TSTF-155

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.1 Core Flood Tanks (CFTs)

LCO 3.5.1 Two CFTs shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with Reactor Coolant System (RCS) pressure > [750] psig.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One CFT inoperable due to boron concentration not within limits.	A.1	Restore boron concentration to within limits.	72 hours
B. One CFT inoperable for reasons other than Condition A.	B.1	Restore CFT to OPERABLE status.	1 hour
C. Required Action and associated Completion Time of Condition A or B not met.	C.1	Be in MODE 3.	6 hours
	AND		
	C.2	Reduce RCS pressure to ≤ [750] psig.	[12] hours
OR D. Two CFTs inoperable.	~~D.1~~	~~Enter LCO 3.0.3.~~	~~Immediately~~

BASES

APPLICABILITY (continued)

In MODE 3 with RCS pressure ≤ 750 psig, and in MODES 4, 5, and 6, the CFT motor operated isolation valves are closed to isolate the CFTs from the RCS. This allows RCS cooldown and depressurization without discharging the CFTs into the RCS or requiring depressurization of the CFTs.

ACTIONS

A.1

If the boron concentration of one CFT is not within limits, it must be returned to within the limits within 72 hours. In this condition, ability to maintain subcriticality may be reduced, but the effects of reduced boron concentration on core subcriticality during reflood are minor. Boiling of the ECCS water in the core during reflood concentrates the boron in the saturated liquid that remains in the core. In addition, the volume of the CFT is still available for injection. Since the boron requirements are based on the average boron concentration of the total volume of two CFTs, the consequences are less severe than they would be if the contents of a CFT were not available for injection. Thus, 72 hours is allowed to return the boron concentration to within limits.

B.1

If one CFT is inoperable for a reason other than boron concentration, the CFT must be returned to OPERABLE status within 1 hour. In this condition it cannot be assumed that the CFT will perform its required function during a LOCA. Due to the severity of the consequences should a LOCA occur in these conditions, the 1 hour Completion Time to open the valve, remove power to the valve, or restore the proper water volume or nitrogen cover pressure ensures that prompt action will be taken to return the inoperable CFT to OPERABLE status. The Completion Time minimizes the time the plant is potentially exposed to a LOCA in these conditions.

C.1 and C.2

Required Actions and

Times of Condition A or B are not met, or if both CFTs are inoperable,

If the ~~CFT cannot be returned to OPERABLE status within the associated Completion Time~~, the plant must be brought to a MODE in which the LCO does not apply. To achieve this

(continued)

BASES

ACTIONS

C.1 and C.2 (continued)

status, the plant must be brought to at least MODE 3 within 6 hours and RCS pressure reduced to ≤ 750 psig within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

move

~~C.1~~

If more than one CFT is inoperable, ~~the unit is in a condition outside the accident analysis; therefore,~~ ~~LCO 3.0.3~~ must be ~~entered~~ initiated immediately.

a shutdown

a loss of safety function has occurred;

SURVEILLANCE REQUIREMENTS

SR 3.5.1.1

Verification every 12 hours that each CFT isolation valve is fully open, as indicated in the control room, ensures that the CFTs are available for injection and ensures timely discovery if a valve should be less than fully open. If an isolation valve is not fully open, the rate of injection to the RCS would be reduced. Although a motor operated valve position should not change with power removed, a closed valve could result in accident analysis assumptions not being met. A 12 hour Frequency is considered reasonable in view of administrative controls that ensure that a mispositioned isolation valve is unlikely.

SR 3.5.1.2 and SR 3.5.1.3

Verification every 12 hours of each CFT's nitrogen cover pressure and the borated water volume is sufficient to ensure adequate injection during a LOCA. Due to the static design of the CFTs, a 12 hour Frequency usually allows the operator to identify changes before the limits are reached. Operating experience has shown that this Frequency is appropriate for early detection and correction of off normal trends.

(continued)

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3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.1 Accumulators

LCO 3.5.1 [Four] ECCS accumulators shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with pressurizer pressure > [1000] psig.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One accumulator inoperable due to boron concentration not within limits.	A.1 Restore boron concentration to within limits.	72 hours
B. One accumulator inoperable for reasons other than Condition A.	B.1 Restore accumulator to OPERABLE status.	1 hour
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3. AND C.2 Reduce pressurizer pressure to ≤ [1000] psig.	6 hours 12 hours
D. Two or more accumulators inoperable.	D.1 ~~Enter LCO 3.0.3.~~	~~Immediately~~

ACTIONS

A.1 (continued)

reduced. The boron in the accumulators contributes to the assumption that the combined ECCS water in the partially recovered core during the early reflooding phase of a large break LOCA is sufficient to keep that portion of the core subcritical. One accumulator below the minimum boron concentration limit, however, will have no effect on available ECCS water and an insignificant effect on core subcriticality during reflood. Boiling of ECCS water in the core during reflood concentrates boron in the saturated liquid that remains in the core. In addition, current analysis techniques demonstrate that the accumulators do not discharge following a large main steam line break for the majority of plants. Even if they do discharge, their impact is minor and not a design limiting event. Thus, 72 hours is allowed to return the boron concentration to within limits.

B.1

If one accumulator is inoperable for a reason other than boron concentration, the accumulator must be returned to OPERABLE status within 1 hour. In this Condition, the required contents of three accumulators cannot be assumed to reach the core during a LOCA. Due to the severity of the consequences should a LOCA occur in these conditions, the 1 hour Completion Time to open the valve, remove power to the valve, or restore the proper water volume or nitrogen cover pressure ensures that prompt action will be taken to return the inoperable accumulator to OPERABLE status. The Completion Time minimizes the potential for exposure of the plant to a LOCA under these conditions.

C.1 and C.2 Required Actions and

If the ~~accumulator cannot be returned to OPERABLE status within the~~ associated Completion ~~Time~~, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 6 hours and pressurizer pressure reduced to

Times of Condition A or B are not met, or if more than one accumulators are inoperable,

(continued)

ACTIONS

C.1 and C.2 (continued)

≤ 1000 psig within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

D.1

If more than one accumulator is inoperable, the plant is in a condition outside the accident analyses; therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.5.1.1

Each accumulator valve should be verified to be fully open every 12 hours. This verification ensures that the accumulators are available for injection and ensures timely discovery if a valve should be less than fully open. If an isolation valve is not fully open, the rate of injection to the RCS would be reduced. Although a motor operated valve position should not change with power removed, a closed valve could result in not meeting accident analyses assumptions. This Frequency is considered reasonable in view of other administrative controls that ensure a mispositioned isolation valve is unlikely.

If more than one accumulator is inoperable, then a loss of safety function has occurred; therefore, a shutdown must be initiated.

SR 3.5.1.2 and SR 3.5.1.3

Every 12 hours, borated water volume and nitrogen cover pressure are verified for each accumulator. This Frequency is sufficient to ensure adequate injection during a LOCA. Because of the static design of the accumulator, a 12 hour Frequency usually allows the operator to identify changes before limits are reached. Operating experience has shown this Frequency to be appropriate for early detection and correction of off normal trends.

(continued)

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3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.1 Safety Injection Tanks (SITs)

LCO 3.5.1 [Four] SITs shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with pressurizer pressure ≥ [700] psia.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One SIT inoperable due to boron concentration not within limits.	A.1	Restore boron concentration to within limits.	72 hours
B. One SIT inoperable for reasons other than Condition A.	B.1	Restore SIT to OPERABLE status.	1 hour
C. Required Action and associated Completion Time of Condition A or B not met. OR	C.1 AND	Be in MODE 3.	6 hours
	C.2	Reduce pressurizer pressure to < [700] psia.	12 hours
D. Two or more SITs inoperable.	D.1	Enter LCO 3.0.3.	Immediately

ACTIONS

A.1 (continued)

injection. Thus, 72 hours is allowed to return the boron concentration to within limits.

B.1

If one SIT is inoperable, for a reason other than boron concentration, the SIT must be returned to OPERABLE status within 1 hour. In this Condition, the required contents of three SITs cannot be assumed to reach the core during a LOCA. Due to the severity of the consequences should a LOCA occur in these conditions, the 1 hour Completion Time to open the valve, remove power to the valve, or restore the proper water volume or nitrogen cover pressure ensures that prompt action will be taken to return the inoperable accumulator to OPERABLE status. The Completion Time minimizes the exposure of the plant to a LOCA in these conditions.

C.1 and C.2

Required Actions and

Times of Condition A or B are not met, or if more than on SIT is inoperable

If the ~~SIT cannot be restored to OPERABLE status within the~~ associated Completion ~~Time~~, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and pressurizer pressure reduced to < 700 psia within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

~~D.1~~

~~If more than one SIT is inoperable, the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.~~

If more than one SIT is inoperable, a loss of safety function has occurred; therefore, a shutdown must be initiated immediately.

(continued)

Industry/TSTF Standard Technical Specification Change Traveler

LCO 3.1.9.c removal of extraneous detail

Classification: Correct Specifications

NUREGs Affected: ☑ 1430 ☐ 1431 ☐ 1432 ☐ 1433 ☐ 1434

Description:

Modify LCO 3.1.9.c to remove the words "source range and intermediate range"

Justification:

LCO 3.1.9.c, as written, would require the high startup rate control rod withdrawal inhibits associated with the source range to be operable during conditions where the neutron power is above the upper indication range of the instrument. When the source range indication is above the upper indication range, the source range can not be demonstrated operable and the rod withdrawal inhibit is also bypassed. This change results in a requirement that nuclear instrumentation high startup rate rod withdrawal inhibit capability exists. The Bases have been revised to clarify that this can be satisfied by the intermediate range or source range depending on the neutron power in relation to the upper ranges of the intermediate range and startup range nuclear instrumentation.

Affected Technical Specifications

LCO 3.1.9	Physics Tests Exceptions - Mode 2
LCO 3.1.9 Bases	Physics Tests Exceptions - Mode 2
Action 3.1.9.C Bases	Physics Tests Exceptions - Mode 2

BWOG Review Information

BWOG-26

Originating Plant: ANO-1 Date Provided to OG: Needed By: 15-Feb-97

Owners Group History:

Designated ANO-1-04

Owners Group Resolution: Approved Date: 17-Sep-96

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OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF History:

CEOG - Not applicable, accepts
WOG - Not applicable, accepts
BWROG - Not applicable

TSTF Resolution: Approved Date: 07-Jan-97 **TSTF- 156**

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TSTF-156

3.1 REACTIVITY CONTROL SYSTEMS

3.1.9 PHYSICS TESTS Exceptions—MODE 2

LCO 3.1.9 During performance of PHYSICS TESTS, the requirements of

LCO 3.1.3, "Moderator Temperature Coefficient (MTC)";
LCO 3.1.4, "CONTROL ROD Group Alignment Limits";
LCO 3.1.5, "Safety Rod Insertion Limits";
LCO 3.1.6, "AXIAL POWER SHAPING ROD (APSR) Alignment Limits";
LCO 3.2.1, "Regulating Rod Insertion Limits," for the restricted operation region only; and
[LCO 3.4.2, "RCS Minimum Temperature for Criticality"]

may be suspended, provided:

a. THERMAL POWER is ≤ 5% RTP;

b. Reactor trip setpoints on the OPERABLE nuclear overpower channels are set to ≤ 25% RTP;

c. Nuclear instrumentation source range and intermediate range high startup rate CONTROL ROD withdrawal inhibit are OPERABLE; and

d. SDM is ≥ [1.0]% Δk/k.

APPLICABILITY: MODE 2 during PHYSICS TESTS.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. THERMAL POWER not within limit.	A.1 Open control rod drive trip breakers.	Immediately

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

temperature to decrease to 520°F during MODE 2 PHYSICS TESTS, based on the low probability of an accident occurring and on prior operating experience.

PHYSICS TESTS include measurement of core nuclear parameters or exercise of control components that affect process variables.

PHYSICS TESTS satisfy Criteria 1, 2, and 3 of the NRC Policy Statement.

LCO

This LCO permits individual CONTROL RODS to be positioned outside of their specified group alignment and withdrawal limits and to be assigned to other than specified CONTROL ROD groups during the performance of PHYSICS TESTS. In addition, this LCO permits verification of the fundamental core characteristics.

This LCO also allows suspension of LCO 3.1.3, LCO 3.1.4, LCO 3.1.5, LCO 3.1.6, LCO 3.2.1, and LCO 3.4.2, provided:

a. THERMAL POWER is ≤ 5% RTP;

b. Nuclear overpower trip setpoints on the OPERABLE nuclear power range channels are set to ≤ 25% RTP;

c. Nuclear instrumentation ~~source range and intermediate range~~ high startup rate CONTROL ROD withdrawal inhibit are OPERABLE; and

d. SDM is maintained ≥ [1.0]% $\Delta k/k$.

The limits of LCO 3.2.3 and LCO 3.2.4 do not apply in MODE 2. Inhibiting CONTROL ROD withdrawal, based on startup rate, also limits local linear heat rate (LHR), departure from nucleate boiling ratio (DNBR), and peak RCS pressure during accidents initiated from low power.

APPLICABILITY

This LCO is applicable in MODE 2 when the reactor is either not critical or when THERMAL POWER is ≤ 5% RTP. This LCO is applicable for initial criticality or low power testing, as defined by Regulatory Guide 1.68 (Ref. 3). In MODE 1,

(continued)

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BASES

ACTIONS

C.1 (continued)

Time is consistent with, or more conservative than, those specified for the individual LCOs addressed by PHYSICS TESTS exceptions.

If the nuclear instrumentation ~~source and intermediate range~~ high startup rate CONTROL ROD withdrawal inhibit functions are inoperable, then 1 hour is allowed for the operator to restore the functions to OPERABLE status or to complete an orderly suspension of PHYSICS TESTS exceptions. Suspension of PHYSICS TESTS exceptions requires restoration of each of the applicable individual LCOs to within specification. This required Completion Time is consistent with, or more conservative than, those specified for the individual LCOs addressed by PHYS..S TESTS exceptions.

<INSERT B 3.1-56A> →

SURVEILLANCE REQUIREMENTS

SR 3.1.9.1

Performing a CHANNEL FUNCTIONAL TEST on each nuclear instrumentation source and intermediate range high startup rate CONTROL ROD withdrawal inhibit and nuclear overpower channel, ensures that the instrumentation required to detect a deviation from THERMAL POWER or to detect a high startup rate is OPERABLE. Performing the test once within 24 hours, prior to initiating PHYSICS TESTS, ensures that the instrumentation is OPERABLE shortly before PHYSICS TESTS begin and allows the operator to correct any instrumentation problems.

SR 3.1.9.2

Verification that THERMAL POWER is $\leq$ 5% RTP ensures that an adequate margin is maintained between the THERMAL POWER level and the nuclear overpower trip setpoint. Hourly verification is adequate for the operator to determine any change in core conditions, such as xenon redistribution occurring after a THERMAL POWER reduction, that could cause THERMAL POWER to exceed the specified limit.

(continued)

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<<Insert B 3.1-56A>>

The nuclear instrumentation high startup rate CONTROL ROD withdrawal inhibit function is not required when the reactor power level is above the operating range of the instrumentation channel. For example, if the reactor power level is above the source range channel operating range, then only the intermediate range high startup rate CONTROL ROD withdrawal inhibit is required to be functional.

Industry/TSTF Standard Technical Specification Change Traveler

Omit duplicate EFW alignment SR

Classification: Improve Specifications

NUREGs Affected: ☑ 1430 ☐ 1431 ☑ 1432 ☐ 1433 ☐ 1434

Description:

EFW SR 3.7.5.5 unnecessarily duplicates SR 3.7.5.1 and the controls for "locked valves" and is deleted.

Justification:

NUREG 1430, SR 3.7.5.5 is redundant to SR 3.7.5.1 and is deleted. Both SRs require verification of the water flow paths of the EFW System. However, there are two identified differences: a) SR 3.7.5.1 does not apply to valves that are locked, sealed, or otherwise secured in position; and b) SR 3.7.5.5 is not required until "prior to entering MODE 2 whenever the plant has been in MODE 5 or 6 for > 30 days." Pursuant to SR 3.0.4, SR 3.7.5.1 is required to be met prior to entering the applicable MODES which include MODES 1,2,3, and MODE 4 when the steam generator is relied upon for heat removal. If the unit has been in MODE 5 or 6 for > 30 days, then except for the valves that are locked, sealed, or otherwise secured in position, the valves in the flow path must be verified by SR 3.7.5.1 to be in their correct position, and SR 3.7.5.5 is redundant. Further, the Bases for SR 3.7.5.1 indicate that it does not apply to valves that are locked, sealed, or otherwise secured in position since they are verified to be in their correct position prior to locking, sealing, and securing them in position. These same controls are in place and are considered adequate during operation of the plant, and are, therefore, also adequate to ensure that these valves are in their correct position prior to startup.

Affected Technical Specifications

SR 3.7.5.5	EFW System		NUREG(s)- 1430 Only
	Change Description:	Deleted	
SR 3.7.5.5 Bases	EFW System		NUREG(s)- 1430 Only
	Change Description:	Deleted	
SR 3.7.5.6	EFW System		NUREG(s)- 1430 Only
	Change Description:	Renumbered SR 3.7.5.5	
SR 3.7.5.6 Bases	EFW System		NUREG(s)- 1430 Only
	Change Description:	Renumbered SR 3.7.5.5	
SR 3.7.5.7	EFW System		NUREG(s)- 1430 Only
	Change Description:	Renumbered SR 3.7.5.6	
SR 3.7.5.7 Bases	EFW System		NUREG(s)- 1430 Only
	Change Description:	Renumbered SR 3.7.5.6	
SR 3.7.5.5	AFW System		NUREG(s)- 1432 Only
	Change Description:	Deleted	
SR 3.7.5.5 Bases	AFW System		NUREG(s)- 1432 Only
	Change Description:	Deleted	

BWOC Review Information

BWOG-28

Originating Plant: ANO-1 Date Provided to OG: 01-Oct-96 Needed By: 15-Feb-97

Owners Group History:

Designated ANO-1-07

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TSTF History:

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WOG - Not applicable, accepts.
BWROG - Not applicable.

TSTF Resolution: Approved Date: 07-Jan-97 **TSTF- 157**

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NRC Received Date: NRC Reviewer: Reviewer Phone #:

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File to TSTF Date:

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.5.4	----------NOTES---------- 1. Not required to be performed until [24] hours after reaching [800] psig in the steam generators. 2. Not applicable in MODE 4. ----------	
	Verify each EFW pump starts automatically on an actual or simulated actuation signal.	[18] months
SR 3.7.5.5	Verify proper alignment of the required EFW flow paths by verifying [valve alignment/flow] from the condensate storage tank to each steam generator.	Prior to entering MODE 2 whenever plant has been in MODE 5 or 6 for > 30 days
[SR 3.7.5.(5)]	Perform a CHANNEL FUNCTIONAL TEST for the EFW pump suction pressure interlocks.	31 days [
[SR 3.7.5.(6)]	Perform a CHANNEL CALIBRATION for the EFW pump suction pressure interlocks.	[18] months]

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.5.5

This SR ensures that the EFW System is properly aligned by verifying the flow paths to each steam generator prior to entering MODE 2 after more than 30 days in MODE 5 or 6. OPERABILITY of EFW flow paths must be demonstrated before sufficient core heat is generated that would require the operation of the EFW System during a subsequent shutdown. The Frequency is reasonable, based on engineering judgment, in view of other administrative controls to ensure that the flow paths are OPERABLE. To further ensure EFW System alignment, flow path OPERABILITY is verified, following extended outages to determine no misalignment of valves has occurred. This SR ensures that the flow path from the CST to the steam generator is properly aligned. (This SR is not required by those units that use EFW for normal startup and shutdown.)

SR 3.7.5.6 and SR 3.7.5.7

For this facility, the CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION for the EFW pump suction pressure interlocks are as follows:

REFERENCES

1. FSAR, Section [9.2.7].
2. FSAR, Section [9.2.8].
3. ASME, Boiler and Pressure Vessel Code, Section XI.

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.7.5.4	----------NOTES---------- 1. Not required to be performed for the turbine driven AFW pump until [24] hours after reaching [800] psig in the steam generators. 2. Not applicable in MODE 4 when steam generator is relied upon for heat removal. ---------- Verify each AFW pump starts automatically on an actual or simulated actuation signal when in MODE 1, 2, or 3.	[18] months
SR 3.7.5.5	Verify the proper alignment of the required AFW flow paths by verifying flow from the condensate storage tank to each steam generator.	Prior to entering MODE 2 whenever unit has been in MODE 5 or 6 for > 30 days

SURVEILLANCE REQUIREMENTS

SR 3.7.5.4 (continued)

potential for an unplanned transient if the Surveillance were performed with the reactor at power. The 18 month Frequency is acceptable, based on the design reliability and operating experience of the equipment.

This SR is modified by [a] [two] Note[s]. [Note 1 indicates that the SR be deferred until suitable test conditions are established. This deferral is required because there is insufficient steam pressure to perform the test.] [The] Note [2] states that the SR is not required in MODE 4. [In MODE 4, the required pump is already operating and the autostart function is not required.] [In MODE 4, the heat removal requirements would be less providing more time for operator action to manually start the required AFW pump.]

[Reviewer's Note: Some plants may not routinely use the AFW for heat removal in MODE 4. The second justification is provided for plants that use a startup feedwater pump rather than AFW for startup and shutdown.]

SR 3.7.5.5

This SR ensures that the AFW System is properly aligned by verifying the flow path to each steam generator prior to entering MODE 2 operation, after 30 days in MODE 5 or 6. OPERABILITY of AFW flow paths must be verified before sufficient core heat is generated that would require the operation of the AFW System during a subsequent shutdown. The Frequency is reasonable, based on engineering judgment, and other administrative controls to ensure that flow paths remain OPERABLE. To further ensure AFW System alignment, the OPERABILITY of the flow paths is verified following extended outages to determine that no misalignment of valves has occurred. This SR ensures that the flow path from the CST to the steam generators is properly aligned by requiring a verification of minimum flow capacity of 750 gpm at 1270 psi. (This SR is not required by those units that use AFW for normal startup and shutdown.)

(continued)

Industry/TSTF Standard Technical Specification Change Traveler

3.1.5 Safety Rod Insertion Limits, Required Action A.1 Deletion

Classification: Correct Specifications

NUREGs Affected: ☑ 1430 ☐ 1431 ☐ 1432 ☐ 1433 ☐ 1434

Description:

Delete Required Action A.1 and associated Completion Time from Specification 3.1.5 Actions.

Justification:

NUREG 1430, Specification 3.1.5 Required Action and Completion Time A.1 are deleted and subsequent Required Actions are renumbered. This deletion is made because this Required Action is not necessary. Taking action to reestablish compliance with the LCO is always an option and need not be specified separately. Removal of this Required Action eliminates the potentially confusing specification of an action which is always an option in every Specification. This change neither adds any new requirements nor does it remove any requirements from this specification.

Affected Technical Specifications

Action 3.1.5.A	Safety Rod Insertion Limits
Action 3.1.5.A Bases	Safety Rod Insertion Limits

BWOG Review Information

BWOG-29

Originating Plant: ANO-1 Date Provided to OG: 01-Oct-96 Needed By: 15-Feb-97

Owners Group History:

Designated ANO-1-08

Owners Group Resolution: Approved Date: 17-Sep-96

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OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF History:

CEOG - Not applicable, accepts
WOG - Not applicable, accepts
BWROG - Not applicable, accepts

TSTF Resolution: Approved Date: 07-Jan-97 **TSTF- 158**

NRC Review Information

NRC Received Date: NRC Reviewer: Reviewer Phone #:

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T3TF-158

3.1 REACTIVITY CONTROL SYSTEMS

3.1.5 Safety Rod Insertion Limits

LCO 3.1.5 Each safety rod shall be fully withdrawn.

APPLICABILITY: MODES 1 and 2.

----------NOTE----------
This LCO is not applicable while performing SR 3.1.4.2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One safety rod not fully withdrawn.	A.1 Withdraw the rod fully.	1 hour
	OR	
	A.1.1 Verify SDM is ≥ 1% Δk/k.	1 hour
	OR	
	A.1.2 Initiate boration to restore SDM to within limit.	1 hour
	AND	
	A.2 Declare the rod inoperable.	1 hour

(continued)

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BASES (continued)

LCO

The safety groups must be fully withdrawn any time the reactor is critical or approaching criticality. This ensures that a sufficient amount of negative reactivity is available to shut down the reactor and maintain the required SDM following a reactor trip.

APPLICABILITY

The safety groups must be within their insertion limits with the reactor in MODES 1 and 2. This ensures that a sufficient amount of negative reactivity is available to shut down the reactor and maintain the required SDM following a reactor trip. Refer to LCO 3.1.1 for SDM requirements in MODES 3, 4, and 5. LCO 3.9.1, "Boron Concentration," ensures adequate SDM in MODE 6.

This LCO has been modified by a Note indicating the LCO requirement is suspended during SR 3.1.4.2. This SR verifies the freedom of the rods to move, and requires the safety group to move below the LCO limits, which would normally violate the LCO.

ACTIONS

A.1.1, A.1.2 and A.2.3

~~A.1, A.2.1.1 / A.2.1.2, and A.2.2~~

When one safety rod is not fully withdrawn, 1 hour is allowed to fully withdraw the rod. This is necessary because the available SDM may be reduced with one of the safety rods not within insertion limits.

safety — must — a — the

~~Alternatively,~~ The rod ~~may~~ be declared inoperable within ~~the same~~ 1 hour time frame. This requires entry into LCO 3.1.4, "CONTROL ROD Group Alignment Limits." In addition, since the rod may be inserted farther than the group average insertion for a long time, SDM must be evaluated. Ensuring the SDM meets the minimum requirement within 1 hour is adequate to determine that further degradation of the SDM is not occurring.

safety

Restoration of the required SDM requires increasing the boron concentration, since the ~~CONTROL ROD~~ may remain misaligned and not be providing its normal negative reactivity on tripping. RCS boration must occur as described in Bases Section 3.1.1. The required Completion Time of 1 hour for initiating boration is reasonable, based

safety rod

(continued)

BASES

ACTIONS

A.1.1, A.1.2 and A.2.2
~~A.1, A.2.1.1, A.2.1.2, and A.2.2~~ (continued)

on the time required for potential xenon redistribution, the low probability of an accident occurring, and the steps required to complete the action. This allows the operator sufficient time for aligning the required valves and starting the boric acid pumps. Boration will continue until the required SDM is restored.

The allowed Completion Time of 1 hour provides an acceptable time for evaluating and repairing minor problems without allowing the plant to remain in an unacceptable condition for an extended period of time.

B.1.1 and B.1.2

When more than one safety rod is inoperable, there is a possibility that the required SDM may be adversely affected. Under these conditions, it is important to determine the SDM, and if it is less than the required value, initiate boration until the required SDM is recovered. The Completion Time of 1 hour is adequate for determining SDM and, if necessary, for initiating emergency boration to restore SDM.

In this situation, SDM verification must include the worth of the untrippable rod as well as the rod of maximum worth.

B.2

If more than one safety rod is inoperable the unit must be brought to a MODE where the LCO is not applicable. The allowed Completion Time of 6 hours is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.5.1

Verification that each safety rod is fully withdrawn ensures the rods are available to provide reactor shutdown capability.

(continued)

Industry/TSTF Standard Technical Specification Change Traveler

LCO 3.1.6 Applicability Modification

Classification: Correct Specifications

NUREGs Affected: ☑ 1430 ☐ 1431 ☐ 1432 ☐ 1433 ☐ 1434

Description:

Modify Applicability of LCO 3.1.6 to specify Modes 1 and 2. Remove additional specified condition wording of "when the APSRs are not fully withdrawn."

Justification:

Modify Applicability of LCO 3.1.6 to specify MODES 1 and 2. The additional specified condition of "when the APSRs are not fully withdrawn" is inconsistent with the requirements of the LCO. After APSR withdrawal near the end of the operating cycle, the APSRs must still be aligned to within 6.5% of its group average height. Further, after APSR withdrawal, SR 3.1.6.1 is not required to be performed even though it verifies that the individual APSRs are within their alignment limits. Changing the ITS LCO 3.1.6 Applicability to Modes 1 and 2 establishes an Applicability consistent with other control rod related LCOs.

Affected Technical Specifications

Appl. 3.1.6 APSR Alignment Limits

Appl. 3.1.6 Bases APSR Alignment Limits

BWOG Review Information

BWOG-30

Originating Plant: ANO-1 Date Provided to OG: 01-Oct-96 Needed By: 15-Feb-97

Owners Group History:

Designated ANO-1-09

Owners Group Resolution: Approved Date: 17-Sep-96

TSTF Review Information

TSTF Received Date: 01-Nov-96 Date Distributed to OGs for Review: 05-Dec-96

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF History:

CEOG - Not applicable, accepts
WOG - Not applicable, accepts
BWROG - Not applicable, accepts

TSTF Resolution: Approved Date: 07-Jan-97 **TSTF- 159**

NRC Review Information

NRC Received Date: NRC Reviewer: Reviewer Phone #:

Reviewer Comments:

Final Resolution: NRC Reviewing Final Resolution Date:

Revision History

Incorporation Into the NUREGs

File to BBS/LAN Date:

File to TSTF Date:

File Rev Incoporated:

File Rev Incorporated Date

TSTF-159

3.1 REACTIVITY CONTROL SYSTEMS

3.1.6 AXIAL POWER SHAPING ROD (APSR) Alignment Limits

LCO 3.1.6 Each APSR shall be OPERABLE and aligned within [6.5]% of its group average height.

APPLICABILITY: MODES 1 and 2 ~~when the APSRs are not fully withdrawn.~~

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One APSR inoperable, not aligned within its limits, or both.	A.1	Align the APSR group to within [6.5]% of the inoperable or misaligned rod, while maintaining the APSR insertion limits in the COLR.	2 hours
	AND		
	A.2	Prevent movement of the APSR group, while the rod remains inoperable or misaligned.	2 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours

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BASES

LCO (continued)

value is established based on the distance between reed switches, with additional allowances for uncertainty in the absolute position indicator amplifiers, group maximum or minimum synthesizer, and asymmetric alarm or fault detector outputs. The position of an inoperable rod is not included in the calculation of the rod group's average position.

Failure to meet the requirements of this LCO may produce unacceptable power peaking factors, and LHRs, which may constitute initial conditions inconsistent with the safety analysis.

APPLICABILITY

The requirements on APSR OPERABILITY and alignment are applicable in MODES 1 and 2 when the APSRs are not fully withdrawn because these are the only MODES in which neutron (or fission) power is generated, and the OPERABILITY and alignment of rods have the potential to affect the safety of the plant. OPERABILITY and alignment of the APSRs are not required when they are fully withdrawn because they do not influence core power peaking. In MODES 3, 4, 5, and 6, the alignment limits do not apply because the reactor is shut down and not producing fission power, and excessive local LHRs cannot occur from APSR misalignment.

ACTIONS

The ACTIONS described below are required if one APSR is inoperable. The plant is not allowed to operate with more than one inoperable APSR. This would require the reactor to be shut down, in accordance with LCO 3.0.3.

A.1 and A.2

An alternate to realigning a single misaligned APSR to the group average position is to align the remainder of the APSR group to the position of the misaligned or inoperable APSR, while maintaining APSR insertion, in accordance with the limits in the COLR. This restores the alignment requirements. Deviations up to 2 hours will not cause significant xenon redistribution to occur. Required Action A.1 assumes the APSR group movement does not cause the limits of LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," to be exceeded. For this reason,

(continued)

TSB FORM 1 (11-95)	U.S. NUCLEAR REGULATORY COMMISSION	PACKAGE NO.	DATE
TRAVELLER FOR STS Rev 2 CHANGES		TSTF-160	02/12/97

NUREGs	Specs/LCOs/Bases	Filenames
-1430 (BWOG)	3.1.4, 3.1.8, 3.2.1, 3.2.2, 3.2.5, B 3.1.4, B 3.1.8, B 3.2.1, B 3.2.2, B 3.2.5	BS3104__.L01, BS3108__.L01, BS3201__.L01, BS3202__.L01, BS3205__.L01, BS3104__.BA1, BS3108__.BA1, BS3201__.BA1, BS3202__.BA1, BS3205__.BA1
-1431 (WOG)		
-1432 (CEOG)		
-1433 (BWR/4)		
-1434 (BWR/6)		
Entered Database	Date: 2/12/97	Filename: g:\forms\changes.mdb

STS CHANGE REVIEW

Date Assigned: 2/12/97	Tech Branch: (if review requested)
TSB Reviewer: R. Tjader	Tech Reviewer:
Recommendation DATE:	Recommendation DATE:
[ ] APPROVE [ ] MODIFIY [ ] REJECT	[ ] APPROVE [ ] MODIFIY [ ] REJECT
Comments:	Comments:

STS CHANGE DISPOSITION

TSB ACTION DATE:	TSTF ACTION (if applicable) DATE:
[ ] APPROVED [ ] MODIFIED [ ] REJECTED	[ ] WITHDRAWN [ ] REVISED [ ] APPEALED
Comments:	Comments:

STS FILE AND RECORD DATA CHANGES

ACTION	BY	DATE	ACTION	BY	DATE
WP Files Updated			Changes Certified		
Changes Proofed			Access Database Updated		
Returned for Corrections			Comment Resolution Database Updated		
Control Books Updated			Memo w/h.c. Sent to TSTF/NRC		
BBS Files Updated			Package Filed		

Industry/TSTF Standard Technical Specification Change Traveler

LCO 3.2.5, "Power Peaking Factors" Applicability Change to MODE 1 with THERMAL POWER . 20% RTP.

Classification: Correct Specifications

NUREGs Affected: ☑ 1430 ☐ 1431 ☐ 1432 ☐ 1433 ☐ 1434

Description:

Change LCO 3.2.5 Applicability to MODE 1 with THERMAL POWER > 20% RTP. Add Notes to LCO 3.1.4 Required Action A.2.5, LCO 3.1.8.c, LCO 3.1.8 Condition B, SR 3.1.8.2, LCO 3.2.1 Required Action A.1, and LCO 3.2.2 Required Action A.1 to state that these requirements are not applicable when thermal power is < = 20% RTP. The associated Bases have also been revised to discuss the Notes and Applicability changes. The requirements as written are not technically accurate and do not reflect the design of a B&W plant.

Justification:

The power peaking factors referred to in Sections 3.1 and 3.2 are calculated from data received from the incore detector system. However, it is not possible to obtain meaningful power distribution data from the incore detector system at thermal power levels much below 20% RTP. Therefore, at very low power levels the calculation of power peaking factors may be erroneous. All requirements associated with the power peaking factors (LCOs, SRs, Conditions, and Required Actions) have been modified by a Note stating that these requirements are only required when > 20% RTP. This results in requirements that are consistent with the instrumentation capability available to satisfy the LCO.

Affected Technical Specifications

Action 3.1.4.A	Control Rod Group Alignment Limits
Action 3.1.4.A Bases	Control Rod Group Alignment Limits
S/A 3.1.8 Bases	Physics Tests Exceptions - Mode 1
LCO 3.1.8	Physics Tests Exceptions - Mode 1
LCO 3.1.8 Bases	Physics Tests Exceptions - Mode 1
Action 3.1.8.B	Physics Tests Exceptions - Mode 1
Action 3.1.8.B Bases	Physics Tests Exceptions - Mode 1
SR 3.1.8.2	Physics Tests Exceptions - Mode 1
SR 3.1.8.2 Bases	Physics Tests Exceptions - Mode 1
Action 3.2.1.A	Regulating Rod Insertion Limits
Action 3.2.1.A Bases	Regulating Rod Insertion Limits
Action 3.2.2.A	APSR Insertion Limits
Action 3.2.2.A Bases	APSR Insertion Limits
Bkgnd 3.2.5 Bases	Power Peaking Factors
S/A 3.2.5 Bases	Power Peaking Factors
Appl. 3.2.5	Power Peaking Factors

Appl. 3.2.5 Bases	Power Peaking Factors
Action 3.2.5.C	Power Peaking Factors
Action 3.2.5.C Bases	Power Peaking Factors

BWOG Review Information

BWOG-32

Originating Plant: ANO-1 Date Provided to OG: 01-Oct-96 Needed By: 15-Feb-97

Owners Group History:

Designated ANO-1-13

Owners Group Resolution: Approved Date: 17-Sep-96

TSTF Review Information

TSTF Received Date: 01-Nov-96 Date Distributed to OGs for Review: 05-Dec-96

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF History:

CEOG - Not applicable, accepts. Similar allowances already in NUREG-1432.
WOG - Not applicable, accepts
BWROG - Not applicable, accepts

TSTF Resolution: Approved Date: 07-Jan-97 **TSTF- 160**

NRC Review Information

NRC Received Date: NRC Reviewer: Reviewer Phone #:

Reviewer Comments:

Final Resolution: NRC Reviewing Final Resolution Date:

Revision History

Incorporation Into the NUREGs

File to BBS/LAN Date:

File to TSTF Date:

File Rev Incoporated:

File Rev Incorporated Date

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.2 Reduce THERMAL POWER to ≤ 60% of the ALLOWABLE THERMAL POWER. AND	2 hours
	A.2.3 Reduce the nuclear overpower trip setpoint to ≤ 70% of the ALLOWABLE THERMAL POWER. AND	10 hours
	A.2.4 Verify the potential ejected rod worth is within the assumptions of the rod ejection analysis. AND	72 hours
<INSERT 3.1-7A>	A.2.5 Perform SR 3.2.5.1.	72 hours
B. Required Action and associated Completion Time for Condition A not met.	B.1 Be in MODE 3.	6 hours
C. More than one trippable CONTROL ROD inoperable, or not aligned within [6.5]% of its group average height, or both.	C.1.1 Verify SDM is ≥ [1]% Δk/k. OR	1 hour

(continued)

<Insert 3.1-7A>

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A.2.5 ----------NOTE----------
Only required when THERMAL POWER is > 20% RTP.

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3.1 REACTIVITY CONTROL SYSTEMS

3.1.8 PHYSICS TESTS Exceptions—MODE 1

LCO 3.1.8 During the performance of PHYSICS TESTS, the requirements of

LCO 3.1.4, "CONTROL ROD Alignment Limits";
LCO 3.1.5, "Safety Rod Insertion Limits";
LCO 3.1.6, "AXIAL POWER SHAPING ROD (APSR) Alignment Limits";
LCO 3.2.1, "Regulating Rod Insertion Limits," for the restricted operation region only;
LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits"; and
LCO 3.2.4, "QUADRANT POWER TILT (QPT)"

may be suspended, provided:

a. THERMAL POWER is maintained ≤ 85% RTP;

b. Nuclear overpower trip setpoint is ≤ 10% RTP higher than the THERMAL POWER at which the test is performed, with a maximum setting of 90% RTP;

<INSERT 3.1-18A>

c. $F_Q(Z)$ and $F^N_{\Delta H}$ are maintained within the limits specified in the COLR; and

d. SDM is ≥ [1.0]% Δk/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
	AND		
	A.2	Suspend PHYSICS TESTS exceptions.	1 hour

(continued)

<Insert 3.1-18A>

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c. ----------NOTE----------
Only required when THERMAL POWER is > 20% RTP.

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ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. THERMAL POWER > 85% RTP. OR Nuclear overpower trip setpoint > 10% higher than PHYSICS TESTS power level. OR Nuclear overpower trip setpoint > 90% RTP. OR <INSERT 3.1-19A> $F_Q(Z)$ or $F^N_{\Delta H}$ not within limits.	B.1 Suspend PHYSICS TESTS exceptions.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.8.1	Verify THERMAL POWER is ≤ 85% RTP.	1 hour
<INSERT 3.1-19B> SR 3.1.8.2	Perform SR 3.2.5.1.	2 hours
SR 3.1.8.3	Verify nuclear overpower trip setpoint is ≤ 10% RTP higher than the THERMAL POWER at which the test is performed, with a maximum setting of 90% RTP.	8 hours

(continued)

<Insert 3.1-19A>

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---------NOTE----------
Only required when
THERMAL POWER
is > 20% RTP.

<Insert 3.1-19B>

----------NOTE----------
Only required when THERMAL
POWER is > 20% RTP.

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3.2 POWER DISTRIBUTION LIMITS

3.2.1 Regulating Rod Insertion Limits

LCO 3.2.1 Regulating rod groups shall be within the physical insertion, sequence, and overlap limits specified in the COLR.

APPLICABILITY: MODES 1 and 2.

---NOTE---
This LCO is not applicable while performing SR 3.1.4.2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
<INSERT 3.2-1A> A. Regulating rod groups inserted in restricted operational region, or sequence or overlap, or any combination, not met.	A.1	Perform SR 3.2.5.1.	Once per 2 hours
	AND		
	A.2	Restore regulating rod groups to within limits.	24 hours from discovery of failure to meet the LCO
B. Required Action and associated Completion Time of Condition A not met.	B.1	Reduce THERMAL POWER to less than or equal to THERMAL POWER allowed by regulating rod group insertion limits.	2 hours

(continued)

<Insert 3.2-1A>

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A.1	----------NOTE---------- Only required when THERMAL POWER is > 20% RTP. ----------	

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3.2 POWER DISTRIBUTION LIMITS

3.2.2 AXIAL POWER SHAPING ROD (APSR) Insertion Limits

LCO 3.2.2 APSRs shall be positioned within the limits specified in the COLR.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<INSERT 3.2-4A>		
A. APSRs not within limits.	A.1 Perform SR 3.2.5.1. AND	Once per 2 hours
	A.2 Restore APSRs to within limits.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.2.1	Verify APSRs are within acceptable limits specified in the COLR.	12 hours

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<Insert 3.2-4A>

A.1	----------NOTE---------- Only required when THERMAL POWER is > 20% RTP. ----------	

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3.2 POWER DISTRIBUTION LIMITS

3.2.5 Power Peaking Factors

LCO 3.2.5 $F_Q(Z)$ and $F^N_{\Delta H}$ shall be within the limits specified in the COLR.

APPLICABILITY: MODE 1, with THERMAL POWER > 20% RTP.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. $F_Q(Z)$ not within limit.	A.1	Reduce THERMAL POWER ≥ 1% RTP for each 1% that $F_Q(Z)$ exceeds limit.	15 minutes
	AND		
	A.2	Reduce nuclear overpower trip setpoint and nuclear overpower based on Reactor Coolant System (RCS) flow and AXIAL POWER IMBALANCE trip setpoint ≥ 1% RTP for each 1% that $F_Q(Z)$ exceeds limit.	8 hours
	AND		
	A.3	Restore $F_Q(Z)$ to within limit.	24 hours

(continued)

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ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. $F^N_{\Delta H}$ not within limit.	B.1	Reduce THERMAL POWER ≥ RH(%) RTP (specified in the COLR) for each 1% that $F^N_{\Delta H}$ exceeds limit.	15 minutes
	AND		
	B.2	Reduce nuclear overpower trip setpoint and nuclear overpower based on RCS flow and AXIAL POWER IMBALANCE trip setpoint ≥ RH(%) RTP (specified in the COLR) for each 1% that $F^N_{\Delta H}$ exceeds limit.	8 hours
	AND		
	B.3	Restore $F^N_{\Delta H}$ within limit.	24 hours
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 2 1 with THERMAL POWER ≤ 20% RTP.	2 hours

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BASES

ACTIONS

A.2.4 (continued)

evaluation, should fuel cycle conditions at some later time become more bounding than those at the time of the rod misalignment. The required Completion Time of 72 hours is acceptable because LHRs are limited by the THERMAL POWER reduction and sufficient time is provided to perform the required evaluation.

A.2.5

Performance of SR 3.2.5.1 provides a determination of the power peaking factors using the Incore Detector System. Verification of the $F_Q(Z)$ and $F^N_{\Delta H}$ from an incore power distribution map is necessary to ensure that excessive local LHRs will not occur due to CONTROL ROD misalignment. This is necessary because the assumption that all CONTROL RODS are aligned (used to determine the regulating rod insertion, AXIAL POWER IMBALANCE, and QPT limits) is not valid when the CONTROL RODS are not aligned. The required Completion Time of 72 hours is acceptable because LHRs are limited by the THERMAL POWER reduction and adequate time is allowed to obtain an incore power distribution map.

<INSERT B3.1-23A> →→

B.1

If the Required Actions and associated Completion Times for Condition A cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours. The allowed Completion Time of 6 hours is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

C.1.1

More than one trippable CONTROL ROD becoming inoperable or misaligned, or both inoperable but trippable and misaligned from their group average position, is not expected and may violate the minimum SDM requirement. Therefore, SDM must be evaluated. Ensuring the SDM meets the minimum requirement

(continued)

<Insert B3.1-23A>

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Required Action A.2.5 is modified by a Note that requires the performance of SR 3.2.5.1 only when THERMAL POWER is greater than 20% RTP. This establishes a Required Action that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors."

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BASES

APPLICABLE SAFETY ANALYSES (continued)

surveillance of the $F_Q(Z)$, the $F^N_{\Delta H}$, and SDM is required to verify that their limits are not exceeded. The limits for the nuclear hot channel factors are specified in the COLR. Refer to the Bases for LCO 3.2.5 for a complete discussion of $F_Q(Z)$ and $F^N_{\Delta H}$. During PHYSICS TESTS, one or more of the LCOs that normally preserve the $F_Q(Z)$ and $F^N_{\Delta H}$ limits may be suspended. However, the results of the safety analysis are not adversely impacted if verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits is obtained, while one or more of the LCOs is suspended. Therefore, SRs are placed on $F_Q(Z)$ and $F^N_{\Delta H}$ during MODE 1 PHYSICS TESTS to verify that these factors remain within their limits. Periodic verification of these factors allows PHYSICS TESTS to be conducted while continuing to maintain the design criteria.

when THERMAL POWER exceeds 20% RTP

PHYSICS TESTS include measurement of core nuclear parameters or exercise of control components that affect process variables. Among the process variables involved are AXIAL POWER IMBALANCE and QPT, which represent initial condition input (power peaking) for the accident analysis. Also involved are the movable control components, i.e., the regulating rods and the APSRs, which affect power peaking and are required for shutdown of the reactor. The limits for these variables are specified for each fuel cycle in the COLR.

PHYSICS TESTS satisfy Criteria 1, 2, and 3 of the NRC Policy Statement.

LCO

This LCO permits individual CONTROL RODS to be positioned outside of their specified group alignment and withdrawal limits and to be assigned to other than specified CONTROL ROD groups, and permits AXIAL POWER IMBALANCE and QPT limits to be exceeded during the performance of PHYSICS TESTS. In addition, this LCO permits verification of the fundamental core characteristics and nuclear instrumentation operation.

The requirements of LCO 3.1.4, LCO 3.1.5, LCO 3.1.6, LCO 3.2.1 (for the restricted operation region only), LCO 3.2.3, and LCO 3.2.4 may be suspended during the performance of PHYSICS TESTS provided:

a. THERMAL POWER is maintained ≤ 85% RTP;

(continued)

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BASES

LCO (continued)

b. Nuclear overpower trip setpoint is ≤ 10% RTP higher than the THERMAL POWER at which the test is performed, with a maximum setting of 90% RTP;

c. $F_Q(Z)$ and $F^N_{\Delta H}$ are maintained within limits specified in the COLR; and

While operating at greater than 20% RTP

d. SDM is maintained ≥ 1.0% Δk/k.

Operation with THERMAL POWER ≤ 85% RTP during PHYSICS TESTS provides an acceptable thermal margin when one or more of the applicable LCOs is out of specification. Eighty-five percent RTP is consistent with the maximum power level for conducting the intermediate core power distribution test specified in Reference 4. The nuclear overpower trip setpoint is reduced so that a similar margin exists between the steady state condition and trip setpoint as exists during normal operation at RTP.

<INSERT B 3.1-48A>

APPLICABILITY

This LCO is applicable in MODE 1, when the reactor has completed low power testing and is in power ascension, or during power operation with THERMAL POWER > 5% RTP but ≤ 85% RTP. This LCO is applicable for power ascension testing, as defined by Regulatory Guide 1.68 (Ref. 3). In MODE 2, Applicability of this LCO is not required because LCO 3.1.9, "PHYSICS TESTS Exceptions—MODE 2," addresses PHYSICS TESTS exceptions in MODE 2. In MODES 3, 4, 5, and 6, Applicability is not required because PHYSICS TESTS are not performed in these MODES.

ACTIONS

A.1 and A.2

If the SDM requirements are not met, boration must be initiated promptly. A Completion Time of 15 minutes is adequate for an operator to correctly align and start the required systems and components. The operator should begin boration with the best source available for the plant conditions. Boration will be continued until SDM is within limit. In the determination of the required combination of boration flow rate and boron concentration, there is no unique requirement that must be satisfied.

(continued)

<Insert B3.1-48A>

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LCO provision c is modified by a Note that requires the adherence to power peaking factor requirements only when THERMAL POWER is greater than 20% RTP. This establishes an LCO provision that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors."

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BASES

ACTIONS

A.1 and A.2 (continued)

Suspension of PHYSICS TESTS exceptions requires restoration of each of the applicable LCOs to within specification.

B.1

If THERMAL POWER exceeds 85% RTP, then 1 hour is allowed for the operator to reduce THERMAL POWER to within limits or to complete an orderly suspension of PHYSICS TESTS exceptions. Suspension of PHYSICS TESTS exceptions requires restoration of each of the applicable individual LCOs to within specification. This required Completion Time is consistent with, or more conservative than, those specified for the individual LCO, addressed by PHYSICS TESTS exceptions.

If the nuclear overpower trip setpoint is not within the specified limits, then 1 hour is allowed for the operator to restore the nuclear overpower trip setpoint within limits or to complete an orderly suspension of PHYSICS TESTS exceptions. Suspension of PHYSICS TESTS exceptions requires restoration of each of the applicable individual LCOs to within specification. This required Completion Time is consistent with, or more conservative than, those specified for the individual LCO, addressed by these PHYSICS TESTS exceptions.

If the results of the incore flux map indicate that either $F_Q(Z)$ or $F^N_{\Delta H}$ has exceeded its limit, then PHYSICS TESTS are suspended. This action is required because of direct indication that the core peaking factors, which are fundamental initial conditions for the safety analysis, are excessive. Suspension of PHYSICS TESTS exceptions requires restoration of each of the applicable LCOs to within specification.

<INSERT B3.1-49A> —>>

SURVEILLANCE REQUIREMENTS

SR 3.1.8.1

Verification that THERMAL POWER is ≤ 85% RTP ensures that the required additional thermal margin has been established prior to and during PHYSICS TESTS. The required Frequency of once per hour allows the operator adequate time to

(continued)

<Insert B3.1-49A>

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This Condition is modified by a Note that requires performance of the Required Action only when THERMAL POWER is greater than 20% RTP. This establishes an ACTIONS entry Condition that is consistent with LCO provision c and the Applicability of LCO 3.2.5, "Power Peaking Factors."

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BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.8.1 (continued)

determine any degradation of the established thermal margin during PHYSICS TESTS.

SR 3.1.8.2

Verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits ensures that core local linear heat rate and departure from nucleate boiling ratio will remain within their limits, while one or more of the LCOs that normally control these design limits are out of specification. The required Frequency of 2 hours allows the operator adequate time for collecting a flux map and for performing the hot channel factor verifications, based on operating experience. If SR 3.2.5.1 is not met, PHYSICS TESTS are suspended and LCO 3.2.5 applies. This Frequency is more conservative than the Completion Time for restoration of the individual LCOs that preserve the $F_Q(Z)$ and $F^N_{\Delta H}$ limits.

<INSERT B3.1-50A> →→

SR 3.1.8.3

Verification that the nuclear overpower trip setpoint is within the limit specified for each PHYSICS TEST ensures that core protection at the reduced power level is established and will remain in place during the PHYSICS TESTS. Performing the verification once every 8 hours allows the operator adequate time for determining any degradation of the established trip setpoint margin before and during PHYSICS TESTS and for adjusting the nuclear overpower trip setpoint.

SR 3.1.8.4

The SDM is verified by performing a reactivity balance calculation, considering the following reactivity effects:

a. Reactor Coolant System (RCS) boron concentration;

b. CONTROL ROD position;

c. RCS average temperature;

(continued)

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<Insert B3.1-50A>

This SR is modified by a Note that requires performance only when THERMAL POWER is greater than 20% RTP. This establishes a performance requirement that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors."

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BASES

ACTIONS

A.1 (continued)

that a rod insertion limit is ejected rod worth limited, then the ejected rod worth is no more limiting than the SDM based rod insertion limit in the core design (Ref. 8). Ejected rod worth limits are independently maintained by the Required Actions of Conditions A and C.

<INSERT B3.2-6A>

A.2

Indefinite operation with the regulating rods inserted in the restricted region, or in violation of the group sequence or overlap limits, is not prudent. Even if power peaking monitoring per Required Action A.1 is continued, reactivity limits may not be met and the abnormal regulating rod insertion or group configuration may cause an adverse xenon redistribution, may cause the limits on AXIAL POWER IMBALANCE to be exceeded, or may adversely affect the long term fuel depletion pattern. Therefore, power peaking monitoring is allowed for up to 24 hours after discovery of failure to meet the requirements of this LCO. This required Completion Time is reasonable based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. In addition, it precludes long term depletion with abnormal group insertions or configurations, thereby limiting the potential for an adverse xenon redistribution.

B.1

If the regulating rods cannot be restored within the acceptable operating limits shown on the figures in the COLR within the required Completion Time (i.e., Required Action A.2 not met), then the limits can be restored by reducing the THERMAL POWER to a value allowed by the regulating rod insertion limits in the COLR. The required Completion Time of 2 hours is sufficient to allow the operator to complete the power reduction in an orderly manner and without challenging the plant systems. Operation for up to 2 hours more in the restricted region shown in the COLR is acceptable, based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. In addition, it precludes long term depletion with abnormal group insertions

(continued)

<Insert B3.2-6A>

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Required Action A.1 is modified by a Note that requires the performance of SR 3.2.5.1 only when THERMAL POWER is greater than 20% RTP. This establishes a Required Action that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors."

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BASES

ACTIONS (continued)

the APSR withdrawal. If this occurs, the APSRs must be restored to their normal inserted position. Conversely, after the fuel cycle burnup for the APSR withdrawal occurs, the APSRs may not be reinserted for the remainder of the fuel cycle. These restrictions apply to ensure the axial burnup distribution that accumulates in the fuel will be consistent with the expected (as designed) distribution.

A.1

For verification that the core parameters $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits, SR 3.2.5.1 is performed using the Incore Detector System to obtain a three dimensional power distribution map. Successful verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits ensures that operation with the APSRs inserted or withdrawn in violation of the times specified in the COLR do not violate either the ECCS or DNB criteria (Ref. 4). The required Completion Time of 2 hours is reasonable to allow the operator to obtain a power distribution map and to verify the power peaking factors. Repeating SR 3.2.5.1 every 2 hours is reasonable to ensure that continued verification of the power peaking factors is obtained as core conditions (primarily the regulating rod insertion and induced xenon redistribution) change.

<INSERT B3.2-14A> →

A.2

Indefinite operation with the APSRs inserted or withdrawn in violation of the times specified in the COLR is not prudent. Even if power peaking monitoring per Required Action A.1 is continued, the abnormal APSR insertion or withdrawal may cause an adverse xenon redistribution, may cause the limits on AXIAL POWER IMBALANCE to be exceeded, or may affect the long term fuel depletion pattern. Therefore, power peaking monitoring is allowed for up to 24 hours. This required Completion Time is reasonable based on the low probability of an event occurring simultaneously with the APSR limit out of specification. In addition, it precludes long term depletion with the APSRs in positions that have not been analyzed, thereby limiting the potential for an adverse xenon redistribution. This time limit also ensures that the intended burnup distribution is maintained, and allows the operator sufficient time to reposition the APSRs to correct their positions.

(continued)

<Insert B3.2-14A>

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Required Action A.1 is modified by a Note that requires the performance of SR 3.2.5.1 only when THERMAL POWER is greater than 20% RTP. This establishes a Required Action that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors."

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B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.5 Power Peaking Factors

BASES

BACKGROUND

The purpose of this MODE 1 LCO is to establish limits that constrain the core power distribution within design limits during normal operation (Condition 1) and during anticipated operational occurrences (Condition 2) such that accident initial condition protection criteria are preserved. The accident initial condition criteria are preserved by bounding operation at THERMAL POWER within specified acceptable fuel design limits.

$F_Q(Z)$ is a specified acceptable fuel design limit that preserves the initial conditions for the Emergency Core Cooling Systems (ECCS) analysis. $F_Q(Z)$ is defined as the maximum local fuel rod linear power density divided by the average fuel rod linear power density, assuming nominal fuel pellet and rod dimensions. Because $F_Q(Z)$ is a ratio of local power densities, it is related to the maximum local (pellet) power density in a fuel rod. Operation within the $F_Q(Z)$ limits given in the COLR prevents power peaking that would exceed the loss of coolant accident (LOCA) linear heat rate (LHR) limits derived from the analysis of the ECCS.

The $F^N_{\Delta H}$ limit is a specified acceptable fuel design limit that preserves the initial conditions for the limiting loss of flow transient. $F^N_{\Delta H}$ is defined as the ratio of the integral of linear power along the fuel rod on which the minimum departure from nucleate boiling ratio (DNBR) occurs to the average integrated rod power. Because $F^N_{\Delta H}$ is a ratio of integrated powers, it is related to the maximum total power produced in a fuel rod. Operation within the $F^N_{\Delta H}$ limits given in the COLR prevents departure from nucleate boiling (DNB) during a postulated loss of reactor coolant flow accident.

Measurement of the core power peaking factors using the Incore Detector System to obtain a three dimensional power distribution map provides direct confirmation that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits, and may be used to verify that the power peaking factors remain bounded when one or more normal operating parameters exceed their limits.

(continued)

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BASES (continued)

APPLICABLE SAFETY ANALYSES

The limits on $F_Q(Z)$ are determined by the ECCS analysis in order to limit peak cladding temperatures to 2200°F during a LOCA. The maximum acceptable cladding temperature is specified by 10 CFR 50.46 (Ref. 1). Higher cladding temperatures could cause severe cladding failure by oxidation due to a Zircaloy water reaction. Other criteria must also be met (e.g., maximum cladding oxidation, maximum hydrogen generation, coolable geometry, and long term cooling). However, peak cladding temperature is usually most limiting.

The limits on $F^N_{\Delta H}$ provide protection from DNB during a limiting loss of flow transient. Proximity to the DNB condition is expressed by the DNBR, defined as the ratio of the cladding surface heat flux required to cause DNB to the actual cladding surface heat flux. The minimum DNBR value during both normal operation and anticipated transients is limited to the DNBR correlation limit for the particular fuel design in use, and is accepted as an appropriate margin to DNB. The DNBR correlation limit ensures that there is at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB.

This LCO precludes core power distributions that violate the following fuel design criteria:

a. During a large break LOCA, peak cladding temperature must not exceed 2200°F (Ref. 1).

b. During a loss of forced reactor coolant flow accident, there must be at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition.

The reload safety evaluation analysis determines limits on global core parameters that characterize the core power distribution. The primary parameters used to monitor and control the core power distribution are the regulating rod position, the APSR position, the AXIAL POWER IMBALANCE, and the QPT. These parameters are normally used to monitor and control the core power distribution because their measurements are continuously observable. Limits are placed on these parameters to ensure that the core power peaking factors remain bounded during operation in MODE 1 with THERMAL POWER greater than 20% RTP. Nuclear

(continued)

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BASES

APPLICABLE SAFETY ANALYSES (continued)

design model calculational uncertainty, manufacturing tolerances (e.g., the engineering hot channel factor), effects of fuel densification and rod bow, and modeling simplifications (such as treatment of the spacer grid effects) are accommodated through use of peaking augmentation factors in the reload safety evaluation analysis.

$F_Q(Z)$ and $F^N_{\Delta H}$ satisfy Criterion 2 of the NRC Policy Statement.

LCO

This LCO for the power peaking factors $F_Q(Z)$ and $F^N_{\Delta H}$ ensures that the core operates within the bounds assumed for the ECCS and thermal hydraulic analyses. Verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within the limits of this LCO as specified in the COLR allows continued operation at THERMAL POWER when the Required Actions of LCO 3.1.4, "CONTROL ROD Group Alignment Limits," LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT," are entered. Conservative THERMAL POWER reductions are required if the limits on $F_Q(Z)$ and $F^N_{\Delta H}$ are exceeded. Verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within limits is also required during MODE 1 PHYSICS TESTS per LCO 3.1.8, "PHYSICS TESTS Exceptions—MODE 1."

Measurement uncertainties are applied when $F_Q(Z)$ and $F^N_{\Delta H}$ are determined using the Incore Detector System. The measurement uncertainties applied to the measured values of $F_Q(Z)$ and $F^N_{\Delta H}$ account for uncertainties in observability and instrument string signal processing.

APPLICABILITY

In MODE 1, the limits on $F_Q(Z)$ and $F^N_{\Delta H}$ must be maintained in order to prevent the core power distribution from exceeding the limits assumed in the analyses of the LOCA and loss of flow accidents. In MODES 2, 3, 4, 5, and 6, this LCO is not applicable because the reactor has insufficient stored energy in the fuel or energy being transferred to the coolant to require a limit on the distribution of core power.

with THERMAL POWER greater than 20% RTP

MODE 1 with THERMAL POWER less than or equal to 20% RTP, and in

<<INSERT B 3.2-40A>>

(continued)

<Insert B3.2-40A>

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The minimum THERMAL POWER level of 20% RTP was chosen based on the ability of the incore detection system to satisfactorily obtain meaningful power distribution data.

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BASES

ACTIONS

B.2 (continued)

time period and the number of steps required to complete this Action.

B.3

Continued operation with $F^N_{\Delta H}$ exceeding its limit is not permitted, because the initial conditions assumed in the accident analyses are no longer valid. The required Completion Time of 24 hours to restore $F^N_{\Delta H}$ within its limit at the reduced THERMAL POWER level is reasonable based on the low probability of a limiting event occurring simultaneously with $F^N_{\Delta H}$ exceeding its limit. In addition, this Completion Time precludes long term depletion with an unacceptably high local power and limits the potential for inducing an adverse perturbation in the radial xenon distribution.

C.1

If a THERMAL POWER reduction is not sufficient to restore $F_Q(Z)$ or $F^N_{\Delta H}$ within its limit (i.e., the Required Actions and associated Completion Times for Condition A or B are not met), then THERMAL POWER operation should cease. The reactor is placed in MODE 2 in which this LCO does not apply. The required Completion Time of 2 hours is a reasonable amount of time for the operator to reduce THERMAL POWER in an orderly manner and without challenging plant systems.

be significantly reduced.

1 with THERMAL POWER less than or equal to 20% RTP

SURVEILLANCE REQUIREMENTS

SR 3.2.5.1

Core monitoring is performed using the Incore Detector System to obtain a three dimensional power distribution map. Maximum values of $F_Q(Z)$ and $F^N_{\Delta H}$ obtained from this map may then be compared with the $F_Q(Z)$ and limits in the COLR to verify that the limits have not been exceeded. Measurement of the core power peaking factors in this manner may be used to verify that the measured values of $F_Q(Z)$ and $F^N_{\Delta H}$ remain within their specified limits when one or more of the limits specified by LCO 3.1.4, LCO 3.2.1, LCO 3.2.2, LCO 3.2.3, or

(continued)