion limits not met.	A.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$.	1 hour
	<u>OR</u>	
	A.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.2 Restore control bank(s) to within limits.	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Control bank sequence or overlap limits not met.	B.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$.	1 hour
	<u>OR</u>	
	B.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	B.2 Restore control bank sequence and overlap to within limits.	2 hours
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.7.1 Verify estimated critical control bank position is within the limits specified in the COLR.	Within 4 hours prior to achieving criticality

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.1.7.2	Verify each control bank insertion is within the limits specified in the COLR.	12 hours <u>AND</u> Once within 4 hours and every 4 hours thereafter when the rod insertion limit monitor is inoperable
SR 3.1.7.3	Verify sequence and overlap limits specified in the COLR are met for control banks not fully withdrawn from the core.	12 hours

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3.1.8 Rod Position Indication

LCO 3.1.8 The Analog Rod Position Indication (ARPI) System and the Demand Position Indication System shall be OPERABLE.

APPLICABILITY: MODES 1 and 2

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each inoperable rod position indicator per group and each demand position indicator per bank.

CONDITION	REQUIRED ACTION	COMPLETION TIME
-----NOTE----- Rod position monitoring by Required Actions A.2.1 and A.2.2 may only be applied to one inoperable ARPI and shall only be allowed: (1) until the end of the current cycle, or (2) until an entry into MODE 5 of sufficient duration, whichever occurs first, when the repair of the inoperable ARPI can safely be performed. Required Actions A.2.1, A.2.2 and A.2.3 shall not be allowed after the plant has been in MODE 5 or other plant condition, for a sufficient period of time, in which the repair of the inoperable ARPI could have safely been performed. ----- A. One ARPI per group inoperable for one or more groups.	A.1 Verify the position of the rods with inoperable position indicators by using the PDMS. <u>OR</u> A.2.1 Verify the position of the rod with the inoperable position indicator by using the PDMS. <u>AND</u>	Once per 8 hours 8 hours <u>AND</u> Once every 31 days thereafter <u>AND</u> 8 hours, if rod control system parameters indicate unintended movement (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.2 Review the parameters of the rod control system for indications of unintended rod movement for the rod with an inoperable position indicator.	16 hours <u>AND</u> Once per 8 hours thereafter
	<u>AND</u>	
	A.2.3 Verify the position of the rod with an inoperable position indicator by using the PDMS.	8 hours, if the rod with an inoperable position indicator is moved greater than 12 steps. <u>AND</u> Prior to increasing THERMAL POWER above 50% RTP and within 8 hours of reaching 100% RTP
	<u>OR</u> A.3 Reduce THERMAL POWER to less than or equal to 50% RTP.	8 hours
B. One or more rods with inoperable position indicators have been moved in excess of 24 steps in one direction since the last determination of the rod's position.	B.1 Verify the position of the rods with inoperable position indicators by using the PDMS.	4 hours
	<u>OR</u> B.2 Reduce THERMAL POWER to less than or equal to 50% RTP.	8 hours

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One demand position indicator per bank inoperable for one or more banks.	C.1.1 Verify by administrative means all ARPIs for the affected banks are OPERABLE.	Once per 8 hours
	<u>AND</u>	
	C.1.2 Verify the most withdrawn rod and the least withdrawn rod of the affected banks are less than or equal to 12 steps apart.	Once per 8 hours
	<u>OR</u>	
	C.2 Reduce THERMAL POWER to less than or equal to 50% RTP.	8 hours
D. Required Action and associated Completion Time not met	D.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.8.1 Verify each ARPI agrees within 12 steps of the group demand position for the full indicated range of rod travel.	18 months

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3.1.9 PHYSICS TESTS Exceptions - MODE 1

LCO 3.1.9 During the performance of PHYSICS TESTS, the requirements of

LCO 3.1.5, "Rod Group Alignment Limits";
LCO 3.1.6, "Shutdown Bank Insertion Limits";
LCO 3.1.7, "Control Bank Insertion Limits";
LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)"; and
LCO 3.2.4, "QUADRANT POWER TILT RATIO (QPTR)"

may be suspended, provided:

- a. THERMAL POWER is maintained $\leq 85\%$ RTP;
- b. Power Range Neutron Flux - High trip setpoints are $\leq 10\%$ RTP above the THERMAL POWER at which the test is performed, with a maximum setting of 90% RTP; and
- c. SDM is $\geq 1.6\%$ $\Delta k/k$.

APPLICABILITY: MODE 1 during PHYSICS TESTS.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SDM not within limit.	A.1 Initiate boration to restore SDM to within limit.	15 minutes
	<u>AND</u>	
	A.2 Suspend PHYSICS TESTS exceptions.	1 hour

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. THERMAL POWER not within limit.	B.1 Reduce THERMAL POWER to within limit.	1 hour
	<u>OR</u> B.2 Suspend PHYSICS TESTS exceptions	1 hour
C. Power Range Neutron Flux - High trip setpoints > 10% RTP above the PHYSICS TEST power level. <u>OR</u> Power Range Neutron Flux - High trip setpoints > 90% RTP.	C.1 Restore Power Range Neutron Flux - High trip setpoints to $\leq 10\%$ above the PHYSICS TEST power level, or to $\leq 90\%$ RTP, whichever is lower.	1 hour
	<u>OR</u> C.2 Suspend PHYSICS TESTS exceptions.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.9.1 Verify THERMAL POWER is $\leq 85\%$ RTP.	1 hour
SR 3.1.9.2 Verify Power Range Neutron Flux - High trip setpoints are $\leq 10\%$ above the PHYSICS TESTS power level, and $\leq 90\%$ RTP.	Within 8 hours prior to initiation of PHYSICS TESTS
SR 3.1.9.3 Perform SR 3.2.1.1 and SR 3.2.2.1.	12 hours
SR 3.1.9.4 Verify SDM is $\geq 1.6\%$ $\Delta k/k$.	24 hours

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3.1.10 PHYSICS TESTS Exceptions - MODE 2

- LCO 3.1.10 During the performance of PHYSICS TESTS, the requirements of
- LCO 3.1.4, "Moderator Temperature Coefficient (MTC)";
LCO 3.1.5, "Rod Group Alignment Limits";
LCO 3.1.6, "Shutdown Bank Insertion Limits";
LCO 3.1.7, "Control Bank Insertion Limits"; and
LCO 3.4.2, "RCS Minimum Temperature for Criticality"
- may be suspended, and the number of required channels for LCO 3.3.1, "RTS Instrumentation," Functions 2, 3, 6, and 16.e, may be reduced to "3" required channels provided:
- a. RCS lowest loop average temperature is $\geq 541^{\circ}\text{F}$; and
 - b. SDM is $\geq 1.6\% \Delta\text{k/k}$.

APPLICABILITY: MODE 2 during PHYSICS TESTS.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SDM not within limit.	A.1 Initiate boration to restore SDM to within limit.	15 minutes
	<u>AND</u> A.2 Suspend PHYSICS TESTS exceptions.	1 hour
B. THERMAL POWER not within limit.	B.1 Open reactor trip breakers.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. RCS lowest loop average temperature not within limit.	C.1 Restore RCS lowest loop average temperature to within limit.	15 minutes
D. Required Action and associated Completion Time of Condition C not met.	D.1 Be in MODE 3.	15 minutes

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.10.1 Perform a CHANNEL OPERATIONAL TEST on power range and intermediate range channels per SR 3.3.1.7, SR 3.3.1.8, and Table 3.3.1-1.	Prior to initiation of PHYSICS TESTS
SR 3.1.10.2 Verify the RCS lowest loop average temperature is $\geq 541^{\circ}\text{F}$.	30 minutes
SR 3.1.10.3 Verify SDM is $\geq 1.6\% \Delta k/k$.	24 hours