ENCLOSURE 4

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3

TECHNICAL REQUIREMENTS MANUAL
CHANGES AND ADDITIONS

(SEE ATTACHED)

Technical Requirements Manual

Revision 13

Addition of Configuration Risk Management Program

TR 5.0 ADMINISTRATIVE CONTROLS

TR 5.4 CONFIGURATION RISK MANAGEMENT PROGRAM

5.4.1 Configuration Risk Management Program

The Configuration Risk Management Program (CRMP) provides a proceduralized risk-informed assessmet to manage the risk associated with equipment inoperability. The program applies to technical specification structures, systems, or components for which a risk-informed allowed outage time has been granted. At present, the CRMP applies to:

1. DGs per TS 3.8.1.B

The program shall include the following.

a. Provisions for the control and implementation of a Level 1 at-power internal events PRA-informed methodology. The assessment is to be capable of evaluating the applicable plant configuration.

b. Provisions for performing an assessment prior to entering the plant configuration described by the Limiting Conditions for Operation (LCO) Action Statement for preplanned activities.

c. Provisions for performing an assessment after entering the plant configuration described by the LCO Action Statement for unplanned entry into the LCO Action Statement.

d. Provisions for assessing the need for additional actions after the discovery of additional equipment-out-of-service conditions while in the plant configuration described by the LCO Action Statement.

e. Provisions for considering other applicable risk-significant contributors such as Level 2 issues and external events, qualitatively or quantitatively.

TR 5.0 ADMINISTRATIVE CONTROLS

TR 5.4 CONFIGURATION RISK MANAGEMENT PROGRAM

5.4.1 Configuration Risk Management Program

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a. Provisions for the control and implementation of a Level 1 at-power internal events PRA-informed methodology. The assessment is to be capable of evaluating the applicable plant configuration.

b. Provisions for performing an assessment prior to entering the plant configuration described by the Limiting Conditions for Operation (LCO) Action Statement for preplanned activities.

c. Provisions for performing an assessment after entering the plant configuration described by the LCO Action Statement for unplanned entry into the LCO Action Statement.

d. Provisions for assessing the need for additional actions after the discovery of additional equipment-out-of-service conditions while in the plant configuration described by the LCO Action Statement.

e. Provisions for considering other applicable risk-significant contributors such as Level 2 issues and external events, qualitatively or quantitatively.

Technical Requirements Manual

Revision 14

Emergency Core Cooling System Keep Fill Instrumentation

and

Containment Nitrogen Makeup Rate

TR 3.3 INSTRUMENTATION

TR 3.3.3.1 ECCS Keep Fill

LCO 3.3.3.1 The ECCS Keep Fill pressure indication instrumentation for each function in Table 3.3.3.1-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3,
MODES 4, 5 when the associated subsystem is required to be OPERABLE

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more subsystem pressure indicator(s) inoperable.	A.1 Verify the subsystem piping filled by observation of water flow from high point vents.	4 hours AND Every 24 hours thereafter
B. Required Action and associated Completion Time of Condition A is not met.	B.1 Declare the affected subsystem inoperable. (Refer to applicable TS and TRM LCOs)	Immediately

BASES

APPLICABLE SAFETY ANALYSIS	The safety objective of maintaining the Core Spray and RHR discharge piping filled is to preserve system integrity by preventing water-hammer. Technical Specification SR 3.5.1.1 requires that ECCS systems be vented/checked vented every 31 days. The frequency is picked to allow for small amounts of system leakage that would introduce air into the lines. As a secondary means of verifying the system is filled, pressure indicators are used to ensure the operator that the system is filled and pressurized while in standby readiness.
LCO 3.3.3.1	The ability of the operator to monitor the RHR and Core Spray discharge pressure is needed to give assurance of standby readiness.
APPLICABILITY	The OPERABILITY requirement is consistent with Technical Specification requirements for the times when the affected subsystem is required to be OPERABLE.
ACTIONS	A.1 If one or more subsystem pressure indicator(s) is inoperable, the subsystem must be vented at the high point vents within 4 hours and every 24 hours thereafter. B.1 The subsystem is declared inoperable if unable to verify the discharge piping is filled.

TR 3.6 CONTAINMENT SYSTEMS

TR 3.6.5 Nitrogen Makeup to Containment

BASES

BACKGROUND

Primary containment nitrogen consumption shall be monitored to determine the average daily nitrogen consumption for the last 24 hours. Excessive leakage is indicated by a nitrogen consumption rate of > 542 scfh per 24 hours (corrected for drywell temperature, pressure, and venting operations) at normal drywell operating pressure of 1.1 psig.

APPLICABLE SAFETY ANALYSES

Establishing the test limit of 542 scfh provides an adequate margin of safety to assure the health and safety of the general public. A leakage of > 542 scfh would provide an indication of gross failure of the primary containment pressure boundary which would defeat the design leak-tightness capability of the structure over its service lifetime. Monitoring the integrity of the primary containment during normal operation ensures its capability to perform its safety function following a design basis accident.

LCO 3.6.5

When the primary containment is inerted the containment shall be continuously monitored for gross leakage by review of the inerting system makeup requirements. Nitrogen makeup to the primary containment, averaged over 24 hours, shall not exceed 542 scfh.

BASES

APPLICABILITY

The requirement for monitoring the containment for gross leakage is only applicable when the primary containment is inerted.

ACTIONS

A.1

If nitrogen makeup to the primary containment, averaged over 24 hours, exceeds 542 scfh, then primary containment is inoperable and Technical Specification LCO 3.6.1.1 is entered.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.6.5.1

When the primary containment is inerted, the containment shall be continuously monitored for gross leakage by review of the inerting system makeup requirements every 24 hours.

This TSR is modified by two Notes. Note 1 allows the monitoring system to be taken out of service for maintenance provided the monitoring system is returned to service as soon as practical. Note 2 allows this TSR not to be performed until after primary containment is inerted. This allowance is required to prevent conflicts with TSR 3.0.4 and since the surveillance can not be performed until after containment is inerted.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)

TR 3.3 INSTRUMENTATION

TR 3.3.3.1 ECCS Keep Fill

LCO 3.3.3.1 The ECCS Keep Fill pressure indication instrumentation for each function in Table 3.3.3.1-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3,
MODES 4, 5 when the associated subsystem is required to be OPERABLE

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more subsystem pressure indicator(s) inoperable.	A.1 Verify the subsystem piping filled by observation of water flow from high point vents.	4 hours AND Every 24 hours thereafter
B. Required Action and associated Completion Time of Condition A is not met.	B.1 Declare the affected subsystem inoperable. (Refer to applicable TS and TRM LCOs)	Immediately

APPLICABLE SAFETY ANALYSIS	The safety objective of maintaining the Core Spray and RHR discharge piping filled is to preserve system integrity by preventing water-hammer. Technical Specification SR 3.5.1.1 requires that ECCS systems be vented/checked vented every 31 days. The frequency is picked to allow for small amounts of system leakage that would introduce air into the lines. As a secondary means of verifying the system is filled, pressure indicators are used to ensure the operator that the system is filled and pressurized while in standby readiness.
LCO 3.3.3.1	The ability of the operator to monitor the RHR and Core Spray discharge pressure is needed to give assurance of standby readiness.
APPLICABILITY	The OPERABILITY requirement is consistent with Technical Specification requirements for the times when the affected subsystem is required to be OPERABLE.
ACTIONS	<u>A.1</u> If one or more subsystem pressure indicator(s) is inoperable, the subsystem must be vented at the high point vents within 4 hours and every 24 hours thereafter. <u>B.1</u> The subsystem is declared inoperable if unable to verify the discharge piping is filled.

TR 3.6 CONTAINMENT SYSTEMS

TR 3.6.5 Nitrogen Makeup to Containment

BASES

BACKGROUND	Primary containment nitrogen consumption shall be monitored to determine the average daily nitrogen consumption for the last 24 hours. Excessive leakage is indicated by a nitrogen consumption rate of > 542 scfh per 24 hours (corrected for drywell temperature, pressure, and venting operations) at normal drywell operating pressure of 1.1 psig.
APPLICABLE SAFETY ANALYSES	Establishing the test limit of 542 scfh provides an adequate margin of safety to assure the health and safety of the general public. A leakage of > 542 scfh would provide an indication of gross failure of the primary containment pressure boundary which would defeat the design leak-tightness capability of the structure over its service lifetime. Monitoring the integrity of the primary containment during normal operation ensures its capability to perform its safety function following a design basis accident.
LCO 3.6.5	When the primary containment is inerted the containment shall be continuously monitored for gross leakage by review of the inerting system makeup requirements. Nitrogen makeup to the primary containment, averaged over 24 hours, shall not exceed 542 scfh.

APPLICABILITY

The requirement for monitoring the containment for gross leakage is only applicable when the primary containment is inerted.

ACTIONS

A.1

If nitrogen makeup to the primary containment, averaged over 24 hours, exceeds 542 scfh, then primary containment is inoperable and Technical Specification LCO 3.6.1.1 is entered.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.6.5.1

When the primary containment is inerted, the containment shall be continuously monitored for gross leakage by review of the inerting system makeup requirements every 24 hours.

This TSR is modified by two Notes. Note 1 allows the monitoring system to be taken out of service for maintenance provided the monitoring system is returned to service as soon as practical. Note 2 allows this TSR not to be performed until after primary containment is inerted. This allowance is required to prevent conflicts with TSR 3.0.4 and since the surveillance can not be performed until after containment is inerted.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)

TR 3.3 INSTRUMENTATION

TR 3.3.3.1 ECCS Keep Fill

LCO 3.3.3.1 The ECCS Keep Fill pressure indication instrumentation for each function in Table 3.3.3.1-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3,
MODES 4, 5 when the associated subsystem is required to be OPERABLE

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more subsystem pressure indicator(s) inoperable.	A.1 Verify the subsystem piping filled by observation of water flow from high point vents.	4 hours <u>AND</u> Every 24 hours thereafter
B. Required Action and associated Completion Time of Condition A is not met.	B.1 Declare the affected subsystem inoperable. (Refer to applicable TS and TRM LCOs)	Immediately

APPLICABLE SAFETY ANALYSIS	The safety objective of maintaining the Core Spray and RHR discharge piping filled is to preserve system integrity by preventing water-hammer. Technical Specification SR 3.5.1.1 requires that ECCS systems be vented/checked vented every 31 days. The frequency is picked to allow for small amounts of system leakage that would introduce air into the lines. As a secondary means of verifying the system is filled, pressure indicators are used to ensure the operator that the system is filled and pressurized while in standby readiness.
LCO 3.3.3.1	The ability of the operator to monitor the RHR and Core Spray discharge pressure is needed to give assurance of standby readiness.
APPLICABILITY	The OPERABILITY requirement is consistent with Technical Specification requirements for the times when the affected subsystem is required to be OPERABLE.
ACTIONS	<u>A.1</u> If one or more subsystem pressure indicator(s) is inoperable, the subsystem must be vented at the high point vents within 4 hours and every 24 hours thereafter. <u>B.1</u> The subsystem is declared inoperable if unable to verify the discharge piping is filled.

TR 3.6 CONTAINMENT SYSTEMS

TR 3.6.5 Nitrogen Makeup to Containment

BASES

BACKGROUND	Primary containment nitrogen consumption shall be monitored to determine the average daily nitrogen consumption for the last 24 hours. Excessive leakage is indicated by a nitrogen consumption rate of > 542 scfh per 24 hours (corrected for drywell temperature, pressure, and venting operations) at normal drywell operating pressure of 1.1 psig.
APPLICABLE SAFETY ANALYSES	Establishing the test limit of 542 scfh provides an adequate margin of safety to assure the health and safety of the general public. A leakage of > 542 scfh would provide an indication of gross failure of the primary containment pressure boundary which would defeat the design leak-tightness capability of the structure over its service lifetime. Monitoring the integrity of the primary containment during normal operation ensures its capability to perform its safety function following a design basis accident.
LCO 3.6.5	When the primary containment is inerted the containment shall be continuously monitored for gross leakage by review of the inerting system makeup requirements. Nitrogen makeup to the primary containment, averaged over 24 hours, shall not exceed 542 scfh.

BASES

APPLICABILITY

The requirement for monitoring the containment for gross leakage is only applicable when the primary containment is inerted.

ACTIONS

A.1

If nitrogen makeup to the primary containment, averaged over 24 hours, exceeds 542 scfh, then primary containment is inoperable and Technical Specification LCO 3.6.1.1 is entered.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.6.5.1

When the primary containment is inerted, the containment shall be continuously monitored for gross leakage by review of the inerting system makeup requirements every 24 hours.

This TSR is modified by two Notes. Note 1 allows the monitoring system to be taken out of service for maintenance provided the monitoring system is returned to service as soon as practical. Note 2 allows this TSR not to be performed until after primary containment is inerted. This allowance is required to prevent conflicts with TSR 3.0.4 and since the surveillance can not be performed until after containment is inerted.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)

Technical Requirements Manual

Revision 15

Condensate Storage Tanks

TR 3.7 PLANT SYSTEMS

TR 3.7.1 Liquid Effluents

BASES

BACKGROUND	This Technical Requirement includes any tanks containing radioactive material that are not surrounded by liners, dikes, or walls capable of holding the contents and that do not have overflows and surrounding area drains connected to the liquid radwaste treatment system. These tanks are also addressed by the Explosive Gas and Storage Tank Radioactivity Monitoring Program of Technical Specification 5.5.8. The Condensate Storage Tanks (CSTs) are not considered liquid radwaste tanks as defined in NUREG-0473. Therefore, this TR is not applicable to the CSTs. The CSTs are, however, periodically sampled and analyzed for radioactivity under a site approved program.
APPLICABLE SAFETY ANALYSIS	Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.
LCO 3.7.1	The limit of 10 curies provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.
APPLICABILITY	This Technical Requirement is applicable at all times.

BASES

ACTIONS	A.1, A.2 and A.3 ACTIONS are provided to immediately stop the further addition of radioactive materials to the tank and reduce tank contents to within limits within 48 hours. This provides a reasonable period of time to re-establish tank contents to within limits while ensuring that prompt ACTIONS are taken. The circumstances surrounding the event are required to be reported to the NRC in the Annual Radioactive Effluent Release Report.
TECHNICAL SURVEILLANCE REQUIREMENTS	TSR 3.7.1.1 Sampling tank contents once per 7 days when radioactive materials are being added to the tank is sufficient to monitor for adherence to limits.
REFERENCES	1. BFN Technical Specifications (version prior to standardized version)

TR 3.7 PLANT SYSTEMS

TR 3.7.1 Liquid Effluents

BASES

BACKGROUND

This Technical Requirement includes any tanks containing radioactive material that are not surrounded by liners, dikes, or walls capable of holding the contents and that do not have overflows and surrounding area drains connected to the liquid radwaste treatment system. These tanks are also addressed by the Explosive Gas and Storage Tank Radioactivity Monitoring Program of Technical Specification 5.5.8.

The Condensate Storage Tanks (CSTs) are not considered liquid radwaste tanks as defined in NUREG-0473. Therefore, this TR is not applicable to the CSTs. The CSTs are, however, periodically sampled and analyzed for radioactivity under a site approved program.

APPLICABLE SAFETY ANALYSIS

Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.

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The limit of 10 curies provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.

APPLICABILITY

This Technical Requirement is applicable at all times.

BASES

ACTIONS	<u>A.1, A.2 and A.3</u> ACTIONS are provided to immediately stop the further addition of radioactive materials to the tank and reduce tank contents to within limits within 48 hours. This provides a reasonable period of time to re-establish tank contents to within limits while ensuring that prompt ACTIONS are taken. The circumstances surrounding the event are required to be reported to the NRC in the Annual Radioactive Effluent Release Report.
TECHNICAL SURVEILLANCE REQUIREMENTS	<u>TSR 3.7.1.1</u> Sampling tank contents once per 7 days when radioactive materials are being added to the tank is sufficient to monitor for adherence to limits.
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TR 3.7 PLANT SYSTEMS

TR 3.7.1 Liquid Effluents

BASES

BACKGROUND	This Technical Requirement includes any tanks containing radioactive material that are not surrounded by liners, dikes, or walls capable of holding the contents and that do not have overflows and surrounding area drains connected to the liquid radwaste treatment system. These tanks are also addressed by the Explosive Gas and Storage Tank Radioactivity Monitoring Program of Technical Specification 5.5.8. The Condensate Storage Tanks (CSTs) are not considered liquid radwaste tanks as defined in NUREG-0473. Therefore, this TR is not applicable to the CSTs. The CSTs are, however, periodically sampled and analyzed for radioactivity under a site approved program.
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LCO 3.7.1	The limit of 10 curies provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.
APPLICABILITY	This Technical Requirement is applicable at all times.

ACTIONS

A.1, A.2 and A.3

ACTIONS are provided to immediately stop the further addition of radioactive materials to the tank and reduce tank contents to within limits within 48 hours. This provides a reasonable period of time to re-establish tank contents to within limits while ensuring that prompt ACTIONS are taken. The circumstances surrounding the event are required to be reported to the NRC in the Annual Radioactive Effluent Release Report.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.1.1

Sampling tank contents once per 7 days when radioactive materials are being added to the tank is sufficient to monitor for adherence to limits.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)

Technical Requirements Manual

Revision 16

Offgas Hydrogen Analyzer Instrumentation

and

Reactor Coolant Chemistry Limits

TR 3.3 INSTRUMENTATION

TR 3.3.9 Offgas Hydrogen Analyzer Instrumentation

LCO 3.3.9 There shall be at least one OPERABLE Offgas Hydrogen Analyzer instrument with alarm setpoint set to ensure the limit of TRM LCO 3.7.2 is not exceeded.

APPLICABILITY: During main condenser offgas treatment system operation

---NOTE---
TRM LCO 3.0.3 is not applicable.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. No OPERABLE Offgas Hydrogen Analyzer instruments.	A.1 Install a temporary monitor	4 hours
	<u>OR</u>	
	A.2.1 Take grab samples <u>AND</u>	4 hours from discovery of no OPERABLE instrument AND Every 4 hours thereafter
	A.2.2 Analyze the sample for explosive concentration of hydrogen.	4 hours following grab sample

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.3.9.1	Perform CHANNEL CHECK.	24 hours
TSR 3.3.9.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
TSR 3.3.9.3	-----------------------NOTE----------------------- Shall include use of standard gas samples containing a nominal zero volume percent hydrogen (compressed air), and a nominal one volume percent hydrogen, balance nitrogen. --	
	Perform CHANNEL CALIBRATION.	Once per OPERATING CYCLE

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Conditions A, B, or C not met. OR Conductivity > 10 µmho/cm at 25°C. OR Chloride concentration > 0.5 ppm. OR Conductivity or chloride concentration limits of Table 3.4.1-1 Column A exceeded.	D.1 Initiate an orderly shutdown. AND D.2 Be in MODE 4.	Immediately As rapidly as cooldown rate permits
E. Coolant chemistry limits of Table 3.4.1-1 Column C or D exceeded.	E.1 Initiate action to restore coolant chemistry within limits.	Immediately

Table 3.4.1-1
Coolant Chemistry Limits[1]

CHEMISTRY PARAMETERS	COLUMN A APPLICABLE CONDITION Prior To Startup And At Steaming Rates < 100,000 lb/hr	COLUMN B APPLICABLE CONDITION Steaming Rates > 100,000 lb/hr	COLUMN C APPLICABLE CONDITION Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup Condition	COLUMN D[2] APPLICABLE CONDITION Noble Metal Chemical Application and Subsequent Reactor Coolant Cleanup
CHLORIDE (ppm)	≤ 0.1	≤ 0.2	≤ 0.5	≤ 0.1
CONDUCTIVITY (µmho/cm at 25°C)	≤ 2.0	≤ 1.0	≤ 10.0	≤ 20.0
pH	5.6-8.6	5.6-8.6	5.3-8.6	4.3-9.9

(1) When there is no fuel in the reactor vessel, Technical Requirement reactor coolant chemistry limits do not apply.

(2) During the Noble Metal Chemical Application and subsequent reactor coolant cleanup, CONDITIONS A, B, C, and D (including Required Actions and Completion Times) do not apply.

BASES

APPLICABLE SAFETY ANALYSIS	The hydrogen concentration of the gases from the air ejector is maintained below the flammable limit by maintaining adequate steam flow for dilution at all times. The pressure of the steam supplied to the first and third stage steam jet air ejectors is monitored. The steam jet air ejector inlet and effluent are automatically isolated on low steam supply pressure. The preheaters are heated with steam, rather than electrically, to eliminate presence of potential ignition sources and to limit the temperature of the gases in the event of cessation of gas flow. The recombiner temperatures are monitored and an alarm is actuated to indicate any deterioration of performance. A hydrogen analyzer downstream of the recombiners provides an additional check on recombiner performance.
LCO 3.3.9	These instruments are required to alert the operator of explosive conditions within the offgas system, and prompt the operator to comply with Technical Requirements 3.7.2
APPLICABILITY	The hydrogen buildup in the offgas system will stop when the main condenser offgas system is removed from service. Hence, this requirement is only applicable during main condenser offgas treatment system operation. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 63 of Appendix A to 10 CFR 50.
ACTIONS	<u>A.1 and A.2</u> Continued operation of the main condenser offgas treatment system is allowed provided adequate backup information is obtained from grab samples or a temporary monitor as required by ACTION A.

LCO 3.4.1 (continued)

Since oxygen may be at higher concentrations at low steaming rates, the chloride concentration limit is lower than at higher steaming rates when the oxygen content is lower.

However, the conductivity is allowed to be at a higher level provided it is not caused from chloride ions due to the fact that the dissolved gases may result in higher conductivity. During startup or hot standby conditions, the reactor water cleanup system may be more efficient since the makeup from feedwater is very low.

Steaming Rates > 100,000 lb/hr

At steaming rates greater than 100,000 lb/hr, the boiling rates are significant enough to strip away dissolved oxygen, but high enough to start concentrating dissolved ions.

Because the dissolved oxygen is being effectively removed, the chloride ion limits are relaxed.

However, because the reactor is now acting as a concentrator for ionic impurities and particulates, the conductivity limits are made more stringent.

Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup

These are the baseline chemistry limits for water in contact with fuel. They are the same as the spent fuel pool with the extra limitation of pH.

Noble Metal Chemical Application (NMCA) and Subsequent Reactor Coolant Cleanup

During NMCA, the chemicals added to the reactor coolant (which contain the noble metals) will increase conductivity and affect pH. Therefore, special chemistry parameter limits are used for the NMCA process and subsequent reactor coolant cleanup. The chloride limits for this condition are unchanged from the 'Steaming Rates < 100,000 lb/hr' condition.

BASES

APPLICABILITY	These limits are applicable, as specified, at all times when fuel is in the reactor vessel.

ACTIONS

A.1 and B.1

A two week per year allowance for exceeding the normal chemistry limits is allowed to give the opportunity for the reactor water cleanup system to return the water chemistry to normal after a transient chemical intrusion.

C.1

These chemistry limits take into account factors of corrosion that may not be affected by the amount of chloride ion.

D.1 and D.2

The major benefit of Cold Shutdown is to reduce the temperature dependent corrosion rates and provide time for the cleanup system to reestablish the purity of the reactor coolant.

E.1

Immediate ACTIONS are taken to bring coolant chemistry within limits.

TR 3.3 INSTRUMENTATION

TR 3.3.9 Offgas Hydrogen Analyzer Instrumentation

LCO 3.3.9 There shall be at least one OPERABLE Offgas Hydrogen Analyzer instrument with alarm setpoint set to ensure the limit of TRM LCO 3.7.2 is not exceeded.

APPLICABILITY: During main condenser offgas treatment system operation

---NOTE---
TRM LCO 3.0.3 is not applicable.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. No OPERABLE Offgas Hydrogen Analyzer instruments.	A.1 Install a temporary monitor	4 hours
	<u>OR</u>	
	A.2.1 Take grab samples <u>AND</u>	4 hours from discovery of no OPERABLE instrument AND Every 4 hours thereafter
	A.2.2 Analyze the sample for explosive concentration of hydrogen.	4 hours following grab sample

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.3.9.1	Perform CHANNEL CHECK.	24 hours
TSR 3.3.9.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
TSR 3.3.9.3	------------------------NOTE------------------------ Shall include use of standard gas samples containing a nominal zero volume percent hydrogen (compressed air), and a nominal one volume percent hydrogen, balance nitrogen. -- Perform CHANNEL CALIBRATION.	92 days

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Conditions A, B, or C not met. OR Conductivity > 10 µmho/cm at 25°C. OR Chloride concentration > 0.5 ppm. OR Conductivity or chloride concentration limits of Table 3.4.1-1 Column A exceeded.	D.1 Initiate an orderly shutdown. AND D.2 Be in MODE 4.	Immediately As rapidly as cooldown rate permits
E. Coolant chemistry limits of Table 3.4.1-1 Column C or D exceeded.	E.1 Initiate action to restore coolant chemistry within limits.	Immediately

Table 3.4.1-1
Coolant Chemistry Limits[1]

CHEMISTRY PARAMETERS	COLUMN A APPLICABLE CONDITION Prior To Startup And At Steaming Rates < 100,000 lb/hr	COLUMN B APPLICABLE CONDITION Steaming Rates > 100,000 lb/hr	COLUMN C APPLICABLE CONDITION Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup Condition	COLUMN D[2] APPLICABLE CONDITION Noble Metal Chemical Application and Subsequent Reactor Coolant Cleanup
CHLORIDE (ppm)	≤ 0.1	≤ 0.2	≤ 0.5	≤ 0.1
CONDUCTIVITY (μmho/cm at 25°C)	≤ 2.0	≤ 1.0	≤ 10.0	≤ 20.0
pH	5.6-8.6	5.6-8.6	5.3-8.6	4.3-9.9

(1) When there is no fuel in the reactor vessel, Technical Requirement reactor coolant chemistry limits do not apply.

(2) During the Noble Metal Chemical Application and subsequent reactor coolant cleanup, CONDITIONS A, B, C, and D (including Required Actions and Completion Times) do not apply.

APPLICABLE SAFETY ANALYSIS	The hydrogen concentration of the gases from the air ejector is maintained below the flammable limit by maintaining adequate steam flow for dilution at all times. The pressure of the steam supplied to the first and third stage steam jet air ejectors is monitored. The steam jet air ejector inlet and effluent are automatically isolated on low steam supply pressure. The preheaters are heated with steam, rather than electrically, to eliminate presence of potential ignition sources and to limit the temperature of the gases in the event of cessation of gas flow. The recombiner temperatures are monitored and an alarm is actuated to indicate any deterioration of performance. A hydrogen analyzer downstream of the recombiners provides an additional check on recombiner performance.
LCO 3.3.9	These instruments are required to alert the operator of explosive conditions within the offgas system, and prompt the operator to comply with Technical Requirements 3.7.2
APPLICABILITY	The hydrogen buildup in the offgas system will stop when the main condenser offgas system is removed from service. Hence, this requirement is only applicable during main condenser offgas treatment system operation. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 63 of Appendix A to 10 CFR 50.
ACTIONS	<u>A.1 and A.2</u> Continued operation of the main condenser offgas treatment system is allowed provided adequate backup information is obtained from grab samples or a temporary monitor as required by ACTION A.

LCO 3.4.1
(continued)

Since oxygen may be at higher concentrations at low steaming rates, the chloride concentration limit is lower than at higher steaming rates when the oxygen content is lower.

However, the conductivity is allowed to be at a higher level provided it is not caused from chloride ions due to the fact that the dissolved gases may result in higher conductivity. During startup or hot standby conditions, the reactor water cleanup system may be more efficient since the makeup from feedwater is very low.

Steaming Rates > 100,000 lb/hr

At steaming rates greater than 100,000 lb/hr, the boiling rates are significant enough to strip away dissolved oxygen, but high enough to start concentrating dissolved ions.

Because the dissolved oxygen is being effectively removed, the chloride ion limits are relaxed.

However, because the reactor is now acting as a concentrator for ionic impurities and particulates, the conductivity limits are made more stringent.

Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup

These are the baseline chemistry limits for water in contact with fuel. They are the same as the spent fuel pool with the extra limitation of pH.

Noble Metal Chemical Application (NMCA) and Subsequent Reactor Coolant Cleanup

During NMCA, the chemicals added to the reactor coolant (which contain the noble metals) will increase conductivity and affect pH. Therefore, special chemistry parameter limits are used for the NMCA process and subsequent reactor coolant cleanup. The chloride limits for this condition are unchanged from the 'Steaming Rates < 100,000 lb/hr' condition.

APPLICABILITY

These limits are applicable, as specified, at all times when fuel is in the reactor vessel.

ACTIONS

A.1 and B.1

A two week per year allowance for exceeding the normal chemistry limits is allowed to give the opportunity for the reactor water cleanup system to return the water chemistry to normal after a transient chemical intrusion.

C.1

These chemistry limits take into account factors of corrosion that may not be affected by the amount of chloride ion.

D.1 and D.2

The major benefit of Cold Shutdown is to reduce the temperature dependent corrosion rates and provide time for the cleanup system to reestablish the purity of the reactor coolant.

E.1

Immediate ACTIONS are taken to bring coolant chemistry within limits.

TR 3.3 INSTRUMENTATION

TR 3.3.9 Offgas Hydrogen Analyzer Instrumentation

LCO 3.3.9 There shall be at least one OPERABLE Offgas Hydrogen Analyzer instrument with alarm setpoint set to ensure the limit of TRM LCO 3.7.2 is not exceeded.

APPLICABILITY: During main condenser offgas treatment system operation

-----NOTE-----
TRM LCO 3.0.3 is not applicable.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. No OPERABLE Offgas Hydrogen Analyzer instruments.	A.1 Install a temporary monitor	4 hours
	<u>OR</u>	
	A.2.1 Take grab samples <u>AND</u>	4 hours from discovery of no OPERABLE instrument AND Every 4 hours thereafter
	A.2.2 Analyze the sample for explosive concentration of hydrogen.	4 hours following grab sample

TECHNICAL SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
TSR 3.3.9.1	Perform CHANNEL CHECK.	24 hours
TSR 3.3.9.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
TSR 3.3.9.3	------------------------NOTE------------------------ Shall include use of standard gas samples containing a nominal zero volume percent hydrogen (compressed air), and a nominal one volume percent hydrogen, balance nitrogen. -- Perform CHANNEL CALIBRATION.	Once per OPERATING CYCLE

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Conditions A, B, or C not met. OR Conductivity > 10 µmho/cm at 25°C. OR Chloride concentration > 0.5 ppm. OR Conductivity or chloride concentration limits of Table 3.4.1-1 Column A exceeded.	D.1 Initiate an orderly shutdown. AND D.2 Be in MODE 4.	Immediately As rapidly as cooldown rate permits
E. Coolant chemistry limits of Table 3.4.1-1 Column C or D exceeded.	E.1 Initiate action to restore coolant chemistry within limits.	Immediately

Table 3.4.1-1
Coolant Chemistry Limits[1]

CHEMISTRY PARAMETERS	COLUMN A APPLICABLE CONDITION Prior To Startup And At Steaming Rates < 100,000 lb/hr	COLUMN B APPLICABLE CONDITION Steaming Rates > 100,000 lb/hr	COLUMN C APPLICABLE CONDITION Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup Condition	COLUMN D[2] APPLICABLE CONDITION Noble Metal Chemical Application and Subsequent Reactor Coolant Cleanup
CHLORIDE (ppm)	≤ 0.1	≤ 0.2	≤ 0.5	≤ 0.1
CONDUCTIVITY (μmho/cm at 25°C)	≤ 2.0	≤ 1.0	≤ 10.0	≤ 20.0
pH	5.6-8.6	5.6-8.6	5.3-8.6	4.3-9.9

(1) When there is no fuel in the reactor vessel, Technical Requirement reactor coolant chemistry limits do not apply.

(2) During the Noble Metal Chemical Application and subsequent reactor coolant cleanup, CONDITIONS A, B, C, and D (including Required Actions and Completion Times) do not apply.

BASES

APPLICABLE SAFETY ANALYSIS

The hydrogen concentration of the gases from the air ejector is maintained below the flammable limit by maintaining adequate steam flow for dilution at all times. The pressure of the steam supplied to the first and third stage steam jet air ejectors is monitored. The steam jet air ejector inlet and effluent are automatically isolated on low steam supply pressure. The preheaters are heated with steam, rather than electrically, to eliminate presence of potential ignition sources and to limit the temperature of the gases in the event of cessation of gas flow. The recombiner temperatures are monitored and an alarm is actuated to indicate any deterioration of performance. A hydrogen analyzer downstream of the recombiners provides an additional check on recombiner performance.

LCO 3.3.9

These instruments are required to alert the operator of explosive conditions within the offgas system, and prompt the operator to comply with Technical Requirements 3.7.2

APPLICABILITY

The hydrogen buildup in the offgas system will stop when the main condenser offgas system is removed from service. Hence, this requirement is only applicable during main condenser offgas treatment system operation.

The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 63 of Appendix A to 10 CFR 50.

ACTIONS

A.1 and A.2

Continued operation of the main condenser offgas treatment system is allowed provided adequate backup information is obtained from grab samples or a temporary monitor as required by ACTION A.

LCO 3.4.1 (continued)

Since oxygen may be at higher concentrations at low steaming rates, the chloride concentration limit is lower than at higher steaming rates when the oxygen content is lower.

However, the conductivity is allowed to be at a higher level provided it is not caused from chloride ions due to the fact that the dissolved gases may result in higher conductivity. During startup or hot standby conditions, the reactor water cleanup system may be more efficient since the makeup from feedwater is very low.

Steaming Rates > 100,000 lb/hr

At steaming rates greater than 100,000 lb/hr, the boiling rates are significant enough to strip away dissolved oxygen, but high enough to start concentrating dissolved ions.

Because the dissolved oxygen is being effectively removed, the chloride ion limits are relaxed.

However, because the reactor is now acting as a concentrator for ionic impurities and particulates, the conductivity limits are made more stringent.

Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup

These are the baseline chemistry limits for water in contact with fuel. They are the same as the spent fuel pool with the extra limitation of pH.

Noble Metal Chemical Application (NMCA) and Subsequent Reactor Coolant Cleanup

During NMCA, the chemicals added to the reactor coolant (which contain the noble metals) will increase conductivity and affect pH. Therefore, special chemistry parameter limits are used for the NMCA process and subsequent reactor coolant cleanup. The chloride limits for this condition are unchanged from the 'Steaming Rates < 100,000 lb/hr' condition.

APPLICABILITY

These limits are applicable, as specified, at all times when fuel is in the reactor vessel.

ACTIONS

A.1 and B.1

A two week per year allowance for exceeding the normal chemistry limits is allowed to give the opportunity for the reactor water cleanup system to return the water chemistry to normal after a transient chemical intrusion.

C.1

These chemistry limits take into account factors of corrosion that may not be affected by the amount of chloride ion.

D.1 and D.2

The major benefit of Cold Shutdown is to reduce the temperature dependent corrosion rates and provide time for the cleanup system to reestablish the purity of the reactor coolant.

E.1

Immediate ACTIONS are taken to bring coolant chemistry within limits.

Technical Requirements Manual

Revision 17

Snubbers

TR 3.7 PLANT SYSTEMS

TR 3.7.4 Snubbers

LCO 3.7.4 During all MODES of operation, all snubbers shall be OPERABLE. All safety-related snubbers are listed in plant procedures.

APPLICABILITY: MODES 1, 2, 3, 4, 5 when the associated system/component is required to be OPERABLE.

---NOTE---
Snubbers located inside the drywell on reactor vessel attached piping shall be OPERABLE whenever fuel is in the reactor vessel. Snubbers on the Main Steam, HPCI, and RCIC piping, in the drywell, are exempt from the operability requirement when the steam line plugs are installed in the reactor vessel.

ACTIONS

---NOTE---
Separate condition entry is allowed for each system/train - not per snubber.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more snubber(s) inoperable.	A.1.1 Replace or restore the inoperable snubber(s) to OPERABLE status. <u>AND</u>	72 hours (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more snubber(s) inoperable (continued).	-----NOTES----- 1. Only required if the snubber(s) do not meet the functional test acceptance criteria of TSR 3.7.4.2. 2. The evaluation must ensure the inoperable snubber did not adversely affect the supported component or system during the previous operating cycle. -----	
	A.1.2 Perform an engineering evaluation on the supported component or system.	72 hours
	<u>OR</u>	
	A.2 Declare the supported system inoperable. (Refer to applicable TS and TRM LCOs).	72 hours

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.7.4.1 (continued)	c. Fasteners for the attachment of the snubber to the component or system and to the snubber anchorage are functional. The discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. Snubbers which appear inoperable as a result of visual inspection shall be classified unacceptable and may be reclassified acceptable for the purpose of establishing the next visual inspection interval, provided that (1) the cause of the rejection is clearly established and remedied for that particular snubber and for other snubbers irrespective of type that may be generically susceptible; and (2) the affected snubber is functionally tested in the as-found condition and determined OPERABLE per the criteria of TSR 3.7.4.2. A review and evaluation shall be performed and documented to justify continued operation with an unacceptable snubber. If continued operation cannot be justified, the system or train shall be declared inoperable. Additionally, snubbers attached to sections of safety related systems that have experienced unexpected potentially damaging transients since the last inspection period shall be evaluated for the possibility of concealed damage and functionally tested, if applicable, to confirm OPERABILITY. Snubbers which have been made inoperable as the result of unexpected transients, isolated damage, or other random	

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.7.4.1 (continued)	events, when the provisions of TSR 3.7.4.5 and TSR 3.7.4.6 have been met and any other appropriate corrective action implemented, shall not be counted in determining the next visual inspection interval.	
TSR 3.7.4.2	Perform an in-place or bench functional test of a representative sample of 10% of the total of each type of safety-related snubber(s). a. The representative sample selected for functional testing shall include the various configurations, operating environments, and the range of size and capacity of snubbers within the types; b. The representative sample should be weighed to include more snubbers from severe service areas such as near heavy equipment; c. The stroke setting and the security of fasteners for attachment of the snubbers to the component or system and to the snubber anchorage shall be verified.	24 months

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.7.4.2 (continued)	Functional Test Acceptance Criteria: The snubber functional test shall verify that: a. Activation (restraining action) is achieved in both tension and compression within the specified range, except that inertia dependent, acceleration limiting mechanical snubbers may be tested to verify only that activation takes place in both directions of travel. b. Snubber bleed or release, where required, is present in both compression and tension within the specified range. c. For mechanical snubbers, the force required to initiate or maintain motion of the snubber is not great enough to overstress the supported component or system during thermal movement, or to indicate impending failure of the snubber. d. For snubbers specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement shall be verified. e. Testing methods may be used to measure parameters indirectly or parameters other than those specified if those results can be correlated to the specified parameters through established methods.	

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
TSR 3.7.4.3	A failure analysis shall be made of each failure to meet the functional test acceptance criteria of TSR 3.7.4.2 to determine the cause of the failure. The result of this analysis shall be used, if applicable, in selecting snubbers to be tested in the subsequent lot in an effort to determine the OPERABILITY of other snubbers which may be subject to the same failure mode. Selection of snubbers for future testing may also be based on the failure analysis. For each failed snubber, perform in-place or bench functional test on an additional lot equal to 10% of the remainder of that type of snubber. Testing shall continue until no additional inoperable snubbers are found within subsequent lots or all snubbers of the original test type are tested or all suspect snubbers identified by the failure analysis have been tested, as applicable. The functional test criteria shall be as specified in TSR 3.7.4.2.	Once for each discovery of snubber failure to meet functional test acceptance criteria
	Prior to functional testing the discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. The result of the evaluation will be used to select other suspect snubbers for verifying the attachment fasteners, as applicable.	Once for each discovery of loose or missing attachment fasteners

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
TSR 3.7.4.4	---NOTE--- This testing is independent of the requirements of TSR 3.7.4.3. --- For any snubber which fails to lockup or fails to move (i.e., frozen in place), evaluate the cause. If caused by manufacturer or design deficiency, perform in-place or bench functional test of all snubbers of the same design, subject to the same defect. The functional test acceptance criteria shall be as specified in TSR 3.7.4.2.	Once for each discovery of snubber failure to lockup or failure to move
TSR 3.7.4.5	Perform an engineering evaluation on the component or system which is restrained by the snubber(s) found inoperable due to not meeting their functional test acceptance criteria as specified in TSR 3.7.4.2.	Once for each discovery of an inoperable snubber
TSR 3.7.4.6	Verify replacement snubbers and snubbers having repairs which might affect the functional test results meet the test criteria of TSR 3.7.4.2. a. These snubbers shall have met the acceptance criteria subsequent to their most recent service; and b. The functional test must have been performed within the 12 months prior to being installed in the unit.	Once prior to installation in the unit for each replacement snubber and each snubber which has repairs which might affect functional test results

TR 3.7 PLANT SYSTEMS

TR 3.7.4 Snubbers

BASES

BACKGROUND

Snubbers are designed to prevent unrestrained component or system motion under dynamic loads as might occur during an earthquake or severe transient, while allowing normal thermal motion during startup and shutdown. The consequence of an inoperable snubber is an increase in the probability of structural damage to the component or system as a result of a seismic or other event initiating dynamic loads. An inoperable snubber (ex: failed by locked in place) may cause damage to the supported component or system from normal operating modes such as thermal operation. It is, therefore, required that all snubbers required to protect the primary coolant system or any other safety related component or system be OPERABLE during MODES 1, 2, 3, 4, and 5. The Technical Requirements Manual (TRM) action statements establish allowable outage times for components or systems addressed by the Limiting Conditions of Operation (LCO) for snubbers. These time limits are applicable when a snubber must be removed from service to perform required surveillance tests. For snubbers, the allowable outage time is 72 hours. Table 3.7.4-1, "Snubber Visual Inspection Interval" was issued to all nuclear plant license holders by the Nuclear Regulatory Commission (NRC) under Generic Letter (GL) 90-09. This was added to the old Technical Specification and approved by the NRC under Technical Specification Amendment 210.

APPLICABLE SAFETY ANALYSIS

When a snubber is removed from a component or system for surveillance testing or maintenance activity the snubber is declared inoperable since it cannot perform its intended function while removed. This type of inoperability is not a failure and does not require an engineering evaluation to be performed. If a snubber is found to be inoperable during testing, an engineering evaluation is performed to determine whether the mode of failure of the snubber(s) has adversely affected any safety-related component or system, to which the snubber(s) are attached during the previous unit operating cycle with the snubber inoperable, to assure the component or system remains capable of meeting its designed service. This engineering evaluation does not relate to the component or system capability to withstand a seismic event or severe transients.

APPLICABLE SAFETY ANALYSIS (continued)	Removal for surveillance testing is not a mode of failure. The modes of failure for snubbers are (locked in place, high drag force, does not activate, no lockup, high lockup, low lockup, high bleed, no bleed, or damage to the snubber hardware). Once a snubber is found to be inoperable, by failing its functional test acceptance criteria as stated in TSR 3.7.4.2, an engineering evaluation shall be performed to determine the effects on the supported component or system during the previous unit operating cycle with the snubber inoperable, and to assure the component or system remains capable of meeting its designed service and the OPERABILITY of the affected system(s). Additionally, only a limited amount of time (72 hours) is allowed for the supported component or system to be considered OPERABLE, since adequate protection during seismic or other events initiating dynamic loads may not be provided with the snubber inoperable. Any degradation in seismic or dynamic protection due to an inoperable snubber(s) was taken into account in establishing the 72 hour allowable time, because the protection is required only during relatively low probability events. During MODES 1, 2, 3, 4, and 5 snubbers may be removed from service for functional surveillance testing to satisfy the required testing interval.
LCO 3.7.4	During all MODES of operation, all snubbers shall be OPERABLE. The number of snubbers on each unit and shared systems at BFN are too numerous to list in this Technical Requirement. The surveillance 4.6.H series lists the snubbers that are required.
APPLICABILITY	During all MODES of operation, all snubbers shall be OPERABLE. All MODES are applicable for this requirement since the snubbers affect a wide variety of components and systems, of which some of the systems are required in one or more MODES of operation. All MODES are covered since every MODE will be applicable for one or more of the supported components or systems. However, if a component or system affected by the snubber is not required to be OPERABLE, then the snubber is not required to be OPERABLE, except as follows: the snubbers located inside the drywell on reactor vessel attached piping systems shall be considered OPERABLE whenever fuel is in the reactor vessel. The snubbers on Main Steam, HPCI, and RCIC piping in the drywell are exempt from this requirement when the steam line

BASES

APPLICABILITY (continued)	plugs are installed inside the reactor vessel. During the times the snubbers are not required to be OPERABLE for an inoperable system, the inoperable snubber(s) will be tracked to prevent declaring the system OPERABLE with unanalyzed inoperable snubbers.

ACTIONS

A.1 and A.2

A separate condition entry statement has been added to the ACTIONS allowing a separate condition to be entered for each system/train. The CONDITION statement does not look at how many snubbers are inoperable on a system/train, but requires that all of the inoperable snubbers be replaced within the 72 hours time limit or the system/train must be declared inoperable.

A note is provided, in the Required Action section, to indicate that an engineering evaluation is not required if snubber(s) are removed for surveillance testing or maintenance, unless the snubber(s) do not meet their functional test acceptance criteria of TSR 3.7.4.2.

Because the protection is required only during relatively low probability events, a period of 72 hours is allowed to replace or restore the inoperable snubber(s) to an OPERABLE status, or the supported component, system, or train must be declared inoperable. The component, system, or train will not be declared inoperable unless the snubber(s) does not meet their functional test acceptance criteria of TSR 3.7.4.2 and Required Action A.1.1 cannot be met. An engineering evaluation shall be performed on the supported component or system, only if the snubber(s) do not meet their functional test acceptance criteria of TSR 3.7.4.2. The engineering evaluation is performed to determine whether the mode of failure of the snubber(s) has adversely affected any safety-related component or system, to which the snubber(s) are attached during the previous unit operating cycle with the snubber inoperable, and to assure the component or system remains capable of meeting its designed service. The engineering evaluation does not relate to the component or system capability to withstand a seismic event or severe transient. Any degradation in seismic or dynamic protection due to an inoperable snubber(s) was taken into account in establishing the 72 hour allowable time.

TECHNICAL SURVEILLANCE REQUIREMENTS

A note is provided to indicate that each safety-related snubber (listed in plant procedures) shall be demonstrated OPERABLE by performance of the augmented inservice inspection program and requirements of this Technical Requirement.

An additional note is provided to indicate that in this Technical Requirement, "type of snubber" shall mean snubbers of the same design and manufacturer, irrespective of capacity.

The augmented inservice inspection program includes the following.

All safety-related snubbers are visually inspected for overall integrity and OPERABILITY. The visual inspection will include verification of proper orientation, adequate fluid level, if applicable, no visible indications of damage or impaired OPERABILITY, proper attachment of the snubber to the component or system and structures, and no loose or missing fasteners. The removal of insulation or the verification of torque values for threaded fasteners is not required for visual inspections.

The visual inspection frequency is based upon maintaining a constant level of snubber protection. In accordance with Table 3.7.4-1, the number of inoperable snubbers found during a required inspection determines the time interval for the next required inspection. Inspections performed before that interval has elapsed may be used as a new reference point to determine the next inspection. However, the results of such early inspections performed before the original required time interval has elapsed (nominal time less 25 percent) may not be used to lengthen the required inspection interval. Any inspection whose results require a shorter inspection interval will override the previous schedule.

When the cause of the rejection of a snubber in a visual inspection is clearly established and remedied for that snubber and for any other snubber(s) that may be generically susceptible and OPERABILITY verified by inservice functional testing, if applicable, that snubber(s) may be reclassified as OPERABLE. Generically susceptible snubbers are those which are of a specific make or model and have the same design features directly related to the rejected snubber, or are similarly located or exposed to the same environmental conditions such as temperature, radiation, and

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

vibration. The inspection population or category may be established based on design features, or installed conditions which may be expected to be generic. Each of these inspection populations or categories may be inspected and tested separately unless an engineering analysis indicates the inspection population or category is improperly constituted. All suspect snubbers are subject to inspection and testing regardless of inspection population or category.

To verify snubber OPERABILITY, a functional test shall be performed once per 24 months.

These tests will include stroking of the snubbers to verify proper movement, activation, and bleed or release. Ten percent represents an adequate sample for such tests. Observed failures on these samples will require a failure analysis and testing of additional units. If the failure analysis results in the determination that the failure of a snubber to activate or to stroke (i.e., seized components) is the result of a manufacture or design deficiency, all snubbers subject to the same defect shall be functionally tested. Also, an engineering evaluation shall be performed to determine the effects on the supported component or system during the previous unit operating cycle with the snubber inoperable, and to ensure it remains capable of meeting its designed service. A thorough visual inspection of the snubber threaded attachments to the component or system and the anchorage will be made in conjunction with all required functional tests. The stroke setting of the snubbers selected for functional testing also will be verified.

Exemption from Visual Inspection or Functional Tests:

Permanent or other exemptions from visual inspections and/or functional testing for individual snubbers may be granted by the Nuclear Regulatory Commission if a justifiable basis for exemption is presented and if applicable snubber life destructive testing was performed to qualify the snubber OPERABILITY for the applicable design conditions at either the completion of their fabrication or at a subsequent date. Snubbers so exempted shall continue to be listed in the plant instructions with footnotes indicating the extent of the exemptions.

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

Snubber Service Life Program:

The service life of snubbers may be extended based on an evaluation of the records of functional tests, maintenance history, and environmental conditions to which the snubbers have been exposed.

The following will be implemented by the augmented inservice inspection program:

TSR 3.7.4.1

Visual Inspections:

Snubbers are categorized as inaccessible or accessible during reactor operation. Each of these populations or categories (inaccessible or accessible) may be inspected separately or jointly according to the schedule determined by Table 3.7.4-1. The visual inspection interval for a snubber population or category shall be determined based upon the criteria provided by Table 3.7.4-1. The first inspection interval determined using Table 3.7.4-1 criteria shall be based on the previous inspection interval as established by the requirements in effect before Technical Specification Amendment No. 210 was issued.

Visual Inspection Acceptance Criteria:

Visual inspections shall verify that (1) the snubber has no visible indications of damage or impaired OPERABILITY, (2) attachments to the foundation or supporting structure are functional, and (3) fasteners for the attachment of the snubber to the component or system and to the snubber anchorage are functional.

Snubbers which appear inoperable as a result of visual inspection shall be classified unacceptable and may be reclassified acceptable for the purpose of establishing the next visual inspection interval, provided that (1) the cause of the rejection is clearly established and remedied for that particular snubber and for other snubbers, irrespective of type, that may be generically susceptible; and (2) the affected snubber is functionally tested in the as-found condition and determined OPERABLE per the functional test acceptance criteria of TSR 3.7.4.2.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.1 (continued)

A review and evaluation shall be performed and documented to justify continued operation with an unacceptable snubber. If continued operation cannot be justified, the snubber shall be declared inoperable.

Additionally, snubbers attached to sections of safety-related systems that have experienced unexpected potentially damaging transients since the last inspection period shall be evaluated for the possibility of concealed damage and functionally tested, if applicable, to confirm OPERABILITY. Snubbers which have been made inoperable as the result of unexpected transients, isolated damage, or other random events, when the provisions of TSR 3.7.4.5 and 3.7.4.6 have been met and any other appropriate corrective action implemented, shall not be counted in determining the next visual inspection interval.

TSR 3.7.4.2

Functional Test Schedule, Lot Size, and Composition:

Once per 24 months, a representative sample of 10% of the total of each type of safety-related snubbers in use in the plant shall be functionally tested either in place or in a bench test.

The representative sample selected for functional testing shall include the various configurations, operating environments, and the range of size and capacity of snubbers within the types. The representative sample should be weighed to include more snubbers from severe service areas such as near heavy equipment. The stroke setting and the security of fasteners for attachment of the snubbers to the component or system and to the snubber anchorage shall be verified on snubbers selected for functional tests.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.2 (continued)

Functional Test Acceptance Criteria:

The snubber functional test shall verify that:

a. Activation (restraining action) is achieved in both tension and compression within the specified range, except that inertia dependent, acceleration limiting mechanical snubbers may be tested to verify only that activation takes place in both directions of travel.

b. Snubber bleed, or release where required, is present in both compression and tension within the specified range.

c. For mechanical snubbers, the force required to initiate or maintain motion of the snubber is not great enough to overstress the supported component or system during thermal movement, or to indicate impending failure of the snubber.

d. For snubbers specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement shall be verified.

e. Testing methods may be used to measure parameters indirectly or parameters other than those specified if those results can be correlated to the specified parameters through established methods.

TSR 3.7.4.3

Functional Test Failure Analysis and Additional Test Lots:

A failure analysis shall be performed for each failure to meet the functional test acceptance criteria to determine the cause of the failure. The result of this analysis shall be used, if applicable, in selecting snubbers to be tested in the subsequent lot in an effort to determine the OPERABILITY of other snubbers which may be subject to the same failure mode. Selection of snubbers for future testing may also be based on the failure analysis.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.3 (continued)

For each snubber that does not meet the functional test acceptance criteria, an additional lot equal to 10 percent of the remainder of that type of snubber(s) shall be functionally tested. Testing shall continue until no additional inoperable snubbers are found within subsequent lots or all snubbers of the original functional test type have been tested or all suspect snubbers identified by the failure analysis have been tested, as applicable.

The discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. The result of the evaluation will be used to select other suspect snubbers for verifying the attachment fasteners, as applicable.

TSR 3.7.4.4

If any snubber selected for functional testing either fails to lockup or fails to move, i.e., frozen in place, the cause will be evaluated and if caused by manufacturer or design deficiency, all snubbers of the same design, subject to the same defect, shall be functionally tested. This testing requirement shall be independent of the requirements stated above for snubbers not meeting the functional test acceptance criteria.

TSR 3.7.4.5

Functional Test Failure - Supported Component or System Analysis:

For the snubber(s) found inoperable, an engineering evaluation shall be performed on the component or system which is restrained by the snubber(s) due to not meeting their functional test acceptance criteria. The purpose of this engineering evaluation shall be to determine if the component or system restrained by the snubber(s) was adversely affected by the inoperability of the snubber(s), and in order to ensure that the restrained component or system remains capable of meeting the designed service.

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

TSR 3.7.4.6

Functional Testing of Repaired and Spare Snubbers:

Snubbers which fail the visual inspection or the functional test acceptance criteria shall be repaired or replaced. Replacement snubbers and snubbers having repairs which might affect the functional test results shall meet the functional test acceptance criteria before installation in the unit. These snubbers shall have met the acceptance criteria subsequent to their most recent service, and the functional test must have been performed within 12 months prior to being installed in the unit.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)

TR 3.7 PLANT SYSTEMS

TR 3.7.4 Snubbers

LCO 3.7.4 During all MODES of operation, all snubbers shall be OPERABLE. All safety-related snubbers are listed in plant procedures.

APPLICABILITY: MODES 1, 2, 3, 4, 5 when the associated system/component is required to be OPERABLE.

-----NOTE-----
Snubbers located inside the drywell on reactor vessel attached piping shall be OPERABLE whenever fuel is in the reactor vessel. Snubbers on the Main Steam, HPCI, and RCIC piping, in the drywell, are exempt from the operability requirement when the steam line plugs are installed in the reactor vessel.

ACTIONS

-----NOTE-----
Separate condition entry is allowed for each system/train - not per snubber.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more snubber(s) inoperable.	A.1.1 Replace or restore the inoperable snubber(s) to OPERABLE status. <u>AND</u>	72 hours
		(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more snubber(s) inoperable (continued).	--------------NOTES-------------- 1. Only required if the snubber(s) do not meet the functional test acceptance criteria of TSR 3.7.4.2. 2. The evaluation must ensure the inoperable snubber did not adversely affect the supported component or system during the previous operating cycle. --	
	A.1.2 Perform an engineering evaluation on the supported component or system.	72 hours
	<u>OR</u>	
	A.2 Declare the supported system inoperable. (Refer to applicable TS and TRM LCOs).	72 hours

TECHNICAL SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
TSR 3.7.4.1 (continued)	c. Fasteners for the attachment of the snubber to the component or system and to the snubber anchorage are functional. The discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. Snubbers which appear inoperable as a result of visual inspection shall be classified unacceptable and may be reclassified acceptable for the purpose of establishing the next visual inspection interval, provided that (1) the cause of the rejection is clearly established and remedied for that particular snubber and for other snubbers irrespective of type that may be generically susceptible; and (2) the affected snubber is functionally tested in the as-found condition and determined OPERABLE per the criteria of TSR 3.7.4.2. A review and evaluation shall be performed and documented to justify continued operation with an unacceptable snubber. If continued operation cannot be justified, the system or train shall be declared inoperable. Additionally, snubbers attached to sections of safety related systems that have experienced unexpected potentially damaging transients since the last inspection period shall be evaluated for the possibility of concealed damage and functionally tested, if applicable, to confirm OPERABILITY. Snubbers which have been made inoperable as the result of unexpected transients, isolated damage, or other random	

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.7.4.1 (continued)	events, when the provisions of TSR 3.7.4.5 and TSR 3.7.4.6 have been met and any other appropriate corrective action implemented, shall not be counted in determining the next visual inspection interval.	
TSR 3.7.4.2	Perform an in-place or bench functional test of a representative sample of 10% of the total of each type of safety-related snubber(s). a. The representative sample selected for functional testing shall include the various configurations, operating environments, and the range of size and capacity of snubbers within the types; b. The representative sample should be weighed to include more snubbers from severe service areas such as near heavy equipment; c. The stroke setting and the security of fasteners for attachment of the snubbers to the component or system and to the snubber anchorage shall be verified.	24 months

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.7.4.2 (continued)	Functional Test Acceptance Criteria: The snubber functional test shall verify that: a. Activation (restraining action) is achieved in both tension and compression within the specified range, except that inertia dependent, acceleration limiting mechanical snubbers may be tested to verify only that activation takes place in both directions of travel. b. Snubber bleed or release, where required, is present in both compression and tension within the specified range. c. For mechanical snubbers, the force required to initiate or maintain motion of the snubber is not great enough to overstress the supported component or system during thermal movement, or to indicate impending failure of the snubber. d. For snubbers specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement shall be verified. e. Testing methods may be used to measure parameters indirectly or parameters other than those specified if those results can be correlated to the specified parameters through established methods.	

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
TSR 3.7.4.3	A failure analysis shall be made of each failure to meet the functional test acceptance criteria of TSR 3.7.4.2 to determine the cause of the failure. The result of this analysis shall be used, if applicable, in selecting snubbers to be tested in the subsequent lot in an effort to determine the OPERABILITY of other snubbers which may be subject to the same failure mode. Selection of snubbers for future testing may also be based on the failure analysis. For each failed snubber, perform in-place or bench functional test on an additional lot equal to 10% of the remainder of that type of snubber. Testing shall continue until no additional inoperable snubbers are found within subsequent lots or all snubbers of the original test type are tested or all suspect snubbers identified by the failure analysis have been tested, as applicable. The functional test criteria shall be as specified in TSR 3.7.4.2.	Once for each discovery of snubber failure to meet functional test acceptance criteria
	Prior to functional testing the discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. The result of the evaluation will be used to select other suspect snubbers for verifying the attachment fasteners, as applicable.	Once for each discovery of loose or missing attachment fasteners

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
TSR 3.7.4.4	---NOTE--- This testing is independent of the requirements of TSR 3.7.4.3. ------ For any snubber which fails to lockup or fails to move (i.e., frozen in place), evaluate the cause. If caused by manufacturer or design deficiency, perform in-place or bench functional test of all snubbers of the same design, subject to the same defect. The functional test acceptance criteria shall be as specified in TSR 3.7.4.2.	Once for each discovery of snubber failure to lockup or failure to move
TSR 3.7.4.5	Perform an engineering evaluation on the component or system which is restrained by the snubber(s) found inoperable due to not meeting their functional test acceptance criteria as specified in TSR 3.7.4.2.	Once for each discovery of an inoperable snubber
TSR 3.7.4.6	Verify replacement snubbers and snubbers having repairs which might affect the functional test results meet the test criteria of TSR 3.7.4.2. a. These snubbers shall have met the acceptance criteria subsequent to their most recent service; and b. The functional test must have been performed within the 12 months prior to being installed in the unit.	Once prior to installation in the unit for each replacement snubber and each snubber which has repairs which might affect functional test results

TR 3.7 PLANT SYSTEMS

TR 3.7.4 Snubbers

BASES

BACKGROUND	Snubbers are designed to prevent unrestrained component or system motion under dynamic loads as might occur during an earthquake or severe transient, while allowing normal thermal motion during startup and shutdown. The consequence of an inoperable snubber is an increase in the probability of structural damage to the component or system as a result of a seismic or other event initiating dynamic loads. An inoperable snubber (ex: failed by locked in place) may cause damage to the supported component or system from normal operating modes such as thermal operation. It is, therefore, required that all snubbers required to protect the primary coolant system or any other safety related component or system be OPERABLE during MODES 1, 2, 3, 4, and 5. The Technical Requirements Manual (TRM) action statements establish allowable outage times for components or systems addressed by the Limiting Conditions of Operation (LCO) for snubbers. These time limits are applicable when a snubber must be removed from service to perform required surveillance tests. For snubbers, the allowable outage time is 72 hours. Table 3.7.4-1, "Snubber Visual Inspection Interval" was issued to all nuclear plant license holders by the Nuclear Regulatory Commission (NRC) under Generic Letter (GL) 90-09. This was added to the old Technical Specification and approved by the NRC under Technical Specification Amendment 225.
APPLICABLE SAFETY ANALYSIS	When a snubber is removed from a component or system for surveillance testing or maintenance activity the snubber is declared inoperable since it cannot perform its intended function while removed. This type of inoperability is not a failure and does not require an engineering evaluation to be performed. If a snubber is found to be inoperable during testing, an engineering evaluation is performed to determine whether the mode of failure of the snubber(s) has adversely affected any safety-related component or system, to which the snubber(s) are attached during the previous unit operating cycle with the snubber inoperable, to assure the component or system remains capable of meeting its designed service. This engineering evaluation does not relate to the component or system capability to withstand a seismic event or severe transients.

APPLICABLE SAFETY ANALYSIS (continued)	Removal for surveillance testing is not a mode of failure. The modes of failure for snubbers are (locked in place, high drag force, does not activate, no lockup, high lockup, low lockup, high bleed, no bleed, or damage to the snubber hardware). Once a snubber is found to be inoperable, by failing its functional test acceptance criteria as stated in TSR 3.7.4.2, an engineering evaluation shall be performed to determine the effects on the supported component or system during the previous unit operating cycle with the snubber inoperable, and to assure the component or system remains capable of meeting its designed service and the OPERABILITY of the affected system(s). Additionally, only a limited amount of time (72 hours) is allowed for the supported component or system to be considered OPERABLE, since adequate protection during seismic or other events initiating dynamic loads may not be provided with the snubber inoperable. Any degradation in seismic or dynamic protection due to an inoperable snubber(s) was taken into account in establishing the 72 hour allowable time, because the protection is required only during relatively low probability events. During MODES 1, 2, 3, 4, and 5 snubbers may be removed from service for functional surveillance testing to satisfy the required testing interval.
LCO 3.7.4	During all MODES of operation, all snubbers shall be OPERABLE. The number of snubbers on each unit and shared systems at BFN are too numerous to list in this Technical Requirement. The surveillance 4.6.H series lists the snubbers that are required.
APPLICABILITY	During all MODES of operation, all snubbers shall be OPERABLE. All MODES are applicable for this requirement since the snubbers affect a wide variety of components and systems, of which some of the systems are required in one or more MODES of operation. All MODES are covered since every MODE will be applicable for one or more of the supported components or systems. However, if a component or system affected by the snubber is not required to be OPERABLE, then the snubber is not required to be OPERABLE, except as follows: the snubbers located inside the drywell on reactor vessel attached piping systems shall be considered OPERABLE whenever fuel is in the reactor vessel. The snubbers on Main Steam, HPCI, and RCIC piping in the drywell are exempt from this requirement when the steam line

BASES

APPLICABILITY (continued)

plugs are installed inside the reactor vessel. During the times the snubbers are not required to be OPERABLE for an inoperable system, the inoperable snubber(s) will be tracked to prevent declaring the system OPERABLE with unanalyzed inoperable snubbers.

ACTIONS

A.1 and A.2

A separate condition entry statement has been added to the ACTIONS allowing a separate condition to be entered for each system/train. The CONDITION statement does not look at how many snubbers are inoperable on a system/train, but requires that all of the inoperable snubbers be replaced within the 72 hours time limit or the system/train must be declared inoperable.

A note is provided, in the Required Action section, to indicate that an engineering evaluation is not required if snubber(s) are removed for surveillance testing or maintenance, unless the snubber(s) do not meet their functional test acceptance criteria of TSR 3.7.4.2.

Because the protection is required only during relatively low probability events, a period of 72 hours is allowed to replace or restore the inoperable snubber(s) to an OPERABLE status, or the supported component, system, or train must be declared inoperable. The component, system, or train will not be declared inoperable unless the snubber(s) does not meet their functional test acceptance criteria of TSR 3.7.4.2 and Required Action A.1.1 cannot be met. An engineering evaluation shall be performed on the supported component or system, only if the snubber(s) do not meet their functional test acceptance criteria of TSR 3.7.4.2. The engineering evaluation is performed to determine whether the mode of failure of the snubber(s) has adversely affected any safety-related component or system, to which the snubber(s) are attached during the previous unit operating cycle with the snubber inoperable, and to assure the component or system remains capable of meeting its designed service. The engineering evaluation does not relate to the component or system capability to withstand a seismic event or severe transient. Any degradation in seismic or dynamic protection due to an inoperable snubber(s) was taken into account in establishing the 72 hour allowable time.

TECHNICAL SURVEILLANCE REQUIREMENTS

A note is provided to indicate that each safety-related snubber (listed in plant procedures) shall be demonstrated OPERABLE by performance of the augmented inservice inspection program and requirements of this Technical Requirement.

An additional note is provided to indicate that in this Technical Requirement, "type of snubber" shall mean snubbers of the same design and manufacturer, irrespective of capacity.

The augmented inservice inspection program includes the following.

All safety-related snubbers are visually inspected for overall integrity and OPERABILITY. The visual inspection will include verification of proper orientation, adequate fluid level, if applicable, no visible indications of damage or impaired OPERABILITY, proper attachment of the snubber to the component or system and structures, and no loose or missing fasteners. The removal of insulation or the verification of torque values for threaded fasteners is not required for visual inspections.

The visual inspection frequency is based upon maintaining a constant level of snubber protection. In accordance with Table 3.7.4-1, the number of inoperable snubbers found during a required inspection determines the time interval for the next required inspection. Inspections performed before that interval has elapsed may be used as a new reference point to determine the next inspection. However, the results of such early inspections performed before the original required time interval has elapsed (nominal time less 25 percent) may not be used to lengthen the required inspection interval. Any inspection whose results require a shorter inspection interval will override the previous schedule.

When the cause of the rejection of a snubber in a visual inspection is clearly established and remedied for that snubber and for any other snubber(s) that may be generically susceptible and OPERABILITY verified by inservice functional testing, if applicable, that snubber(s) may be reclassified as OPERABLE. Generically susceptible snubbers are those which are of a specific make or model and have the same design features directly related to the rejected snubber, or are similarly located or exposed to the same environmental conditions such as temperature, radiation, and

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

vibration. The inspection population or category may be established based on design features, or installed conditions which may be expected to be generic. Each of these inspection populations or categories may be inspected and tested separately unless an engineering analysis indicates the inspection population or category is improperly constituted. All suspect snubbers are subject to inspection and testing regardless of inspection population or category.

To verify snubber OPERABILITY, a functional test shall be performed once per 24 months.

These tests will include stroking of the snubbers to verify proper movement, activation, and bleed or release. Ten percent represents an adequate sample for such tests. Observed failures on these samples will require a failure analysis and testing of additional units. If the failure analysis results in the determination that the failure of a snubber to activate or to stroke (i.e., seized components) is the result of a manufacture or design deficiency, all snubbers subject to the same defect shall be functionally tested. Also, an engineering evaluation shall be performed to determine the effects on the supported component or system during the previous unit operating cycle with the snubber inoperable, and to ensure it remains capable of meeting its designed service. A thorough visual inspection of the snubber threaded attachments to the component or system and the anchorage will be made in conjunction with all required functional tests. The stroke setting of the snubbers selected for functional testing also will be verified.

Exemption from Visual Inspection or Functional Tests:

Permanent or other exemptions from visual inspections and/or functional testing for individual snubbers may be granted by the Nuclear Regulatory Commission if a justifiable basis for exemption is presented and if applicable snubber life destructive testing was performed to qualify the snubber OPERABILITY for the applicable design conditions at either the completion of their fabrication or at a subsequent date. Snubbers so exempted shall continue to be listed in the plant instructions with footnotes indicating the extent of the exemptions.

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

Snubber Service Life Program:

The service life of snubbers may be extended based on an evaluation of the records of functional tests, maintenance history, and environmental conditions to which the snubbers have been exposed.

The following will be implemented by the augmented inservice inspection program:

TSR 3.7.4.1

Visual Inspections:

Snubbers are categorized as inaccessible or accessible during reactor operation. Each of these populations or categories (inaccessible or accessible) may be inspected separately or jointly according to the schedule determined by Table 3.7.4-1. The visual inspection interval for a snubber population or category shall be determined based upon the criteria provided by Table 3.7.4-1. The first inspection interval determined using Table 3.7.4-1 criteria shall be based on the previous inspection interval as established by the requirements in effect before Technical Specification Amendment No. 225 was issued.

Visual Inspection Acceptance Criteria:

Visual inspections shall verify that (1) the snubber has no visible indications of damage or impaired OPERABILITY, (2) attachments to the foundation or supporting structure are functional, and (3) fasteners for the attachment of the snubber to the component or system and to the snubber anchorage are functional.

Snubbers which appear inoperable as a result of visual inspection shall be classified unacceptable and may be reclassified acceptable for the purpose of establishing the next visual inspection interval, provided that (1) the cause of the rejection is clearly established and remedied for that particular snubber and for other snubbers, irrespective of type, that may be generically susceptible; and (2) the affected snubber is functionally tested in the as-found condition and determined OPERABLE per the functional test acceptance criteria of TSR 3.7.4.2.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.1 (continued)

A review and evaluation shall be performed and documented to justify continued operation with an unacceptable snubber. If continued operation cannot be justified, the snubber shall be declared inoperable.

Additionally, snubbers attached to sections of safety-related systems that have experienced unexpected potentially damaging transients since the last inspection period shall be evaluated for the possibility of concealed damage and functionally tested, if applicable, to confirm OPERABILITY. Snubbers which have been made inoperable as the result of unexpected transients, isolated damage, or other random events, when the provisions of TSR 3.7.4.5 and 3.7.4.6 have been met and any other appropriate corrective action implemented, shall not be counted in determining the next visual inspection interval.

TSR 3.7.4.2

Functional Test Schedule, Lot Size, and Composition:

Once per 24 months, a representative sample of 10% of the total of each type of safety-related snubbers in use in the plant shall be functionally tested either in place or in a bench test.

The representative sample selected for functional testing shall include the various configurations, operating environments, and the range of size and capacity of snubbers within the types. The representative sample should be weighed to include more snubbers from severe service areas such as near heavy equipment. The stroke setting and the security of fasteners for attachment of the snubbers to the component or system and to the snubber anchorage shall be verified on snubbers selected for functional tests.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.2 (continued)

Functional Test Acceptance Criteria:

The snubber functional test shall verify that:

a. Activation (restraining action) is achieved in both tension and compression within the specified range, except that inertia dependent, acceleration limiting mechanical snubbers may be tested to verify only that activation takes place in both directions of travel.

b. Snubber bleed, or release where required, is present in both compression and tension within the specified range.

c. For mechanical snubbers, the force required to initiate or maintain motion of the snubber is not great enough to overstress the supported component or system during thermal movement, or to indicate impending failure of the snubber.

d. For snubbers specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement shall be verified.

e. Testing methods may be used to measure parameters indirectly or parameters other than those specified if those results can be correlated to the specified parameters through established methods.

TSR 3.7.4.3

Functional Test Failure Analysis and Additional Test Lots:

A failure analysis shall be performed for each failure to meet the functional test acceptance criteria to determine the cause of the failure. The result of this analysis shall be used, if applicable, in selecting snubbers to be tested in the subsequent lot in an effort to determine the OPERABILITY of other snubbers which may be subject to the same failure mode. Selection of snubbers for future testing may also be based on the failure analysis.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.3 (continued)

For each snubber that does not meet the functional test acceptance criteria, an additional lot equal to 10 percent of the remainder of that type of snubber(s) shall be functionally tested. Testing shall continue until no additional inoperable snubbers are found within subsequent lots or all snubbers of the original functional test type have been tested or all suspect snubbers identified by the failure analysis have been tested, as applicable.

The discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. The result of the evaluation will be used to select other suspect snubbers for verifying the attachment fasteners, as applicable.

TSR 3.7.4.4

If any snubber selected for functional testing either fails to lockup or fails to move, i.e., frozen in place, the cause will be evaluated and if caused by manufacturer or design deficiency, all snubbers of the same design, subject to the same defect, shall be functionally tested. This testing requirement shall be independent of the requirements stated above for snubbers not meeting the functional test acceptance criteria.

TSR 3.7.4.5

Functional Test Failure - Supported Component or System Analysis:

For the snubber(s) found inoperable, an engineering evaluation shall be performed on the component or system which is restrained by the snubber(s) due to not meeting their functional test acceptance criteria. The purpose of this engineering evaluation shall be to determine if the component or system restrained by the snubber(s) was adversely affected by the inoperability of the snubber(s), and in order to ensure that the restrained component or system remains capable of meeting the designed service.

BASES

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

TSR 3.7.4.6

Functional Testing of Repaired and Spare Snubbers:

Snubbers which fail the visual inspection or the functional test acceptance criteria shall be repaired or replaced. Replacement snubbers and snubbers having repairs which might affect the functional test results shall meet the functional test acceptance criteria before installation in the unit. These snubbers shall have met the acceptance criteria subsequent to their most recent service, and the functional test must have been performed within 12 months prior to being installed in the unit.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)

TR 3.7 PLANT SYSTEMS

TR 3.7.4 Snubbers

LCO 3.7.4 During all MODES of operation, all snubbers shall be OPERABLE. All safety-related snubbers are listed in plant procedures.

APPLICABILITY: MODES 1, 2, 3, 4, 5 when the associated system/component is required to be operable.

-----NOTE-----
Snubbers located inside the drywell on reactor vessel attached piping shall be operable whenever fuel is in the reactor vessel. Snubbers on the Main Steam, HPCI, and RCIC piping, in the drywell, are exempt from the operability requirement when the steam line plugs are installed in the reactor vessel.

ACTIONS

-----NOTE-----
Separate condition entry is allowed for each system/train - not per snubber.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more snubber(s) inoperable.	A.1.1 Replace or restore the inoperable snubber(s) to OPERABLE status. AND	72 hours (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more snubber(s) inoperable (continued).	---------------NOTES--------------- 1. Only required if the snubber(s) do not meet the functional test acceptance criteria of TSR 3.7.4.2. 2. The evaluation must ensure the inoperable snubber did not adversely affect the supported component or system during the previous operating cycle. --	
	A.1.2 Perform an engineering evaluation on the supported component or system.	72 hours
	<u>OR</u>	
	A.2 Declare the supported system inoperable. (Refer to applicable TS and TRM LCOs).	72 hours

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.7.4.1 (continued)	c. Fasteners for the attachment of the snubber to the component or system and to the snubber anchorage are functional. The discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. Snubbers which appear inoperable as a result of visual inspection shall be classified unacceptable and may be reclassified acceptable for the purpose of establishing the next visual inspection interval, provided that (1) the cause of the rejection is clearly established and remedied for that particular snubber and for other snubbers irrespective of type that may be generically susceptible; and (2) the affected snubber is functionally tested in the as-found condition and determined OPERABLE per the criteria of TSR 3.7.4.2. A review and evaluation shall be performed and documented to justify continued operation with an unacceptable snubber. If continued operation cannot be justified, the system or train shall be declared inoperable. Additionally, snubbers attached to sections of safety related systems that have experienced unexpected potentially damaging transients since the last inspection period shall be evaluated for the possibility of concealed damage and functionally tested, if applicable, to confirm OPERABILITY. Snubbers which have been made inoperable as the result of unexpected transients, isolated damage, or other random	

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.7.4.1 (continued)	events, when the provisions of TSR 3.7.4.5 and TSR 3.7.4.6 have been met and any other appropriate corrective action implemented, shall not be counted in determining the next visual inspection interval.	
TSR 3.7.4.2	Perform an in-place or bench functional test of a representative sample of 10% of the total of each type of safety-related snubber(s). a. The representative sample selected for functional testing shall include the various configurations, operating environments, and the range of size and capacity of snubbers within the types; b. The representative sample should be weighed to include more snubbers from severe service areas such as near heavy equipment; c. The stroke setting and the security of fasteners for attachment of the snubbers to the component or system and to the snubber anchorage shall be verified.	24 months

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
TSR 3.7.4.2 (continued)	Functional Test Acceptance Criteria: The snubber functional test shall verify that: a. Activation (restraining action) is achieved in both tension and compression within the specified range, except that inertia dependent, acceleration limiting mechanical snubbers may be tested to verify only that activation takes place in both directions of travel. b. Snubber bleed or release, where required, is present in both compression and tension within the specified range. c. For mechanical snubbers, the force required to initiate or maintain motion of the snubber is not great enough to overstress the supported component or system during thermal movement, or to indicate impending failure of the snubber. d. For snubbers specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement shall be verified. e. Testing methods may be used to measure parameters indirectly or parameters other than those specified if those results can be correlated to the specified parameters through established methods.	

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
TSR 3.7.4.3	A failure analysis shall be made of each failure to meet the functional test acceptance criteria of TSR 3.7.4.2 to determine the cause of the failure. The result of this analysis shall be used, if applicable, in selecting snubbers to be tested in the subsequent lot in an effort to determine the OPERABILITY of other snubbers which may be subject to the same failure mode. Selection of snubbers for future testing may also be based on the failure analysis. For each failed snubber, perform in-place or bench functional test on an additional lot equal to 10% of the remainder of that type of snubber. Testing shall continue until no additional inoperable snubbers are found within subsequent lots or all snubbers of the original test type are tested or all suspect snubbers identified by the failure analysis have been tested, as applicable. The functional test criteria shall be as specified in TSR 3.7.4.2.	Once for each discovery of snubber failure to meet functional test acceptance criteria
	Prior to functional testing the discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. The result of the evaluation will be used to select other suspect snubbers for verifying the attachment fasteners, as applicable.	Once for each discovery of loose or missing attachment fasteners

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
TSR 3.7.4.4	---NOTE--- This testing is independent of the requirements of TSR 3.7.4.3. --- For any snubber which fails to lockup or fails to move (i.e., frozen in place), evaluate the cause. If caused by manufacturer or design deficiency, perform in-place or bench functional test of all snubbers of the same design, subject to the same defect. The functional test acceptance criteria shall be as specified in TSR 3.7.4.2.	Once for each discovery of snubber failure to lockup or failure to move
TSR 3.7.4.5	Perform an engineering evaluation on the component or system which is restrained by the snubber(s) found inoperable due to not meeting their functional test acceptance criteria as specified in TSR 3.7.4.2.	Once for each discovery of an inoperable snubber
TSR 3.7.4.6	Verify replacement snubbers and snubbers having repairs which might affect the functional test results meet the test criteria of TSR 3.7.4.2. a. These snubbers shall have met the acceptance criteria subsequent to their most recent service; and b. The functional test must have been performed within the 12 months prior to being installed in the unit.	Once prior to installation in the unit for each replacement snubber and each snubber which has repairs which might affect functional test results

TR 3.7 PLANT SYSTEMS

TR 3.7.4 Snubbers

BASES

BACKGROUND

Snubbers are designed to prevent unrestrained component or system motion under dynamic loads as might occur during an earthquake or severe transient, while allowing normal thermal motion during startup and shutdown. The consequence of an inoperable snubber is an increase in the probability of structural damage to the component or system as a result of a seismic or other event initiating dynamic loads. An inoperable snubber (ex: failed by locked in place) may cause damage to the supported component or system from normal operating modes such as thermal operation. It is, therefore, required that all snubbers required to protect the primary coolant system or any other safety related component or system be OPERABLE during MODES 1, 2, 3, 4, and 5. The Technical Requirements Manual (TRM) action statements establish allowable outage times for components or systems addressed by the Limiting Conditions of Operation (LCO) for snubbers. These time limits are applicable when a snubber must be removed from service to perform required surveillance tests. For snubbers, the allowable outage time is 72 hours. Table 3.7.4-1, "Snubber Visual Inspection Interval" was issued to all nuclear plant license holders by the Nuclear Regulatory Commission (NRC) under Generic Letter (GL) 90-09. This was added to the old Technical Specification and approved by the NRC under Technical Specification Amendment 183.

APPLICABLE SAFETY ANALYSIS

When a snubber is removed from a component or system for surveillance testing or maintenance activity the snubber is declared inoperable since it cannot perform its intended function while removed. This type of inoperability is not a failure and does not require an engineering evaluation to be performed. If a snubber is found to be inoperable during testing, an engineering evaluation is performed to determine whether the mode of failure of the snubber(s) has adversely affected any safety-related component or system, to which the snubber(s) are attached during the previous unit operating cycle with the snubber inoperable, to assure the component or system remains capable of meeting its designed service. This engineering evaluation does not relate to the component or system capability to withstand a seismic event or severe transients.

APPLICABLE SAFETY ANALYSIS (continued)

Removal for surveillance testing is not a mode of failure. The modes of failure for snubbers are (locked in place, high drag force, does not activate, no lockup, high lockup, low lockup, high bleed, no bleed, or damage to the snubber hardware). Once a snubber is found to be inoperable, by failing its functional test acceptance criteria as stated in TSR 3.7.4.2, an engineering evaluation shall be performed to determine the effects on the supported component or system during the previous unit operating cycle with the snubber inoperable, and to assure the component or system remains capable of meeting its designed service and the OPERABILITY of the affected system(s). Additionally, only a limited amount of time (72 hours) is allowed for the supported component or system to be considered OPERABLE, since adequate protection during seismic or other events initiating dynamic loads may not be provided with the snubber inoperable. Any degradation in seismic or dynamic protection due to an inoperable snubber(s) was taken into account in establishing the 72 hour allowable time, because the protection is required only during relatively low probability events. During MODES 1, 2, 3, 4, and 5 snubbers may be removed from service for functional surveillance testing to satisfy the required testing interval.

LCO 3.7.4

During all MODES of operation, all snubbers shall be OPERABLE. The number of snubbers on each unit and shared systems at BFN are too numerous to list in this Technical Requirement. The surveillance 4.6.H series lists the snubbers that are required.

APPLICABILITY

During all MODES of operation, all snubbers shall be OPERABLE. All MODES are applicable for this requirement since the snubbers affect a wide variety of components and systems, of which some of the systems are required in one or more MODES of operation. All MODES are covered since every MODE will be applicable for one or more of the supported components or systems.

However, if a component or system affected by the snubber is not required to be OPERABLE, then the snubber is not required to be OPERABLE, except as follows: the snubbers located inside the drywell on reactor vessel attached piping systems shall be considered OPERABLE whenever fuel is in the reactor vessel. The snubbers on Main Steam, HPCI, and RCIC piping in the drywell are exempt from this requirement when the steam line

BASES

APPLICABILITY (continued)

plugs are installed inside the reactor vessel. During the times the snubbers are not required to be OPERABLE for an inoperable system, the inoperable snubber(s) will be tracked to prevent declaring the system OPERABLE with unanalyzed inoperable snubbers.

ACTIONS

A.1 and A.2

A separate condition entry statement has been added to the ACTIONS allowing a separate condition to be entered for each system/train. The CONDITION statement does not look at how many snubbers are inoperable on a system/train, but requires that all of the inoperable snubbers be replaced within the 72 hours time limit or the system/train must be declared inoperable.

A note is provided, in the Required Action section, to indicate that an engineering evaluation is not required if snubber(s) are removed for surveillance testing or maintenance, unless the snubber(s) do not meet their functional test acceptance criteria of TSR 3.7.4.2.

Because the protection is required only during relatively low probability events, a period of 72 hours is allowed to replace or restore the inoperable snubber(s) to an OPERABLE status, or the supported component, system, or train must be declared inoperable. The component, system, or train will not be declared inoperable unless the snubber(s) does not meet their functional test acceptance criteria of TSR 3.7.4.2 and Required Action A.1.1 cannot be met. An engineering evaluation shall be performed on the supported component or system, only if the snubber(s) do not meet their functional test acceptance criteria of TSR 3.7.4.2. The engineering evaluation is performed to determine whether the mode of failure of the snubber(s) has adversely affected any safety-related component or system, to which the snubber(s) are attached during the previous unit operating cycle with the snubber inoperable, and to assure the component or system remains capable of meeting its designed service. The engineering evaluation does not relate to the component or system capability to withstand a seismic event or severe transient. Any degradation in seismic or dynamic protection due to an inoperable snubber(s) was taken into account in establishing the 72 hour allowable time.

BASES (continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

A note is provided to indicate that each safety-related snubber (listed in plant procedures) shall be demonstrated OPERABLE by performance of the augmented inservice inspection program and requirements of this Technical Requirement.

An additional note is provided to indicate that in this Technical Requirement, "type of snubber" shall mean snubbers of the same design and manufacturer, irrespective of capacity.

The augmented inservice inspection program includes the following.

All safety-related snubbers are visually inspected for overall integrity and OPERABILITY. The visual inspection will include verification of proper orientation, adequate fluid level, if applicable, no visible indications of damage or impaired OPERABILITY, proper attachment of the snubber to the component or system and structures, and no loose or missing fasteners. The removal of insulation or the verification of torque values for threaded fasteners is not required for visual inspections.

The visual inspection frequency is based upon maintaining a constant level of snubber protection. In accordance with Table 3.7.4-1, the number of inoperable snubbers found during a required inspection determines the time interval for the next required inspection. Inspections performed before that interval has elapsed may be used as a new reference point to determine the next inspection. However, the results of such early inspections performed before the original required time interval has elapsed (nominal time less 25 percent) may not be used to lengthen the required inspection interval. Any inspection whose results require a shorter inspection interval will override the previous schedule.

When the cause of the rejection of a snubber in a visual inspection is clearly established and remedied for that snubber and for any other snubber(s) that may be generically susceptible and OPERABILITY verified by inservice functional testing, if applicable, that snubber(s) may be reclassified as OPERABLE. Generically susceptible snubbers are those which are of a specific make or model and have the same design features directly related to the rejected snubber, or are similarly located or exposed to the same environmental conditions such as temperature, radiation, and

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

vibration. The inspection population or category may be established based on design features, or installed conditions which may be expected to be generic. Each of these inspection populations or categories may be inspected and tested separately unless an engineering analysis indicates the inspection population or category is improperly constituted. All suspect snubbers are subject to inspection and testing regardless of inspection population or category.

To verify snubber OPERABILITY, a functional test shall be performed once per 24 months.

These tests will include stroking of the snubbers to verify proper movement, activation, and bleed or release. Ten percent represents an adequate sample for such tests. Observed failures on these samples will require a failure analysis and testing of additional units. If the failure analysis results in the determination that the failure of a snubber to activate or to stroke (i.e., seized components) is the result of a manufacture or design deficiency, all snubbers subject to the same defect shall be functionally tested. Also, an engineering evaluation shall be performed to determine the effects on the supported component or system during the previous unit operating cycle with the snubber inoperable, and to ensure it remains capable of meeting its designed service. A thorough visual inspection of the snubber threaded attachments to the component or system and the anchorage will be made in conjunction with all required functional tests. The stroke setting of the snubbers selected for functional testing also will be verified.

Exemption from Visual Inspection or Functional Tests:

Permanent or other exemptions from visual inspections and/or functional testing for individual snubbers may be granted by the Nuclear Regulatory Commission if a justifiable basis for exemption is presented and if applicable snubber life destructive testing was performed to qualify the snubber OPERABILITY for the applicable design conditions at either the completion of their fabrication or at a subsequent date. Snubbers so exempted shall continue to be listed in the plant instructions with footnotes indicating the extent of the exemptions.

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)

Snubber Service Life Program:

The service life of snubbers may be extended based on an evaluation of the records of functional tests, maintenance history, and environmental conditions to which the snubbers have been exposed.

The following will be implemented by the augmented inservice inspection program:

TSR 3.7.4.1

Visual Inspections:

Snubbers are categorized as inaccessible or accessible during reactor operation. Each of these populations or categories (inaccessible or accessible) may be inspected separately or jointly according to the schedule determined by Table 3.7.4-1. The visual inspection interval for a snubber population or category shall be determined based upon the criteria provided by Table 3.7.4-1. The first inspection interval determined using Table 3.7.4-1 criteria shall be based on the previous inspection interval as established by the requirements in effect before Technical Specification Amendment No. 183 was issued.

Visual Inspection Acceptance Criteria:

Visual inspections shall verify that (1) the snubber has no visible indications of damage or impaired OPERABILITY, (2) attachments to the foundation or supporting structure are functional, and (3) fasteners for the attachment of the snubber to the component or system and to the snubber anchorage are functional.

Snubbers which appear inoperable as a result of visual inspection shall be classified unacceptable and may be reclassified acceptable for the purpose of establishing the next visual inspection interval, provided that (1) the cause of the rejection is clearly established and remedied for that particular snubber and for other snubbers, irrespective of type, that may be generically susceptible; and (2) the affected snubber is functionally tested in the as-found condition and determined OPERABLE per the functional test acceptance criteria of TSR 3.7.4.2.

BASES

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.1 (continued)

A review and evaluation shall be performed and documented to justify continued operation with an unacceptable snubber. If continued operation cannot be justified, the snubber shall be declared inoperable.

Additionally, snubbers attached to sections of safety-related systems that have experienced unexpected potentially damaging transients since the last inspection period shall be evaluated for the possibility of concealed damage and functionally tested, if applicable, to confirm OPERABILITY. Snubbers which have been made inoperable as the result of unexpected transients, isolated damage, or other random events, when the provisions of TSR 3.7.4.5 and 3.7.4.6 have been met and any other appropriate corrective action implemented, shall not be counted in determining the next visual inspection interval.

TSR 3.7.4.2

Functional Test Schedule, Lot Size, and Composition:

Once per 24 months, a representative sample of 10% of the total of each type of safety-related snubbers in use in the plant shall be functionally tested either in place or in a bench test.

The representative sample selected for functional testing shall include the various configurations, operating environments, and the range of size and capacity of snubbers within the types. The representative sample should be weighed to include more snubbers from severe service areas such as near heavy equipment. The stroke setting and the security of fasteners for attachment of the snubbers to the component or system and to the snubber anchorage shall be verified on snubbers selected for functional tests.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.2 (continued)

Functional Test Acceptance Criteria:

The snubber functional test shall verify that:

a. Activation (restraining action) is achieved in both tension and compression within the specified range, except that inertia dependent, acceleration limiting mechanical snubbers may be tested to verify only that activation takes place in both directions of travel.

b. Snubber bleed, or release where required, is present in both compression and tension within the specified range.

c. For mechanical snubbers, the force required to initiate or maintain motion of the snubber is not great enough to overstress the supported component or system during thermal movement, or to indicate impending failure of the snubber.

d. For snubbers specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement shall be verified.

e. Testing methods may be used to measure parameters indirectly or parameters other than those specified if those results can be correlated to the specified parameters through established methods.

TSR 3.7.4.3

Functional Test Failure Analysis and Additional Test Lots:

A failure analysis shall be performed for each failure to meet the functional test acceptance criteria to determine the cause of the failure. The result of this analysis shall be used, if applicable, in selecting snubbers to be tested in the subsequent lot in an effort to determine the OPERABILITY of other snubbers which may be subject to the same failure mode. Selection of snubbers for future testing may also be based on the failure analysis.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.7.4.3 (continued)

For each snubber that does not meet the functional test acceptance criteria, an additional lot equal to 10 percent of the remainder of that type of snubber(s) shall be functionally tested. Testing shall continue until no additional inoperable snubbers are found within subsequent lots or all snubbers of the original functional test type have been tested or all suspect snubbers identified by the failure analysis have been tested, as applicable.

The discovery of loose or missing attachment fasteners will be evaluated to determine whether the cause may be localized or generic. The result of the evaluation will be used to select other suspect snubbers for verifying the attachment fasteners, as applicable.

TSR 3.7.4.4

If any snubber selected for functional testing either fails to lockup or fails to move, i.e., frozen in place, the cause will be evaluated and if caused by manufacturer or design deficiency, all snubbers of the same design, subject to the same defect, shall be functionally tested. This testing requirement shall be independent of the requirements stated above for snubbers not meeting the functional test acceptance criteria.

TSR 3.7.4.5

Functional Test Failure - Supported Component or System Analysis:

For the snubber(s) found inoperable, an engineering evaluation shall be performed on the component or system which is restrained by the snubber(s) due to not meeting their functional test acceptance criteria. The purpose of this engineering evaluation shall be to determine if the component or system restrained by the snubber(s) was adversely affected by the inoperability of the snubber(s), and in order to ensure that the restrained component or system remains capable of meeting the designed service.

TECHNICAL SURVEILLANCE REQUIREMENTS (continued)	<u>TSR 3.7.4.6</u> Functional Testing of Repaired and Spare Snubbers: Snubbers which fail the visual inspection or the functional test acceptance criteria shall be repaired or replaced. Replacement snubbers and snubbers having repairs which might affect the functional test results shall meet the functional test acceptance criteria before installation in the unit. These snubbers shall have met the acceptance criteria subsequent to their most recent service, and the functional test must have been performed within 12 months prior to being installed in the unit.
REFERENCES	1. BFN Technical Specifications (version prior to standardized version)

Technical Requirements Manual

Revision 18

Unit 3 Offgas Hydrogen Analyzer Instrumentation Calibration Frequency

and

Unit 3 Core Operating Limits Report Update

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.3.9.1	Perform CHANNEL CHECK.	24 hours
TSR 3.3.9.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
TSR 3.3.9.3	---NOTE--- Shall include use of standard gas samples containing a nominal zero volume percent hydrogen (compressed air), and a nominal one volume percent hydrogen, balance nitrogen. --- Perform CHANNEL CALIBRATION.	92 days

TRM Revision 18

Browns Ferry Nuclear Plant
Unit 3, Cycle 10

CORE OPERATING LIMITS REPORT (COLR)

TENNESSEE VALLEY AUTHORITY
Nuclear Fuel Division
BWR Fuel Engineering Department

Prepared By: ______________________ Date: 4-13-00
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Revision Log

Revision	Date	Description	Affected Pages
0	4/14/2000	Initial Release for New Cycle	All

1. INTRODUCTION

This Core Operating Limits Report for Browns Ferry Unit 3, Cycle 10 is prepared in accordance with the requirements of Browns Ferry Technical Specification 5.6.5. The core operating limits presented here were developed using NRC-approved methods (References 1 and 2). Results from the reload analyses for Browns Ferry Unit 3, Cycle 10 are documented in Reference 3.

The following core operating limits are included in this report:

a. Average Planar Linear Heat Generation Rate (APLHGR) Limit
(Technical Specifications 3.2.1 and 3.7.5)

b. Linear Heat Generation Rate (LHGR) Limit
(Technical Specification 3.2.3)

c. Minimum Critical Power Ratio Operating Limit (OLMCPR)
(Technical Specifications 3.2.2, 3.3.4.1, and 3.7.5)

d. Average Power Range Monitor (APRM) Flow Biased Rod Block Trip Setting
(Technical Requirements Manual Section 5.3.1 and Table 3.3.4-1)

e. Rod Block Monitor (RBM) Trip Setpoints and Operability
(Technical Specification Table 3.3.2.1-1)

f. Shutdown Margin (SDM) Limit
(Technical Specification 3.1.1)

2. APLHGR LIMIT (TECHNICAL SPECIFICATIONS 3.2.1 AND 3.7.5)

The APLHGR limits for full power and flow conditions for each type of fuel as a function of exposure are shown in Figures 1-6. The APLHGR limits for the GE11 and GE13 assemblies are for the most limiting lattice (excluding natural uranium) at each exposure point. The specific values for each lattice are given in Reference 4.

These APLHGR limits are adjusted for off-rated power and flow conditions using the ARTS factors, MAPFAC(P) and MAPFAC(F). The reduced power factor, MAPFAC(P), is given in Figure 7. Similarly, adjustments for reduced flow operation are performed using the MAPFAC(F) corrections given in Figure 8. Both factors are multipliers used to reduce the standard APLHGR limit. The most limiting power-adjusted or flow-adjusted value is taken as the APLHGR operating limit for the off-rated condition.

The APLHGR limits in figures 1-6 are applicable for both Turbine Bypass In-Service and Out-Of-Service. The off-rated power and flow corrections in figures 7 and 8 bound both Turbine Bypass In-Service and Out-Of-Service operation. No corrections are required to the APLHGR limits for TBOOS for either rated or off-rated operation.

For Single Recirculation Loop Operation (SLO), the most limiting of either the SLO multiplier or the off-rated MAPFAC correction is used to reduce the exposure dependent APLHGR limit. The SLO multiplier to be applied to this cycle is 0.84 (reference 3). It is not necessary to apply both the off-rated MAPFAC and SLO multiplier corrections at the same time.

3. LHGR LIMIT (TECHNICAL SPECIFICATION 3.2.3)

The LHGR limit is fuel type dependent. For unit 3 cycle 10 these limits are the same for all fuel types in the core, as shown below:

Fuel Type	LHGR Limit
GE11	14.4 kw/ft
GE13	14.4 kw/ft

4. OLMCPR (TECHNICAL SPECIFICATIONS 3.2.2, 3.3.4.1, AND 3.7.5)

a. The MCPR Operating Limit for rated power and flow conditions, OLMCPR(100), is equal to the fuel type and exposure dependent limit shown in Figures 9 and 10. Figure 9 applies to exposure up to 2846 MWD/ST prior to EOR (end of full power capability at rated flow with normal feedwater temperature) after which Figure 10 shall be used. It is acceptable to use the more restrictive Figure 10 limits at any point in the cycle. For cycle 10, only GE13 results are supplied since they bound all bundle types. As noted in Figures 9 and 10, an adder of 0.02 is applied for single loop operation. The actual OLMCPR(100) value is dependent upon the scram time testing results, as described below (ref. 10):

$$\tau = 0.0 \quad \text{or} \quad \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B}, \quad \text{whichever is greater}$$

where; τ_A = **1.096** sec (analytical Option A scram time limit - based on dropout time for notch position 36)

$$\tau_{ave} = \frac{\sum_{i=1}^{n} \tau_i}{n}$$

$$\tau_B = \mu + 1.65 * \sigma * \left[\frac{N}{n}\right]^{\frac{1}{2}}$$

where; μ = **0.830** sec (mean scram time used in transient analysis - based on dropout time for notch position 36)

σ = **0.019** sec (standard deviation of μ)

N = Total number of active rods measured in Technical Specification Surveillance Requirement SR3.1.4.1

n = Number of surveillance rod tests performed to date in cycle

τ_i = Scram time (dropout time) from fully withdrawn to notch position 36 for the i^{th} rod

b. Option A OLMCPR limits (τ=1.0) shall be used prior to the determination of τ in accordance with SR 3.1.4.1.

c. For off-rated power and flow conditions, power-adjusted and flow-adjusted operating limits are determined from Figures 11 and 12, respectively. The most limiting power-dependent or flow-dependent value is taken as the OLMCPR for the off-rated condition.

d. OLMCPR limits and off-rated corrections are provided for Recirculation Pump Trip out-of-service (RPTOOS) or Turbine Bypass out-of-service (TBOOS) conditions (ref. 5). These events are analyzed separately and the core is not analyzed for both systems Out-Of-Service at the same time.

5. APRM FLOW BIASED ROD BLOCK TRIP SETTING (TECHNICAL REQUIREMENTS MANUAL SECTION 5.3.1 AND TABLE 3.3.4-1)

The APRM Rod Block trip setting shall be:

$S_{RB} \leq (0.66(W-\Delta W) + 61\%)$ Allowable Value

$S_{RB} \leq (0.66(W-\Delta W) + 59\%)$ Nominal Trip Setpoint (NTSP)

where:

S_{RB} = Rod Block setting in percent of rated thermal power (3458 MWt)

W = Loop recirculation flow rate in percent of rated

ΔW = Difference between two-loop and single-loop effective recirculation flow at the same core flow (ΔW=0.0 for two-loop operation)

The APRM Rod Block trip setting is clamped at a maximum allowable value of 115% (corresponding to a NTSP of 113%).

6. ROD BLOCK MONITOR (RBM) TRIP SETPOINTS AND OPERABILITY (TECHNICAL SPECIFICATION TABLE 3.3.2.1-1)

The RBM trip setpoints and applicable power ranges shall be as follows (refs. 7-9):

RBM Trip Setpoint	Allowable Value (AV)	Nominal Trip Setpoint (NTSP)	
LPSP	27%	25%	
IPSP	62%	60%	
HPSP	82%	80%	
LTSP - unfiltered - filtered	118.7% 117.7%	117.0% 116.0%	(1),(2)
ITSP - unfiltered - filtered	113.7% 112.9%	112.0% 111.2%	(1),(2)
HTSP - unfiltered - filtered	108.7% 107.9%	107.0% 106.2%	(1),(2)
DTSP	90%	92%	

Notes: (1) These setpoints are based upon a MCPR operating limit of **<u>1.29</u>** using a safety limit of 1.10. This is consistent with a MCPR operating limit of 1.25 using a safety limit of 1.07, as reported in references 6, 7, and 8. These setpoints bound the cycle specific Option B MCPR operating limit of 1.30.

(2) The unfiltered setpoints are consistent with a nominal RBM filter setting of 0.0 seconds (reference 8). The filtered setpoints are consistent with a nominal RBM filter setting ≤ 0.5 seconds (reference 7).

The RBM setpoints in Technical Specification Table 3.3.2.1-1 are applicable when:

THERMAL POWER (% Rated)	Applicable MCPR [(1)]	Notes from Table 3.3.2.1-1	
≥ 27% and < 90%	< 1.75 < 1.78	(a), (b), (f), (h) (a), (b), (f), (h)	dual loop operation single loop operation
≥ 90%	< 1.44	(g)	dual loop operation [(2)]

Notes: (1) The given MCPR operating limits are adjusted to correspond to a MCPR safety limit of 1.10 for dual loop operation (1.12 for single loop operation). The values shown correspond to operating limits of 1.70 and 1.40 given the original 1.07 MCPR safety limit used in reference 6.

(2) Greater than 90% rated power is not attainable in single loop operation.

7. SHUTDOWN MARGIN (SDM) LIMIT (TECHNICAL SPECIFICATION 3.1.1)

The core shall be subcritical with the following margin with the strongest OPERABLE control rod fully withdrawn and all other OPERABLE control rods fully inserted.

SDM $\geq$ 0.38% dk/k

8. REFERENCES

1. NEDE-24011-P-A-13, "General Electric Standard Application for Reactor Fuel", August 1996.

2. NEDE-24011-P-A-13-US, "General Electric Standard Application for Reactor Fuel (Supplement for United States)", August 1996.

3. J11-03589SRLR Rev. 0, "Supplemental Reload Licensing Report for Browns Ferry Nuclear Plant Unit 3 Reload 9 Cycle 10", March 2000.

4. J11-03589MAPL Rev. 0, "Lattice-Dependent MAPLHGR Report for Browns Ferry Nuclear Plant Unit 3 Reload 9 Cycle 10", March 2000.

5. NEDC-32774P Rev. 1, "Safety Analyses for Browns Ferry Nuclear Plant Units 1, 2, and 3 Turbine Bypass and End-of-Cycle Recirculation Pump Trip Out-Of-Service", dated September 1997.

6. NEDC-32433P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Browns Ferry Nuclear Plant Unit 1, 2, and 3", dated April 1995.

7. EDE-28-0990 Rev. 3 Supplement E, "PRNM (APRM, RBM, and RFM) Setpoint Calculations [ARTS/MELLL (NUMAC) - Power-Uprate Condition] for Tennessee Valley Authority Browns Ferry Nuclear Plant", dated October 1997.

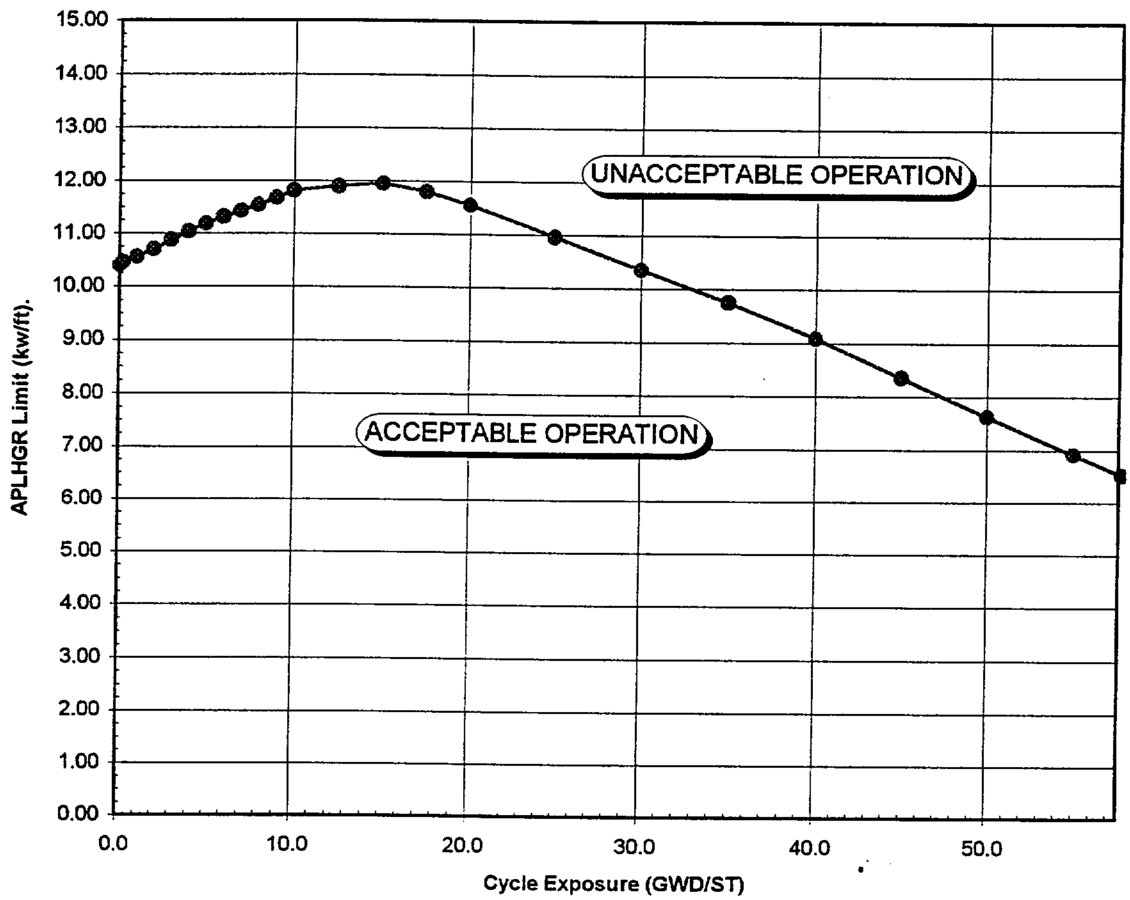
8. EDE-28-0990 Rev. 2 Supplement E, "PRNM (APRM, RBM, and RFM) Setpoint Calculations [ARTS/MELLL (NUMAC) - Power-Uprate Condition] for Tennessee Valley Authority Browns Ferry Nuclear Plant", dated October 1997.

9. GE Letter LB#: 262-97-133, "Browns Ferry Nuclear Plant Rod Block Monitor Setpoint Clarification - GE Proprietary Information", dated September 12, 1997. [L32 970912 800]

10. GE Letter JAB-T8019a, "Technical Specification Changes for Implementation of Advanced Methods", dated June 4, 1998. [L32 980608 800]

11. GE Letter 262-00-021-01, "TVA Unit 3 Cycle 10 MCPR(F) Limits", dated April 4, 2000. [L32 000406 803]

Figure 1
APLHGR Limits for Bundle Type GE13-P9DTB414-15GZ
(GE13)



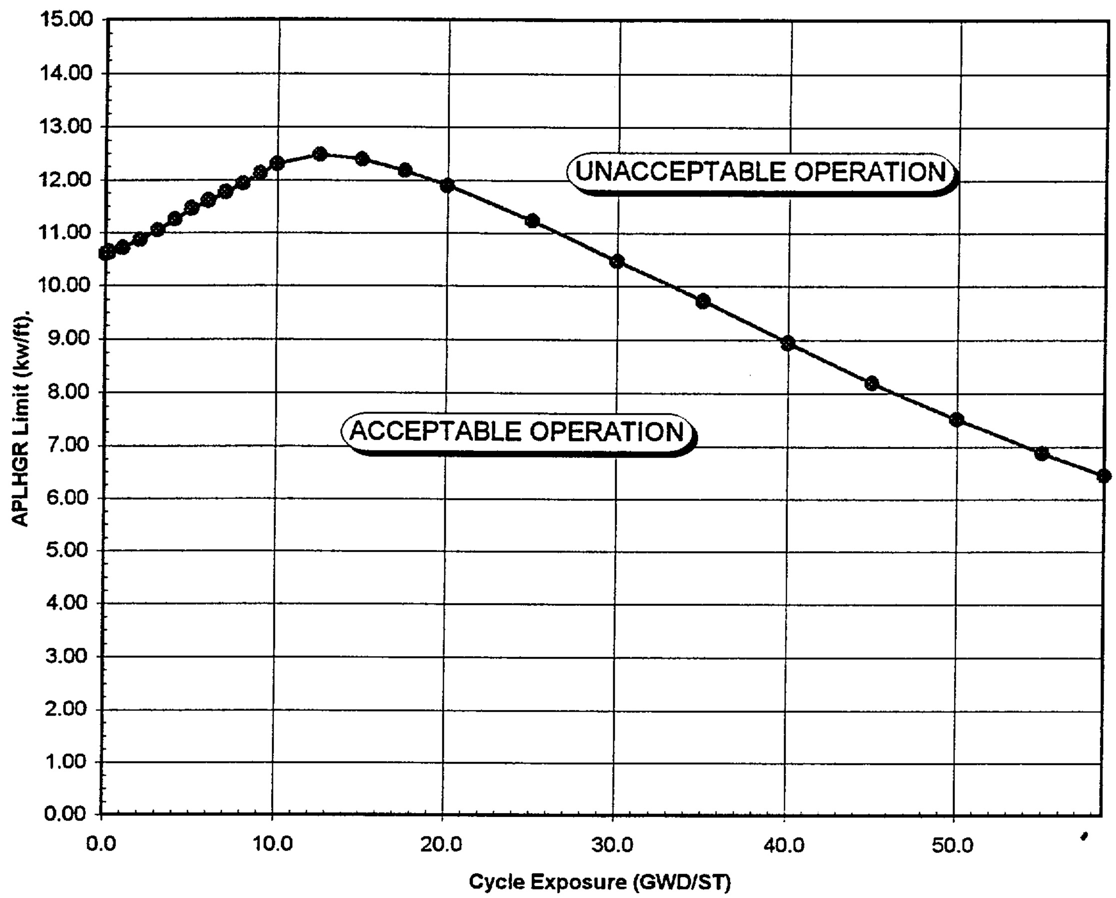
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.40	7.0	11.43	25.0	10.96
0.2	10.46	8.0	11.54	30.0	10.35
1.0	10.56	9.0	11.67	35.0	9.75
2.0	10.71	10.0	11.81	40.0	9.08
3.0	10.88	12.5	11.89	45.0	8.35
4.0	11.04	15.0	11.95	50.0	7.62
5.0	11.18	17.5	11.80	55.0	6.91
6.0	11.31	20.0	11.55	57.81	6.52

These values apply to both Turbine Bypass In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 2
APLHGR Limits for Bundle Type GE13-P9DTB400-13GZ1
(GE13)



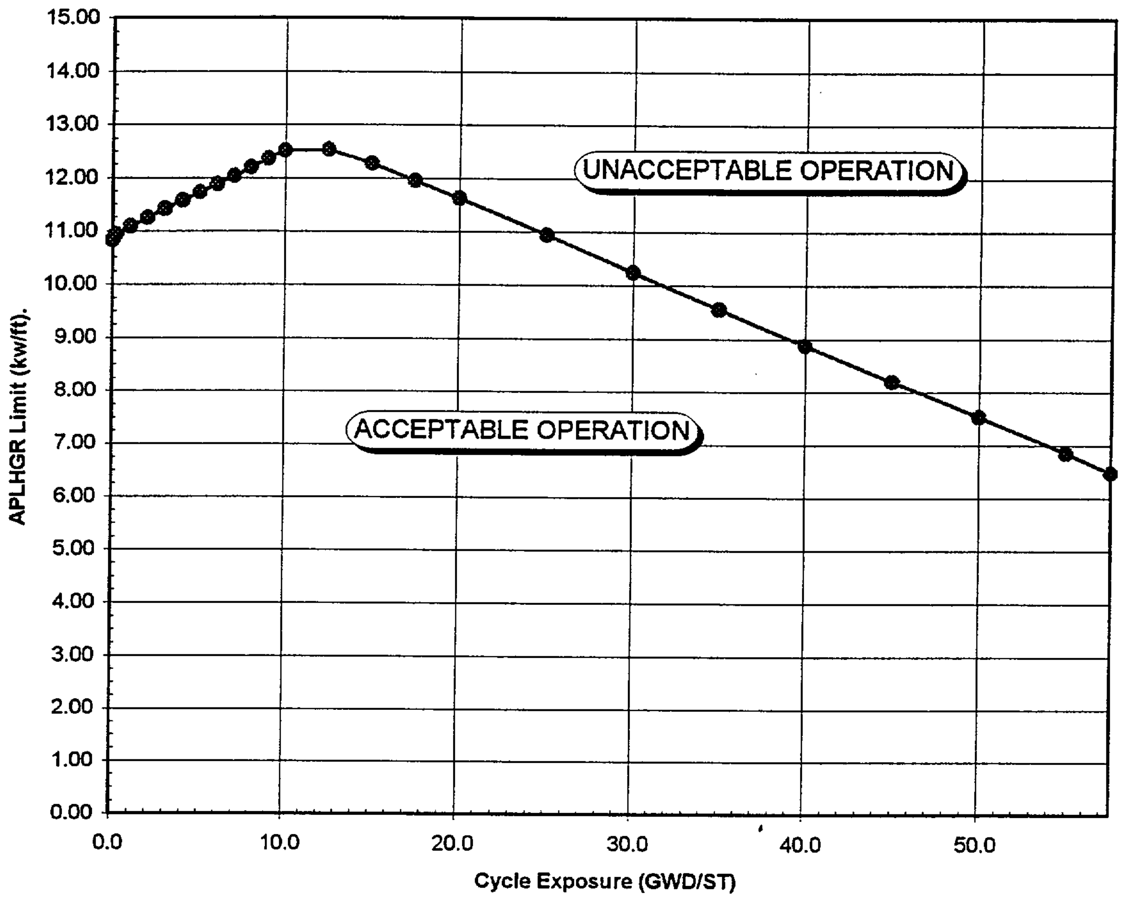
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.61	7.0	11.77	25.0	11.23
0.2	10.64	8.0	11.94	30.0	10.47
1.0	10.72	9.0	12.13	35.0	9.73
2.0	10.87	10.0	12.30	40.0	8.94
3.0	11.05	12.5	12.47	45.0	8.19
4.0	11.26	15.0	12.39	50.0	7.51
5.0	11.46	17.5	12.18	55.0	6.87
6.0	11.61	20.0	11.89	58.61	6.44

These values apply to both Turbine Bypass In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 3
APLHGR Limits for Bundle Type GE13-P9HTB386-12GZ
(GE13)



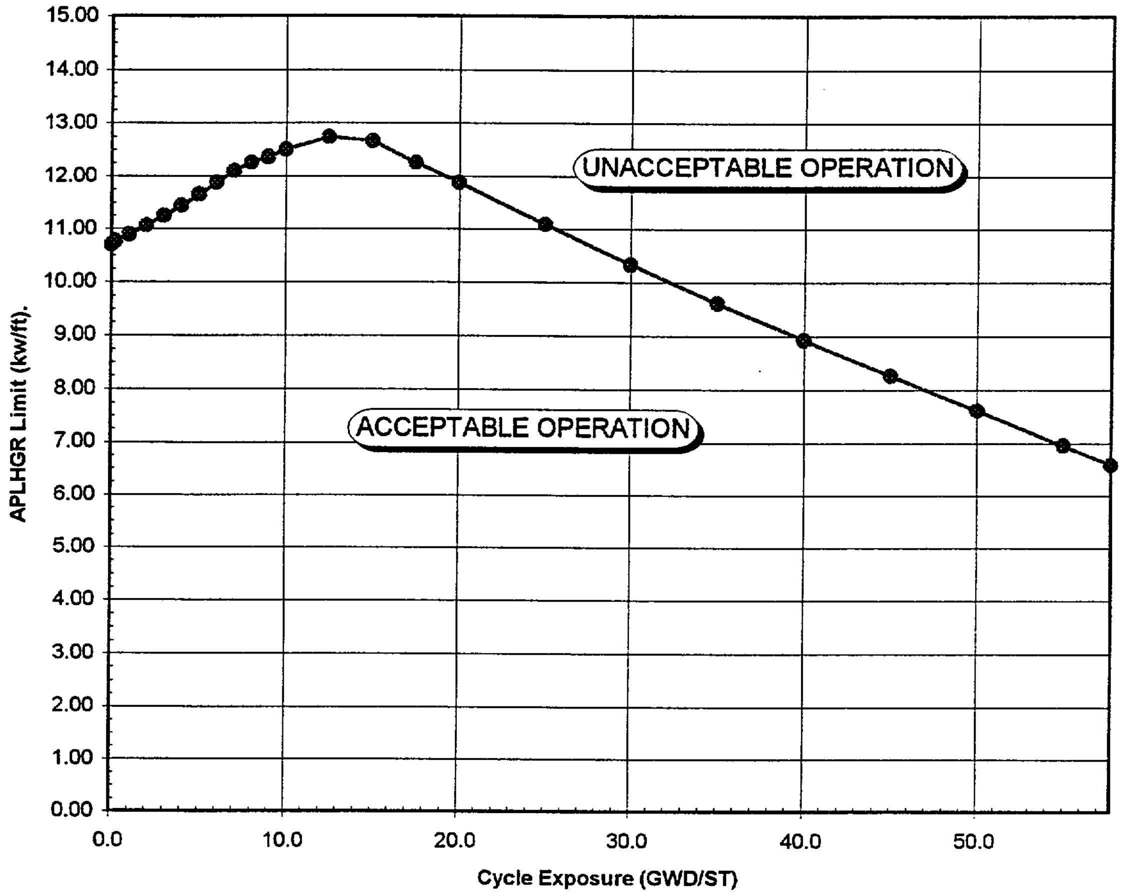
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.83	7.0	12.03	25.0	10.94
0.2	10.94	8.0	12.19	30.0	10.24
1.0	11.08	9.0	12.36	35.0	9.55
2.0	11.25	10.0	12.51	40.0	8.87
3.0	11.41	12.5	12.53	45.0	8.20
4.0	11.57	15.0	12.27	50.0	7.53
5.0	11.72	17.5	11.95	55.0	6.85
6.0	11.88	20.0	11.62	57.62	6.48

These values apply to both Turbine Bypass In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 4
APLHGR Limits for Bundle Type GE13-P9HTB372-11GZ
(GE13)



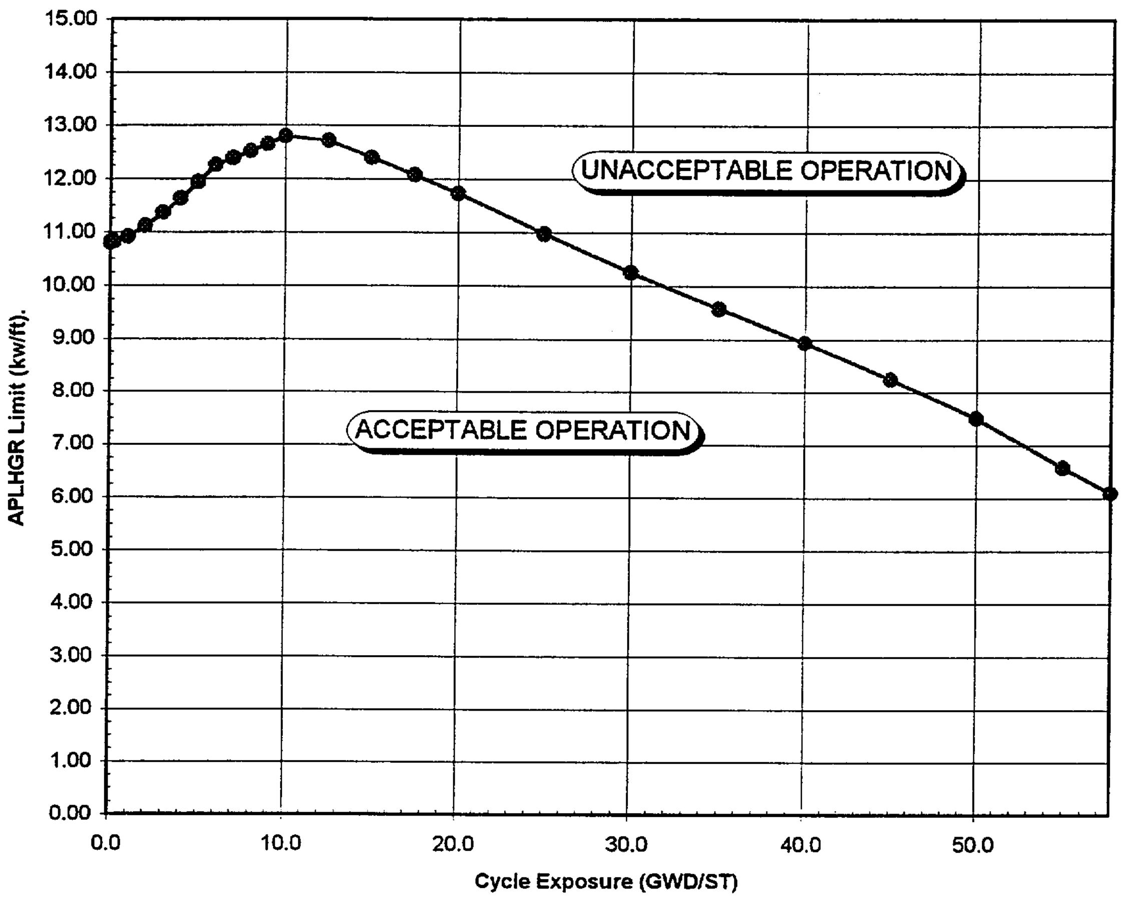
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.71	7.0	12.10	25.0	11.08
0.2	10.77	8.0	12.26	30.0	10.33
1.0	10.89	9.0	12.36	35.0	9.61
2.0	11.06	10.0	12.50	40.0	8.92
3.0	11.25	12.5	12.73	45.0	8.26
4.0	11.44	15.0	12.66	50.0	7.61
5.0	11.65	17.5	12.26	55.0	6.95
6.0	11.87	20.0	11.87	57.79	6.58

These values apply to both Turbine Bypass In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 5
APLHGR Limits for Bundle Type GE11-P9HUB323-8G4.0
(GE11)



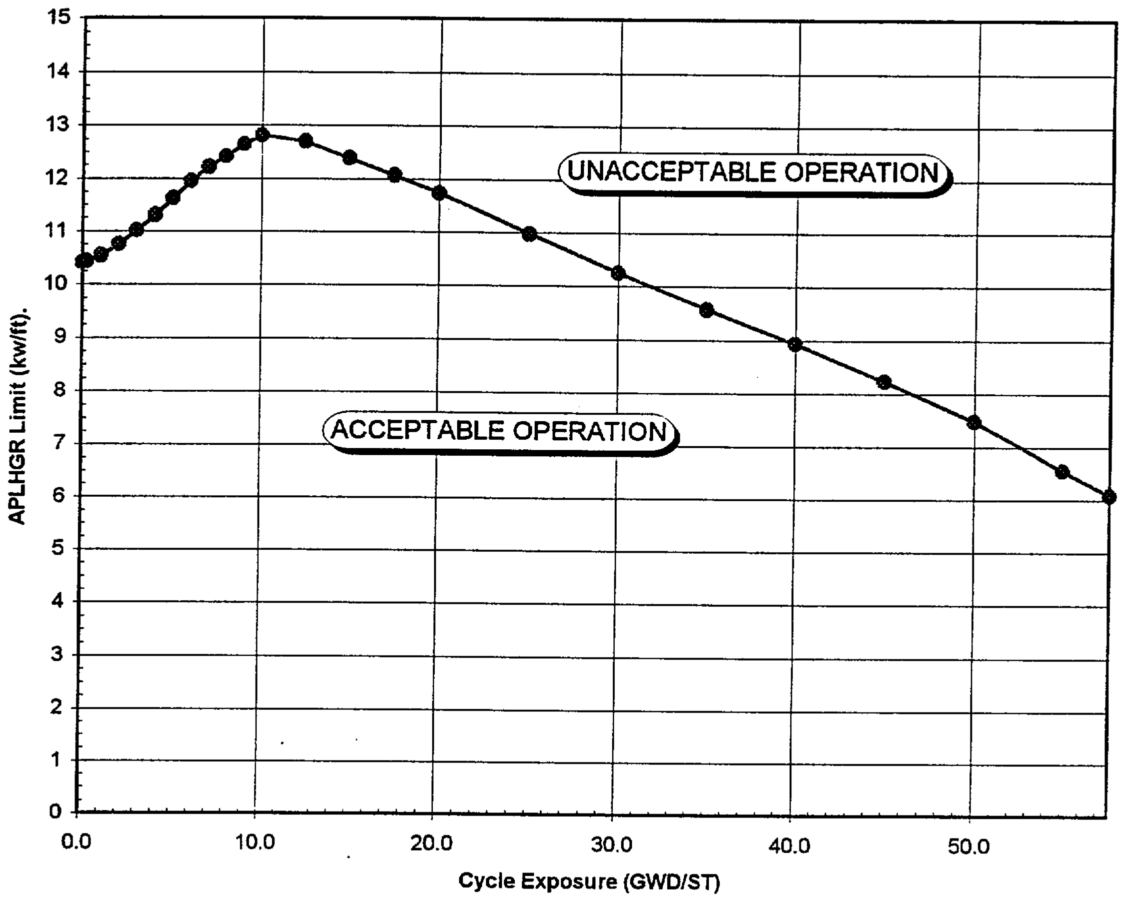
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.81	7.0	12.38	25.0	10.97
0.2	10.83	8.0	12.51	30.0	10.25
1.0	10.91	9.0	12.65	35.0	9.57
2.0	11.11	10.0	12.79	40.0	8.93
3.0	11.36	12.5	12.71	45.0	8.25
4.0	11.63	15.0	12.39	50.0	7.51
5.0	11.93	17.5	12.07	55.0	6.58
6.0	12.25	20.0	11.72	57.72	6.10

These values apply to both Turbine Bypass In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 6
APLHGR Limits for Bundle Type GE11-P9HUB323-5G5.0/4G4.0
(GE11)



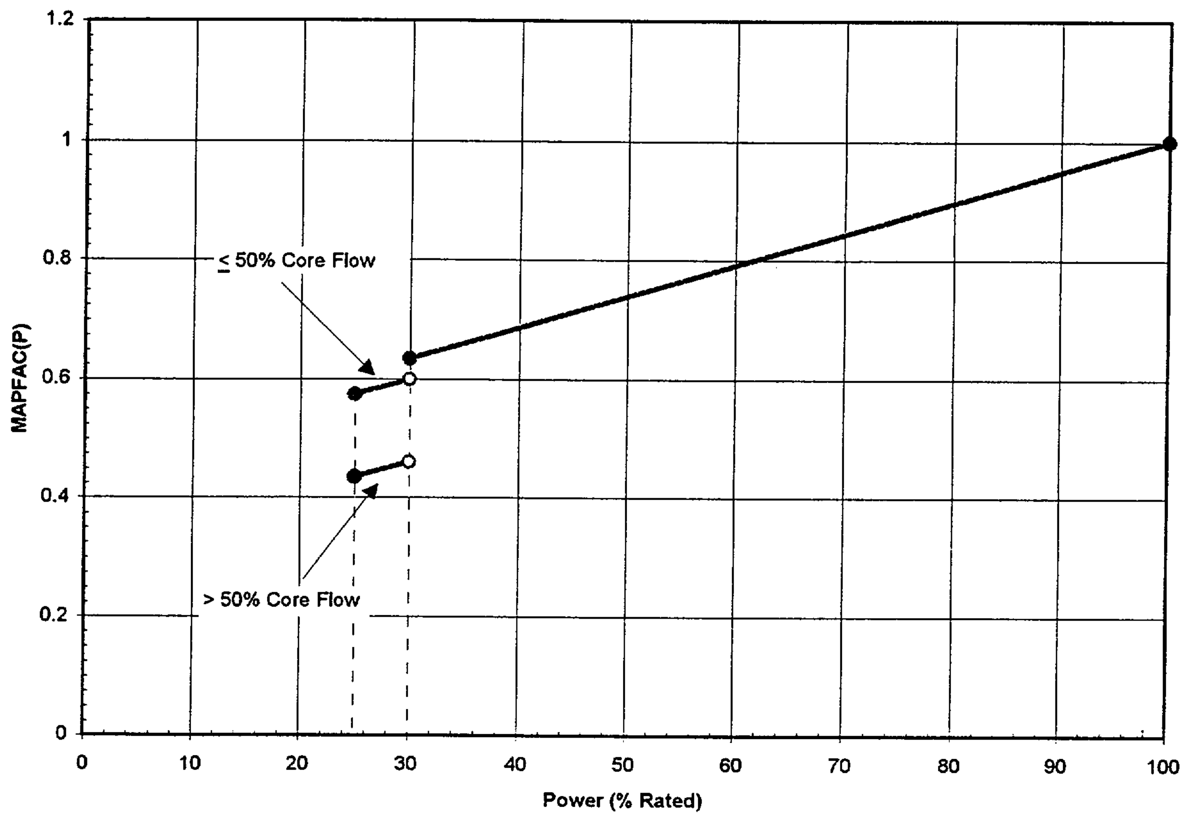
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.41	7.0	12.21	25.0	10.97
0.2	10.44	8.0	12.42	30.0	10.25
1.0	10.54	9.0	12.64	35.0	9.57
2.0	10.75	10.0	12.82	40.0	8.93
3.0	11.01	12.5	12.70	45.0	8.24
4.0	11.30	15.0	12.38	50.0	7.49
5.0	11.62	17.5	12.06	55.0	6.55
6.0	11.95	20.0	11.73	57.70	6.08

These values apply to both Turbine Bypass In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 7
Power Dependent MAPLHGR Factor - MAPFAC(P)



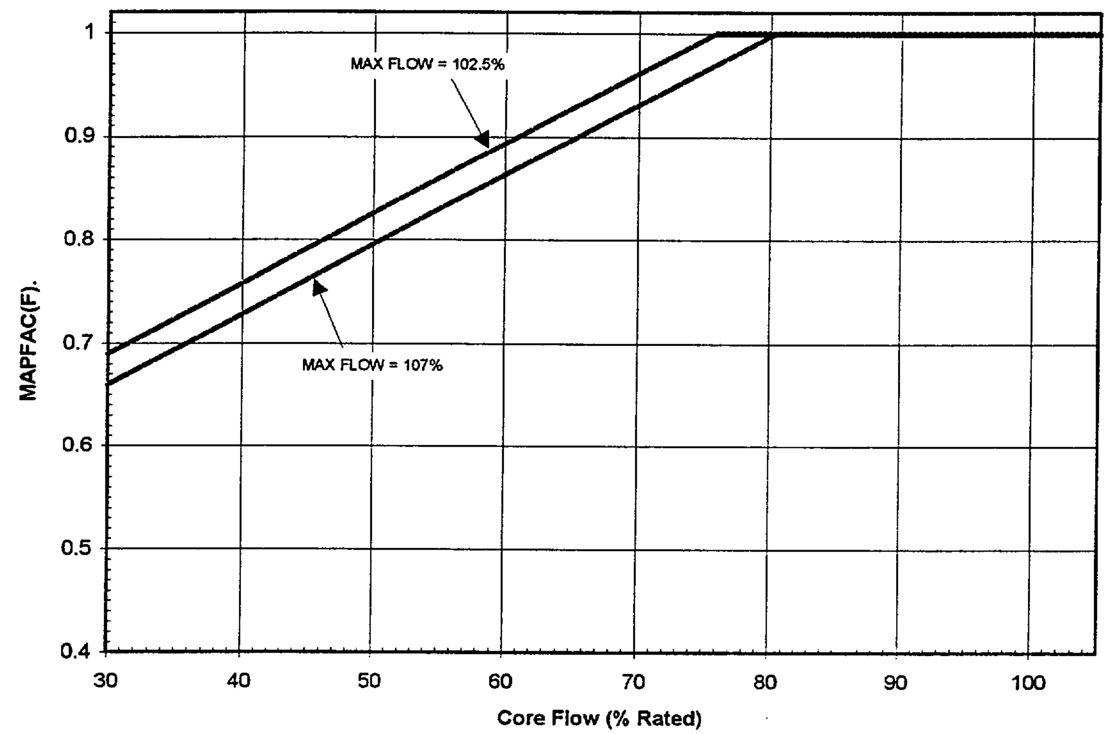
MAPLHGR(P) = MAPFAC(P) x MAPLHGRstd

MAPLHGRstd = Standard MAPLHGR Limits

For	25% ≥ P	: NO THERMAL LIMITS MONITORING REQUIRED
For	25% ≤ P < 30%	: MAPFAC(P) = 0.60 + 0.005(P-30%) For ≤ 50% CORE FLOW : MAPFAC(P) = 0.46 + 0.005(P-30%) For > 50% CORE FLOW
For	30% ≤ P	: MAPFAC(P) = 1.0 + 0.005224(P-100%)

These values bound both Turbine Bypass In-Service and Out-Of-Service

Figure 8
Flow Dependent MAPLHGR Factor - MAPFAC(F)



MAPLHGR(F) = MAPFAC(F) x MAPLHGRstd

MAPLHGRstd = Standard MAPLHGR Limits

MAPFAC(F) = MINIMUM(1.0 , Af * Wc /100 + Bf)

Wc = % Rated Core Flow

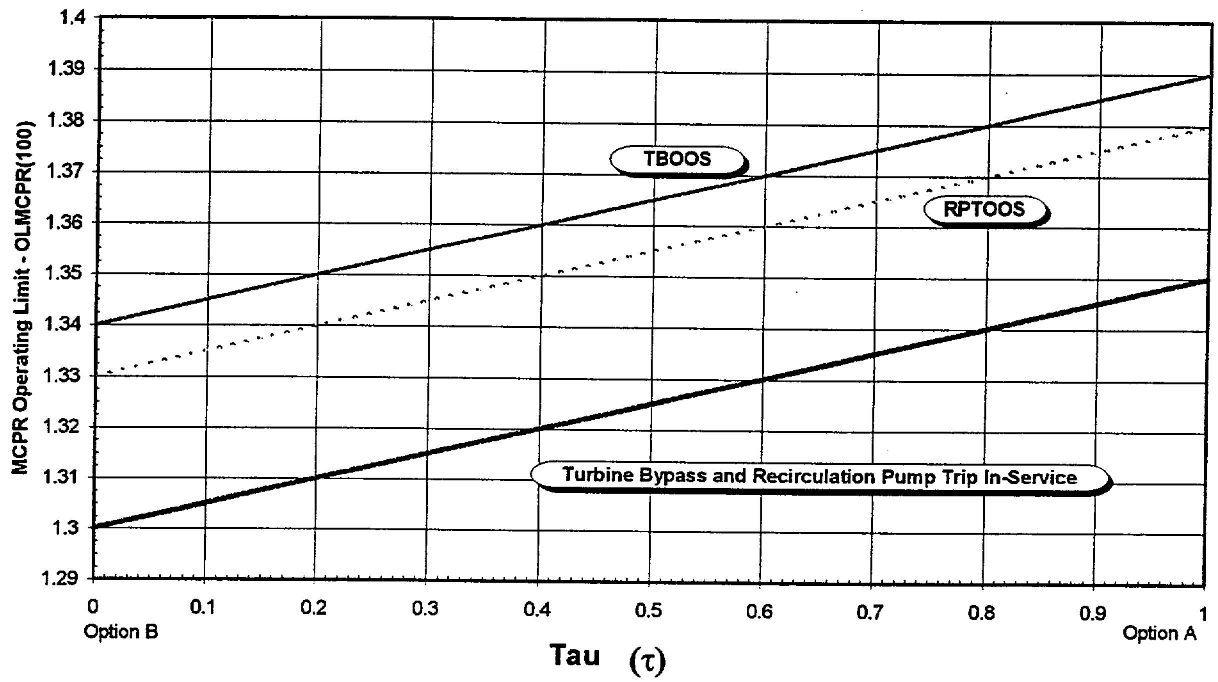
Af and Bf are Constants Given Below:

Maximum Core Flow (% Rated)	Af	Bf
102.5	0.6784	0.4861
107.0	0.6758	0.4574

These values bound both Turbine Bypass In-Service and Out-Of-Service.

The 102.5% maximum flow line is used for operation up to 100% rated flow.
The 107% maximum flow line is used for operation up to 105% rated flow (ICF).

Figure 9
MCPR Operating Limit for All Bundle Types
For Cycle Exposures up to EOR-2846 MWD/ST (see note 4)

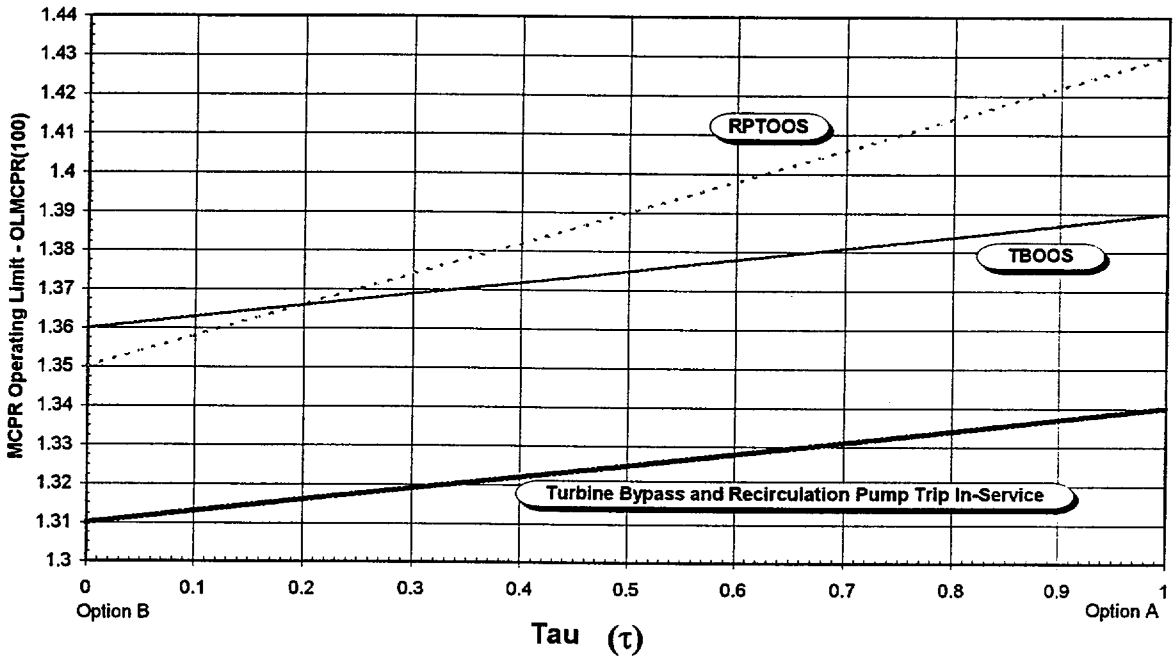


Exposure Range	Out-Of-Service	Option A Tau=1.0	Option B Tau=0.0
BOC10 to (EOR-2846 MWD/ST)	na	1.35 (1)	1.30
BOC10 to (EOR-2846 MWD/ST)	Turbine Bypass (TBOOS)	1.39	1.34
BOC10 to (EOR-2846 MWD/ST)	Recirculation Pump Trip (RPTOOS)	1.38	1.33

Notes
1. Use this value prior to performing scram time testing per SR 3.1.4.1.
2. Either Turbine Bypass or Recirculation Pump Trip may be Out-Of-Service. The core is not analyzed for both TBOOS and RPTOOS at the same time.
3. The values shown are for dual recirculation loop operation. Increase any value shown by 0.02 for Single Loop Operation (SLO).
4. EOR refers to the end of Full Power Capability at Rated Flow with normal Feedwater Heating.

Figure 10
MCPR Operating Limit for All Bundle Types

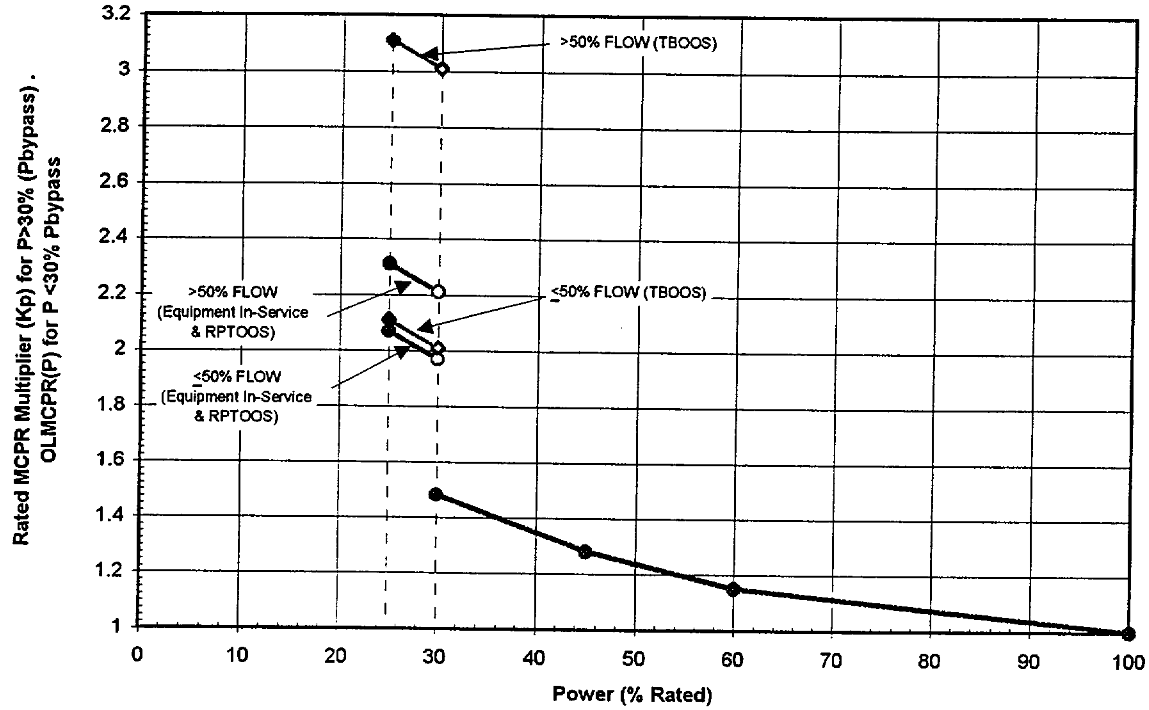
Optional for All Cycle Exposures - Required after EOR-2846 MWD/ST is reached (see note 4)



Exposure Range	Out-Of-Service	Option A Tau=1.0	Option B Tau=0.0
BOC10 to EOC10	na	1.34 (1)	1.31
BOC10 to EOC10	Turbine Bypass (TBOOS)	1.39	1.36
BOC10 to EOC10	Recirculation Pump Trip (RPTOOS)	1.43	1.35

Notes
1. Use this value prior to performing scram time testing per SR 3.1.4.1.
2. Either Turbine Bypass or Recirculation Pump Trip may be Out-Of-Service. The core is not analyzed for both TBOOS and RPTOOS at the same time.
3. The values shown are for dual recirculation loop operation. Increase any value shown by 0.02 for Single Loop Operation (SLO).
4. EOR refers to the end of Full Power Capability at Rated Flow with normal Feedwater Heating.

Figure 11
Power Dependent MCPR(P) Limits



OPERATING LIMIT MCPR(P) = Kp * OLMCPR(100)

For	$P \leq 25\%$	: NO THERMAL LIMITS MONITORING REQUIRED
For	$25\% \leq P <$ Pbypass	: (Pbypass = 30%)
		: Kp = [Kbyp + 0.02(30%-P)]/OLMCPR(100)

Turbine Bypass and RPT In-Service, or RPT Out-Of-Service (RPTOOS)

Kbyp = 1.97 For $\leq$ 50% CORE FLOW
Kbyp = 2.21 For > 50% CORE FLOW

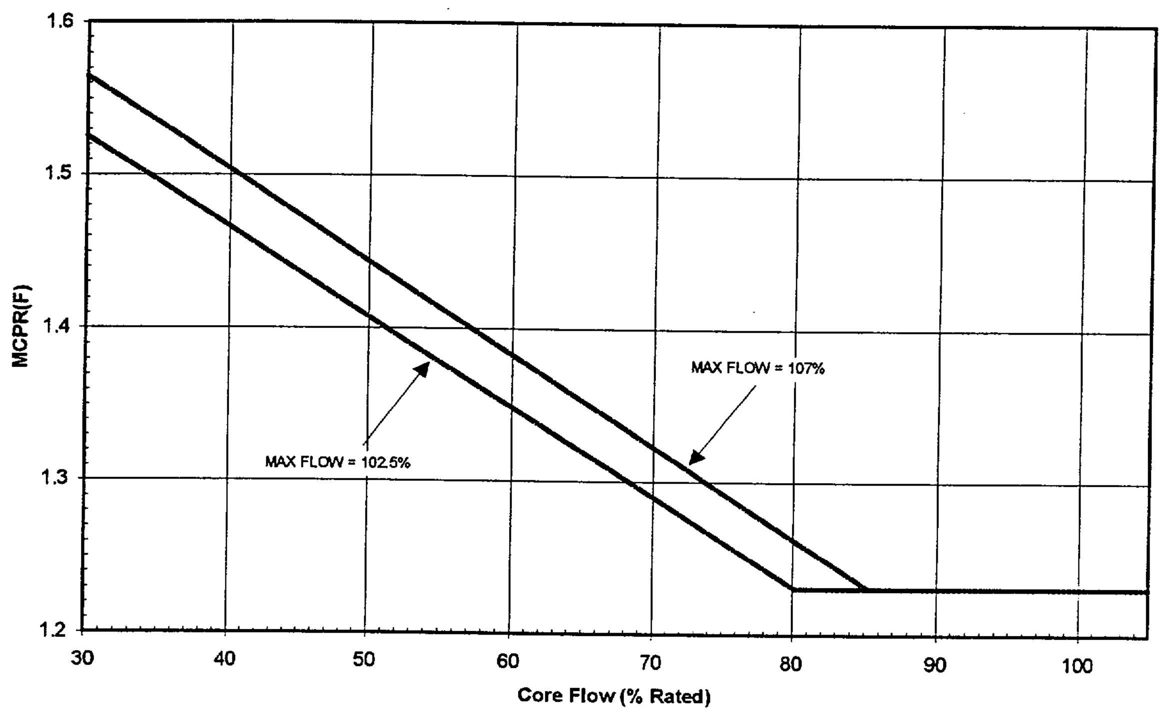
Turbine Bypass Out-Of-Service (TBOOS)

Kbyp = 2.01 For $\leq$ 50% CORE FLOW
Kbyp = 3.01 For > 50% CORE FLOW

For	$30\% \leq P < 45\%$	: Kp = 1.28 + 0.01340(45%-P)
For	$45\% \leq P < 60\%$	: Kp = 1.15 + 0.00867(60%-P)
For	$60\% \leq P$	: Kp = 1.00 + 0.00375(100%-P)

Note: Either Turbine Bypass or Recirculation Pump Trip may be Out-Of-Service. The core is not analyzed for both TBOOS and RPTOOS at the same time.

Figure 12
Flow Dependent MCPR Operating Limit - MCPR(F)



For Wc $\geq$ 30% : MCPR(F) = MAX(1.23, Af*Wc/100 + Bf)

Wc = % Rated Core Flow

Af and Bf are Constants Given Below:

Maximum Core Flow (% Rated)	Af	Bf
102.5	-0.587	1.701
107.0	-0.603	1.745

These values bound both Turbine Bypass In-Service and Out-Of-Service.

These values bound both Recirculation Pump Trip In-Service and Out-Of-Service

Either Turbine Bypass or Recirculation Pump Trip may be Out-Of-Service.
The core is not analyzed for a combination of TBOOS and RPTOOS.

The 102.5% maximum flow line is used for operation up to 100% rated flow.
The 107% maximum flow line is used for operation up to 105% rated flow (ICF).

Technical Requirements Manual

Revision 19

Electric Board Room Chillers

(revision pending-no pages enclosed)

Technical Requirements Manual

Revision 20

Changes to Match Technical Specifications No. 403 Changes

1.0 USE AND APPLICATION

1.4 Frequency

PURPOSE	The purpose of this section is to define the proper use and application of Frequency requirements.

DESCRIPTION

Each Technical Surveillance Requirement (TSR) has a specified Frequency in which the Surveillance must be met in order to meet the associated Limiting Condition for Operation (LCO). An understanding of the correct application of the specified Frequency is necessary for compliance with the TSR.

The "specified Frequency" is referred to throughout this section and each of the Requirements of Section 3.0, TSR Applicability. The "specified Frequency" consists of the requirements of the Frequency column of each TSR, as well as certain Notes in the Surveillance column that modify performance requirements.

Sometimes special situations dictate when the requirements of a Surveillance are to be met. They are "otherwise stated" conditions allowed by TSR 3.0.1. They may be stated as clarifying Notes in the Surveillance, as part of the Surveillance, or both.

Situations where a Surveillance could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after the associated LCO is within its Applicability, represent potential TSR 3.0.4 conflicts. To avoid these conflicts, the TSR (i.e., the Surveillance or the Frequency) is stated such that it is only "required" when it can be and should be performed. With a TSR satisfied, TSR 3.0.4 imposes no restriction.

The use of "met" or "performed" in these instances conveys specific meanings. A Surveillance is "met" only when the acceptance criteria are satisfied. Known failure of the requirements of a Surveillance, even without a Surveillance specifically being "performed," constitutes a Surveillance not "met." "Performance" refers only to the requirement to specifically determine the ability to meet the acceptance criteria.

1.4 Frequency

DESCRIPTION (continued)

Some Surveillances contain notes that modify the Frequency of performance or the conditions during which the acceptance criteria must be satisfied. For these Surveillances, the MODE entry restrictions of TR 3.0.4 may not apply. Such a Surveillance is not required to be performed prior to entering a MODE or other specified condition in the Applicability of the associated LCO if any of the following three conditions are satisfied:

a. The Surveillance is not required to be met in the MODE or other specified condition to be entered; or

b. The Surveillance is required to be met in the MODE or other specified condition to be entered, but has been performed within the specified Frequency (i.e., it is current) and is known not to be failed; or

c. The Surveillance is required to be met, but not performed, in the MODE or other specified condition to be entered, and is known not to be failed.

Examples 1.4-3, 1.4-4, 1.4-5, and 1.4-6 discusses these special situations.

EXAMPLES

The following examples illustrate the various ways that Frequencies are specified. In these examples, the Applicability of the LCO (LCO not shown) is MODES 1, 2, and 3.

EXAMPLE 1.4-1

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Perform CHANNEL CHECK.	12 hours

Example 1.4-1 contains the type of TSR most often encountered in the Technical Requirements (TR). The Frequency specifies an interval (12 hours) during which the associated Surveillance must be performed at least one time. Performance of the Surveillance initiates the subsequent interval. Although the Frequency is stated as 12 hours, an extension of the time interval to 1.25 times the

EXAMPLES

EXAMPLE 1.4-1 (continued)

interval specified in the Frequency is allowed by TSR 3.0.2 for operational flexibility. The measurement of this interval continues at all times, even when the TSR is not required to be met per TSR 3.0.1 (such as when the equipment is inoperable, a variable is outside specified limits, or the unit is outside the Applicability of the LCO). If the interval specified by TSR 3.0.2 is exceeded while the unit is in a MODE or other specified condition in the Applicability of the LCO, and the performance of the Surveillance is not otherwise modified (refer to Examples 1.4-3 and 1.4-4), then TSR 3.0.3 becomes applicable.

If the interval as specified by TSR 3.0.2 is exceeded while the unit is not in a MODE or other specified condition in the Applicability of the LCO for which performance of the TSR is required, the Surveillance must be performed within the Frequency requirements of TSR 3.0.2 prior to entry into the MODE or other specified condition. Failure to do so would result in a violation of TSR 3.0.4.

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-4

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
------------------------NOTE------------------------ Only required to be met in MODE 1. -- Verify LEAKAGE rates are within limits.	24 hours

Example 1.4-4 specifies that the requirements of this Surveillance do not have to be met until the unit is in MODE 1. The interval measurement for the Frequency of this Surveillance continues at all times, as described in Example 1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Surveillance. Therefore, if the Surveillance were not performed within the 24 hour (plus the extension allowed by TSR 3.0.2) interval, but the unit was not in MODE 1, there would be no failure of the TSR nor failure to meet the LCO. Therefore, no violation of TSR 3.0.4 occurs when changing MODES, even with the 24 hour Frequency exceeded, provided the MODE change was not made into MODE 1. Prior to entering MODE 1 (assuming again that the 24 hour Frequency were not met), TSR 3.0.4 would require satisfying the TSR.

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-5

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
-----------------------NOTE------------------------ Only required to be performed in MODE 1. --- Perform complete cycle of the valve.	7 days

The interval continues, whether or not the unit operation is in MODE 1, 2, or 3 (the assumed Applicability of the associated LCO) between performances.

As the Note modifies the required performance of the Surveillance, the Note is construed to be part of the "specified Frequency." Should the 7 day interval be exceeded while operation is not in MODE 1, this Note allows entry into and operation in MODES 2 and 3 to perform the Surveillance. The Surveillance is still considered to be performed within the "specified Frequency" if completed prior to entering MODE 1. Therefore, if the Surveillance were not performed within the 7 day (plus the extension allowed by TR 3.0.2) interval, but operation was not in MODE 1, it would not constitute a failure of the SR or failure to meet the LCO. Also, no violation of TR 3.0.4 occurs when changing MODES, even with the 7 day Frequency not met, provided operation does not result in entry into MODE 1.

Once the unit reaches MODE 1, the requirement for the Surveillance to be performed within its specified Frequency applies and would require that the Surveillance had been performed. If the Surveillance were not performed prior to entering MODE 1, there would then be a failure to perform a Surveillance within the specified Frequency, and the provisions of TR 3.0.3 would apply.

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-6

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
-----------------------NOTE----------------------- Not required to be met in MODE 3. --- Verify parameter is within limits.	24 hours

Example 1.4-6 specifies that the requirements of this Surveillance do not have to be met while the unit is in MODE 3 (the assumed Applicability of the associated LCO is MODES 1, 2, and 3). The interval measurement for the Frequency of this Surveillance continues at all times, as described in Example 1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Surveillance. Therefore, if the Surveillance were not performed within the 24 hour interval (plus the extension allowed by TR 3.0.2), and the unit was in MODE 3, there would be no failure of the TR nor failure to meet the LCO. Therefore, no violation of TR 3.0.4 occurs when changing MODES to enter MODE 3, even with the 24 hour Frequency exceeded, provided the MODE change does not result in entry into MODE 2. Prior to entering MODE 2 (assuming again that the 24 hour Frequency were not met), TR 3.0.4 would require satisfying the TR.

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1 — TRM LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in TRM LCO 3.0.2.

LCO 3.0.2 — Upon discovery of a failure to meet a TRM LCO, the Required Actions of the associated Conditions shall be met, except as provided in TRM LCO 3.0.5 and TRM LCO 3.0.6.

If the TRM LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required, unless otherwise stated.

LCO 3.0.3 — When a TRM LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS, the unit shall be placed in a MODE or other specified condition in which the TRM LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in:

a. MODE 2 within 10 hours;
b. MODE 3 within 13 hours; and
c. MODE 4 within 37 hours.

Exceptions to this Requirement are stated in the individual Requirements.

Where corrective measures are completed that permit operation in accordance with the TRM LCO or ACTIONS, completion of the ACTIONS required by TRM LCO 3.0.3 is not required.

TRM LCO 3.0.3 is only applicable in MODES 1, 2, and 3.

LCO 3.0.4 — When a TRM LCO is not met, entry into a MODE or other specified condition in the Applicability shall not be made except when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. This

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.4 (continued)

Requirement shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are a part of a shutdown of the unit.

Exceptions to this Requirement are stated in the individual Requirements.

TRM LCO 3.0.4 is only applicable for entry into a MODE or other specified condition in the Applicability in MODES 1, 2, and 3.

LCO 3.0.5

Equipment removed from service or declared inoperable to comply with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to TRM LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.

LCO 3.0.6

When a supported system TRM LCO is not met solely due to a support system LCO not being met, the Conditions and Required Actions associated with this supported system are not required to be entered. Only the support system LCO ACTIONS are required to be entered. This is an exception to TRM LCO 3.0.2 for the supported system. In this event, an evaluation shall be performed in accordance with Technical Specification 5.5.11, "Safety Function Determination Program (SFDP)." If a loss of safety function is determined to exist by this program, the appropriate Conditions and Required Actions of the LCO in which the loss of safety function exists are required to be entered. When a support system's Required Action directs a supported system to be declared inoperable or directs entry into Conditions and Required Actions for a supported system, the applicable Conditions and Required Actions shall be entered in accordance with LCO 3.0.2.

TR 5.0 ADMINISTRATIVE CONTROLS

TR 5.1 Technical Requirements Manual (TRM) Control Program

This Program provides a means for controlling changes to the Technical Requirements Manual and the Bases. The CORE OPERATING LIMITS REPORT (COLR) included in Appendix B is not considered to be part of the TRM.

TR 5.1.1	Changes or additions to the Technical Requirements Manual (TRM) shall be made under appropriate administrative controls and reviews.
TR 5.1.2	Licensees may make changes to the TRM without prior NRC approval provided the changes have been determined not to be candidates for inclusion in the Technical Specifications (TS) or not to require NRC approval pursuant to 10 CFR 50.59. The changes to the TRM shall include the following: a. Screening the change against the criteria contained in 10 CFR 50.36(c)(2)(ii). b. The change does not require approval pursuant to 10 CFR 50.59.
TR 5.1.3	The Technical Requirements Control Program shall contain provisions to ensure that changes to the TRM are accurately reflected in the FSAR as appropriate.
TR 5.1.4	Proposed changes that do not meet the criteria of TR 5.1.2 shall be reviewed and approved by the NRC prior to implementation. Changes or additions to the TRM implemented without prior NRC approval shall be provided to the NRC on a frequency consistent with 10 CFR 50.71(e).

1.0 USE AND APPLICATION

1.4 Frequency

PURPOSE	The purpose of this section is to define the proper use and application of Frequency requirements.

DESCRIPTION

Each Technical Surveillance Requirement (TSR) has a specified Frequency in which the Surveillance must be met in order to meet the associated Limiting Condition for Operation (LCO). An understanding of the correct application of the specified Frequency is necessary for compliance with the TSR.

The "specified Frequency" is referred to throughout this section and each of the Requirements of Section 3.0, TSR Applicability. The "specified Frequency" consists of the requirements of the Frequency column of each TSR, as well as certain Notes in the Surveillance column that modify performance requirements.

Sometimes special situations dictate when the requirements of a Surveillance are to be met. They are "otherwise stated" conditions allowed by TSR 3.0.1. They may be stated as clarifying Notes in the Surveillance, as part of the Surveillance, or both.

Situations where a Surveillance could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after the associated LCO is within its Applicability, represent potential TSR 3.0.4 conflicts. To avoid these conflicts, the TSR (i.e., the Surveillance or the Frequency) is stated such that it is only "required" when it can be and should be performed. With a TSR satisfied, TSR 3.0.4 imposes no restriction.

The use of "met" or "performed" in these instances conveys specific meanings. A Surveillance is "met" only when the acceptance criteria are satisfied. Known failure of the requirements of a Surveillance, even without a Surveillance specifically being "performed," constitutes a Surveillance not "met." "Performance" refers only to the requirement to specifically determine the ability to meet the acceptance criteria.

1.4 Frequency

DESCRIPTION (continued)

Some Surveillances contain notes that modify the Frequency of performance or the conditions during which the acceptance criteria must be satisfied. For these Surveillances, the MODE entry restrictions of TR 3.0.4 may not apply. Such a Surveillance is not required to be performed prior to entering a MODE or other specified condition in the Applicability of the associated LCO if any of the following three conditions are satisfied:

a. The Surveillance is not required to be met in the MODE or other specified condition to be entered; or

b. The Surveillance is required to be met in the MODE or other specified condition to be entered, but has been performed within the specified Frequency (i.e., it is current) and is known not to be failed; or

c. The Surveillance is required to be met, but not performed, in the MODE or other specified condition to be entered, and is known not to be failed.

Examples 1.4-3, 1.4-4, 1.4-5, and 1.4-6 discusses these special situations.

EXAMPLES

The following examples illustrate the various ways that Frequencies are specified. In these examples, the Applicability of the LCO (LCO not shown) is MODES 1, 2, and 3.

EXAMPLE 1.4-1

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Perform CHANNEL CHECK.	12 hours

Example 1.4-1 contains the type of TSR most often encountered in the Technical Requirements (TR). The Frequency specifies an interval (12 hours) during which the associated Surveillance must be performed at least one time. Performance of the Surveillance initiates the subsequent interval. Although the Frequency is stated as 12 hours, an extension of the time interval to 1.25 times the

EXAMPLES

EXAMPLE 1.4-1 (continued)

interval specified in the Frequency is allowed by TSR 3.0.2 for operational flexibility. The measurement of this interval continues at all times, even when the TSR is not required to be met per TSR 3.0.1 (such as when the equipment is inoperable, a variable is outside specified limits, or the unit is outside the Applicability of the LCO). If the interval specified by TSR 3.0.2 is exceeded while the unit is in a MODE or other specified condition in the Applicability of the LCO, and the performance of the Surveillance is not otherwise modified (refer to Examples 1.4-3 and 1.4-4), then TSR 3.0.3 becomes applicable.

If the interval as specified by TSR 3.0.2 is exceeded while the unit is not in a MODE or other specified condition in the Applicability of the LCO for which performance of the TSR is required, the Surveillance must be performed within the Frequency requirements of TSR 3.0.2 prior to entry into the MODE or other specified condition. Failure to do so would result in a violation of TSR 3.0.4.

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-4

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
---------------------NOTE--------------------- Only required to be met in MODE 1. -- Verify LEAKAGE rates are within limits.	24 hours

Example 1.4-4 specifies that the requirements of this Surveillance do not have to be met until the unit is in MODE 1. The interval measurement for the Frequency of this Surveillance continues at all times, as described in Example 1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Surveillance. Therefore, if the Surveillance were not performed within the 24 hour (plus the extension allowed by TSR 3.0.2) interval, but the unit was not in MODE 1, there would be no failure of the TSR nor failure to meet the LCO. Therefore, no violation of TSR 3.0.4 occurs when changing MODES, even with the 24 hour Frequency exceeded, provided the MODE change was not made into MODE 1. Prior to entering MODE 1 (assuming again that the 24 hour Frequency were not met), TSR 3.0.4 would require satisfying the TSR.

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-5

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
-----------------------NOTE------------------------ Only required to be performed in MODE 1. --- Perform complete cycle of the valve.	7 days

The interval continues, whether or not the unit operation is in MODE 1, 2, or 3 (the assumed Applicability of the associated LCO) between performances.

As the Note modifies the required performance of the Surveillance, the Note is construed to be part of the “specified Frequency.” Should the 7 day interval be exceeded while operation is not in MODE 1, this Note allows entry into and operation in MODES 2 and 3 to perform the Surveillance. The Surveillance is still considered to be performed within the “specified Frequency” if completed prior to entering MODE 1. Therefore, if the Surveillance were not performed within the 7 day (plus the extension allowed by TR 3.0.2) interval, but operation was not in MODE 1, it would not constitute a failure of the SR or failure to meet the LCO. Also, no violation of TR 3.0.4 occurs when changing MODES, even with the 7 day Frequency not met, provided operation does not result in entry into MODE 1.

Once the unit reaches MODE 1, the requirement for the Surveillance to be performed within its specified Frequency applies and would require that the Surveillance had been performed. If the Surveillance were not performed prior to entering MODE 1, there would then be a failure to perform a Surveillance within the specified Frequency, and the provisions of TR 3.0.3 would apply.

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-6

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
-----------------------NOTE------------------------ Not required to be met in MODE 3. --- Verify parameter is within limits.	24 hours

Example 1.4-6 specifies that the requirements of this Surveillance do not have to be met while the unit is in MODE 3 (the assumed Applicability of the associated LCO is MODES 1, 2, and 3). The interval measurement for the Frequency of this Surveillance continues at all times, as described in Example 1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Surveillance. Therefore, if the Surveillance were not performed within the 24 hour interval (plus the extension allowed by TR 3.0.2), and the unit was in MODE 3, there would be no failure of the TR nor failure to meet the LCO. Therefore, no violation of TR 3.0.4 occurs when changing MODES to enter MODE 3, even with the 24 hour Frequency exceeded, provided the MODE change does not result in entry into MODE 2. Prior to entering MODE 2 (assuming again that the 24 hour Frequency were not met), TR 3.0.4 would require satisfying the TR.

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1

TRM LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in TRM LCO 3.0.2.

LCO 3.0.2

Upon discovery of a failure to meet a TRM LCO, the Required Actions of the associated Conditions shall be met, except as provided in TRM LCO 3.0.5 and TRM LCO 3.0.6.

If the TRM LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required, unless otherwise stated.

LCO 3.0.3

When a TRM LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS, the unit shall be placed in a MODE or other specified condition in which the TRM LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in:

a. MODE 2 within 10 hours;

b. MODE 3 within 13 hours; and

c. MODE 4 within 37 hours.

Exceptions to this Requirement are stated in the individual Requirements.

Where corrective measures are completed that permit operation in accordance with the TRM LCO or ACTIONS, completion of the ACTIONS required by TRM LCO 3.0.3 is not required.

TRM LCO 3.0.3 is only applicable in MODES 1, 2, and 3.

LCO 3.0.4

When a TRM LCO is not met, entry into a MODE or other specified condition in the Applicability shall not be made except when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. This

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.4 (continued)

Requirement shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are a part of a shutdown of the unit.

Exceptions to this Requirement are stated in the individual Requirements.

TRM LCO 3.0.4 is only applicable for entry into a MODE or other specified condition in the Applicability in MODES 1, 2, and 3.

LCO 3.0.5

Equipment removed from service or declared inoperable to comply with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to TRM LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.

LCO 3.0.6

When a supported system TRM LCO is not met solely due to a support system LCO not being met, the Conditions and Required Actions associated with this supported system are not required to be entered. Only the support system LCO ACTIONS are required to be entered. This is an exception to TRM LCO 3.0.2 for the supported system. In this event, an evaluation shall be performed in accordance with Technical Specification 5.5.11, "Safety Function Determination Program (SFDP)." If a loss of safety function is determined to exist by this program, the appropriate Conditions and Required Actions of the LCO in which the loss of safety function exists are required to be entered. When a support system's Required Action directs a supported system to be declared inoperable or directs entry into Conditions and Required Actions for a supported system, the applicable Conditions and Required Actions shall be entered in accordance with LCO 3.0.2.

TR 5.0 ADMINISTRATIVE CONTROLS

TR 5.1 Technical Requirements Manual (TRM) Control Program

This Program provides a means for controlling changes to the Technical Requirements Manual and the Bases. The CORE OPERATING LIMITS REPORT (COLR) included in Appendix B is not considered to be part of the TRM.

TR 5.1.1	Changes or additions to the Technical Requirements Manual (TRM) shall be made under appropriate administrative controls and reviews.
TR 5.1.2	Licensees may make changes to the TRM without prior NRC approval provided the changes have been determined not to be candidates for inclusion in the Technical Specifications (TS) or not to require NRC approval pursuant to 10 CFR 50.59. The changes to the TRM shall include the following: a. Screening the change against the criteria contained in 10 CFR 50.36(c)(2)(ii). b. The change does not require approval pursuant to 10 CFR 50.59.
TR 5.1.3	The Technical Requirements Control Program shall contain provisions to ensure that changes to the TRM are accurately reflected in the FSAR as appropriate.
TR 5.1.4	Proposed changes that do not meet the criteria of TR 5.1.2 shall be reviewed and approved by the NRC prior to implementation. Changes or additions to the TRM implemented without prior NRC approval shall be provided to the NRC on a frequency consistent with 10 CFR 50.71(e).

1.0 USE AND APPLICATION

1.4 Frequency

PURPOSE

The purpose of this section is to define the proper use and application of Frequency requirements.

DESCRIPTION

Each Technical Surveillance Requirement (TSR) has a specified Frequency in which the Surveillance must be met in order to meet the associated Limiting Condition for Operation (LCO). An understanding of the correct application of the specified Frequency is necessary for compliance with the TSR.

The "specified Frequency" is referred to throughout this section and each of the Requirements of Section 3.0, TSR Applicability. The "specified Frequency" consists of the requirements of the Frequency column of each TSR, as well as certain Notes in the Surveillance column that modify performance requirements.

Sometimes special situations dictate when the requirements of a Surveillance are to be met. They are "otherwise stated" conditions allowed by TSR 3.0.1. They may be stated as clarifying Notes in the Surveillance, as part of the Surveillance, or both.

Situations where a Surveillance could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after the associated LCO is within its Applicability, represent potential TSR 3.0.4 conflicts. To avoid these conflicts, the TSR (i.e., the Surveillance or the Frequency) is stated such that it is only "required" when it can be and should be performed. With a TSR satisfied, TSR 3.0.4 imposes no restriction.

The use of "met" or "performed" in these instances conveys specific meanings. A Surveillance is "met" only when the acceptance criteria are satisfied. Known failure of the requirements of a Surveillance, even without a Surveillance specifically being "performed," constitutes a Surveillance not "met." "Performance" refers only to the requirement to specifically determine the ability to meet the acceptance criteria.

1.4 Frequency

DESCRIPTION (continued)

Some Surveillances contain notes that modify the Frequency of performance or the conditions during which the acceptance criteria must be satisfied. For these Surveillances, the MODE entry restrictions of TR 3.0.4 may not apply. Such a Surveillance is not required to be performed prior to entering a MODE or other specified condition in the Applicability of the associated LCO if any of the following three conditions are satisfied:

a. The Surveillance is not required to be met in the MODE or other specified condition to be entered; or

b. The Surveillance is required to be met in the MODE or other specified condition to be entered, but has been performed within the specified Frequency (i.e., it is current) and is known not to be failed; or

c. The Surveillance is required to be met, but not performed, in the MODE or other specified condition to be entered, and is known not to be failed.

Examples 1.4-3, 1.4-4, 1.4-5, and 1.4-6 discusses these special situations.

EXAMPLES

The following examples illustrate the various ways that Frequencies are specified. In these examples, the Applicability of the LCO (LCO not shown) is MODES 1, 2, and 3.

EXAMPLE 1.4-1

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Perform CHANNEL CHECK.	12 hours

Example 1.4-1 contains the type of TSR most often encountered in the Technical Requirements (TR). The Frequency specifies an interval (12 hours) during which the associated Surveillance must be performed at least one time. Performance of the Surveillance initiates the subsequent interval. Although the Frequency is stated as 12 hours, an extension of the time interval to 1.25 times the

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-1 (continued)

interval specified in the Frequency is allowed by TSR 3.0.2 for operational flexibility. The measurement of this interval continues at all times, even when the TSR is not required to be met per TSR 3.0.1 (such as when the equipment is inoperable, a variable is outside specified limits, or the unit is outside the Applicability of the LCO). If the interval specified by TSR 3.0.2 is exceeded while the unit is in a MODE or other specified condition in the Applicability of the LCO, and the performance of the Surveillance is not otherwise modified (refer to Examples 1.4-3 and 1.4-4), then TSR 3.0.3 becomes applicable.

If the interval as specified by TSR 3.0.2 is exceeded while the unit is not in a MODE or other specified condition in the Applicability of the LCO for which performance of the TSR is required, the Surveillance must be performed within the Frequency requirements of TSR 3.0.2 prior to entry into the MODE or other specified condition. Failure to do so would result in a violation of TSR 3.0.4.

EXAMPLES

EXAMPLE 1.4-4

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
-------------------------NOTE------------------------- Only required to be met in MODE 1. --	
Verify LEAKAGE rates are within limits.	24 hours

Example 1.4-4 specifies that the requirements of this Surveillance do not have to be met until the unit is in MODE 1. The interval measurement for the Frequency of this Surveillance continues at all times, as described in Example 1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Surveillance. Therefore, if the Surveillance were not performed within the 24 hour (plus the extension allowed by TSR 3.0.2) interval, but the unit was not in MODE 1, there would be no failure of the TSR nor failure to meet the LCO. Therefore, no violation of TSR 3.0.4 occurs when changing MODES, even with the 24 hour Frequency exceeded, provided the MODE change was not made into MODE 1. Prior to entering MODE 1 (assuming again that the 24 hour Frequency were not met), TSR 3.0.4 would require satisfying the TSR.

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-5

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
-----------------------NOTE----------------------- Only required to be performed in MODE 1. --	
Perform complete cycle of the valve.	7 days

The interval continues, whether or not the unit operation is in MODE 1, 2, or 3 (the assumed Applicability of the associated LCO) between performances.

As the Note modifies the required performance of the Surveillance, the Note is construed to be part of the "specified Frequency." Should the 7 day interval be exceeded while operation is not in MODE 1, this Note allows entry into and operation in MODES 2 and 3 to perform the Surveillance. The Surveillance is still considered to be performed within the "specified Frequency" if completed prior to entering MODE 1. Therefore, if the Surveillance were not performed within the 7 day (plus the extension allowed by TR 3.0.2) interval, but operation was not in MODE 1, it would not constitute a failure of the SR or failure to meet the LCO. Also, no violation of TR 3.0.4 occurs when changing MODES, even with the 7 day Frequency not met, provided operation does not result in entry into MODE 1.

Once the unit reaches MODE 1, the requirement for the Surveillance to be performed within its specified Frequency applies and would require that the Surveillance had been performed. If the Surveillance were not performed prior to entering MODE 1, there would then be a failure to perform a Surveillance within the specified Frequency, and the provisions of TR 3.0.3 would apply.

1.4 Frequency

EXAMPLES

EXAMPLE 1.4-6

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
------------------------NOTE------------------------ Not required to be met in MODE 3. --	
Verify parameter is within limits.	24 hours

Example 1.4-6 specifies that the requirements of this Surveillance do not have to be met while the unit is in MODE 3 (the assumed Applicability of the associated LCO is MODES 1, 2, and 3). The interval measurement for the Frequency of this Surveillance continues at all times, as described in Example 1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Surveillance. Therefore, if the Surveillance were not performed within the 24 hour interval (plus the extension allowed by TR 3.0.2), and the unit was in MODE 3, there would be no failure of the TR nor failure to meet the LCO. Therefore, no violation of TR 3.0.4 occurs when changing MODES to enter MODE 3, even with the 24 hour Frequency exceeded, provided the MODE change does not result in entry into MODE 2. Prior to entering MODE 2 (assuming again that the 24 hour Frequency were not met), TR 3.0.4 would require satisfying the TR.

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1 TRM LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in TRM LCO 3.0.2.

LCO 3.0.2 Upon discovery of a failure to meet a TRM LCO, the Required Actions of the associated Conditions shall be met, except as provided in TRM LCO 3.0.5 and TRM LCO 3.0.6.

If the TRM LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required, unless otherwise stated.

LCO 3.0.3 When a TRM LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS, the unit shall be placed in a MODE or other specified condition in which the TRM LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in:

a. MODE 2 within 10 hours;

b. MODE 3 within 13 hours; and

c. MODE 4 within 37 hours.

Exceptions to this Requirement are stated in the individual Requirements.

Where corrective measures are completed that permit operation in accordance with the TRM LCO or ACTIONS, completion of the ACTIONS required by TRM LCO 3.0.3 is not required.

TRM LCO 3.0.3 is only applicable in MODES 1, 2, and 3.

LCO 3.0.4 When a TRM LCO is not met, entry into a MODE or other specified condition in the Applicability shall not be made except when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. This

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.4 (continued)	Requirement shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are a part of a shutdown of the unit. Exceptions to this Requirement are stated in the individual Requirements. TRM LCO 3.0.4 is only applicable for entry into a MODE or other specified condition in the Applicability in MODES 1, 2, and 3.
LCO 3.0.5	Equipment removed from service or declared inoperable to comply with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to TRM LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.
LCO 3.0.6	When a supported system TRM LCO is not met solely due to a support system LCO not being met, the Conditions and Required Actions associated with this supported system are not required to be entered. Only the support system LCO ACTIONS are required to be entered. This is an exception to TRM LCO 3.0.2 for the supported system. In this event, an evaluation shall be performed in accordance with Technical Specification 5.5.11, "Safety Function Determination Program (SFDP)." If a loss of safety function is determined to exist by this program, the appropriate Conditions and Required Actions of the LCO in which the loss of safety function exists are required to be entered. When a support system's Required Action directs a supported system to be declared inoperable or directs entry into Conditions and Required Actions for a supported system, the applicable Conditions and Required Actions shall be entered in accordance with LCO 3.0.2.

TR 5.0 ADMINISTRATIVE CONTROLS

TR 5.1 Technical Requirements Manual (TRM) Control Program

This Program provides a means for controlling changes to the Technical Requirements Manual and the Bases. The CORE OPERATING LIMITS REPORT (COLR) included in Appendix B is not considered to be part of the TRM.

TR 5.1.1	Changes or additions to the Technical Requirements Manual (TRM) shall be made under appropriate administrative controls and reviews.
TR 5.1.2	Licensees may make changes to the TRM without prior NRC approval provided the changes have been determined not to be candidates for inclusion in the Technical Specifications (TS) or not to require NRC approval pursuant to 10 CFR 50.59. The changes to the TRM shall include the following: a. Screening the change against the criteria contained in 10 CFR 50.36(c)(2)(ii). b. The change does not require approval pursuant to 10 CFR 50.59.
TR 5.1.3	The Technical Requirements Control Program shall contain provisions to ensure that changes to the TRM are accurately reflected in the FSAR as appropriate.
TR 5.1.4	Proposed changes that do not meet the criteria of TR 5.1.2 shall be reviewed and approved by the NRC prior to implementation. Changes or additions to the TRM implemented without prior NRC approval shall be provided to the NRC on a frequency consistent with 10 CFR 50.71(e).

Technical Requirements Manual

Revision 21

Reactor Coolant Chemistry

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.1 Coolant Chemistry

LCO 3.4.1 Reactor coolant chemistry shall be maintained within the limits of Table 3.4.1-1.

APPLICABILITY: According to Table 3.4.1-1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Conductivity greater than the limit of Table 3.4.1-1 Column B but ≤ 10 μmho/cm at 25°C.	A.1 Verify by administrative means that conductivity has not been > 1.0 μmho/cm at 25°C for > 2 weeks in the past year.	Immediately
B. Chloride concentration greater than the limit of Table 3.4.1-1 Column B or E but ≤ 0.5 ppm.	B.1 Verify by administrative means that chloride concentration has not been > 0.2 ppm for > 2 weeks in the past year.	Immediately
C. pH not within limits of Table 3.4.1-1 Column A, B, and E.	C.1 Restore pH to within limits.	24 hours

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.4.1.3	Verify reactor coolant conductivity and chloride concentration within limits of Table 3.4.1-1 Column A.	Once during startup prior to pressurizing the reactor above atmospheric pressure
TSR 3.4.1.4	------------------------NOTE------------------------ Only required when the reactor is operating in MODES 1 or 2. --- Verify chloride ion content and pH within the limits of Table 3.4.1-1.	96 hours <u>AND</u> 8 hours whenever the reactor conductivity is >1.0 μmho/cm at 25°C (not required for Column E.)
TSR 3.4.1.5	------------------------NOTE------------------------ Only required when the reactor is not pressurized with fuel in the reactor vessel. --- Verify conductivity, chloride ion content, and pH within the limits of Table 3.4.1-1.	96 hours

BASES

LCO 3.4.1 (continued)

Operation of Hydrogen Water Chemistry (HWC) following Noble Metal Chemical Application (NMCA)

During the first several weeks of HWC operation following NMCA, the hydrogen added to reactor coolant converts corrosion products (primarily iron) to a soluble form which increases conductivity and affects pH. Soluble corrosion products are not IGSCC initiators or contributors and, therefore, susceptibility to IGSCC is not increased. To aid in maintaining high HWC availability, special conductivity limits were added for returning HWC to service following NMCA. The chloride and lower pH limits for this condition are unchanged from 'Steaming Rates > 100,000 lb/hr.' The higher pH limit is increased from 8.6 to 8.8 to include possible pH values at a conductivity limit of 2.0 μmho/cm. Due to the benign effects of increased conductivity due to soluble metals, the time limit of 2 weeks per year for conductivity > 1.0 μmho/cm and sampling for chloride and pH every 8 hours when conductivity is > 1.0 μmho/cm do not apply to this condition.

BASES

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.4.1.1

Reactor coolant conductivity shall be monitored continuously. If the continuous monitor becomes inoperable, the conductivity shall be checked every 4 hours when the reactor is not in MODE 4 or 5 and every 8 hours when the reactor is in MODE 4 or 5.

TSR 3.4.1.2

The continuous conductivity monitor shall be checked with an in-line flow cell every 7 days. If conductivity is > 1.0 micromhos/cm, this frequency is increased to 24 hours.

TSR 3.4.1.3

During startup and prior to pressurizing the reactor, conductivity and chloride concentration shall be verified to be within limits.

TSR 3.4.1.4

When the reactor is in MODE 1 or 2, the chloride ion content and pH shall be verified to be within limits every 96 hours. When the reactor is in MODE 1 or 2 and conductivity is > 1.0 micromhos/cm (except when in Table 3.4.1-1 Column E), the chloride ion content and pH shall be verified to be within limits every 8 hours.

TSR 3.4.1.5

During conditions with no steaming, there are much slower chemistry changes to the reactor water. Analyzing water samples every 96 hours is prudent and conservative.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)

Table 3.4.1-1
Coolant Chemistry Limits[1]

CHEMISTRY PARAMETERS	COLUMN A APPLICABLE CONDITION Prior To Startup And At Steaming Rates < 100,000 lb/hr	COLUMN B APPLICABLE CONDITION Steaming Rates > 100,000 lb/hr	COLUMN C APPLICABLE CONDITION Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup Condition	COLUMN D[2] APPLICABLE CONDITION Noble Metal Chemical Application and Subsequent Reactor Coolant Cleanup	COLUMN E[3] APPLICABLE CONDITION Operation of HWC Following Noble Metal Chemical Application
CHLORIDE (ppm)	≤ 0.1	≤ 0.2	≤ 0.5	≤ 0.1	≤ 0.2
CONDUCTIVITY (μmho/cm at 25°C)	≤ 2.0	≤ 1.0	≤ 10.0	≤ 20.0	≤ 2.0
pH	5.6-8.6	5.6-8.6	5.3-8.6	4.3-9.9	5.6-8.8

(1) When there is no fuel in the reactor vessel, Technical Requirement reactor coolant chemistry limits do not apply.

(2) During the Noble Metal Chemical Application and subsequent reactor coolant cleanup, CONDITIONS A, B, C, and D (including Required Actions and Completion Times) do not apply.

(3) During operation of HWC following the Noble Metal Chemical Application, CONDITION A (including Required Action and Completion Time) does not apply.

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.1 Coolant Chemistry

LCO 3.4.1 Reactor coolant chemistry shall be maintained within the limits of Table 3.4.1-1.

APPLICABILITY: According to Table 3.4.1-1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Conductivity greater than the limit of Table 3.4.1-1 Column B but ≤ 10 μmho/cm at 25°C.	A.1 Verify by administrative means that conductivity has not been > 1.0 μmho/cm at 25°C for > 2 weeks in the past year.	Immediately
B. Chloride concentration greater than the limit of Table 3.4.1-1 Column B or E but ≤ 0.5 ppm.	B.1 Verify by administrative means that chloride concentration has not been > 0.2 ppm for > 2 weeks in the past year.	Immediately
C. pH not within limits of Table 3.4.1-1 Column A, B, and E.	C.1 Restore pH to within limits.	24 hours

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.4.1.3	Verify reactor coolant conductivity and chloride concentration within limits of Table 3.4.1-1 Column A.	Once during startup prior to pressurizing the reactor above atmospheric pressure
TSR 3.4.1.4	------------------------NOTE------------------------ Only required when the reactor is operating in MODES 1 or 2. -- Verify chloride ion content and pH within the limits of Table 3.4.1-1.	96 hours <u>AND</u> 8 hours whenever the reactor conductivity is >1.0 µmho/cm at 25°C (not required for Column E.)
TSR 3.4.1.5	------------------------NOTE------------------------ Only required when the reactor is not pressurized with fuel in the reactor vessel. -- Verify conductivity, chloride ion content, and pH within the limits of Table 3.4.1-1.	 96 hours

Table 3.4.1-1
Coolant Chemistry Limits[1]

CHEMISTRY PARAMETERS	**COLUMN A** APPLICABLE CONDITION Prior To Startup And At Steaming Rates < 100,000 lb/hr	**COLUMN B** APPLICABLE CONDITION Steaming Rates > 100,000 lb/hr	**COLUMN C** APPLICABLE CONDITION Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup Condition	**COLUMN D**[2] APPLICABLE CONDITION Noble Metal Chemical Application and Subsequent Reactor Coolant Cleanup	**COLUMN E**[3] APPLICABLE CONDITION Operation of HWC Following Noble Metal Chemical Application
CHLORIDE (ppm)	≤ 0.1	≤ 0.2	≤ 0.5	≤ 0.1	≤ 0.2
CONDUCTIVITY (μmho/cm at 25°C)	≤ 2.0	≤ 1.0	≤ 10.0	≤ 20.0	≤ 2.0
pH	5.6-8.6	5.6-8.6	5.3-8.6	4.3-9.9	5.6-8.8

(1) When there is no fuel in the reactor vessel, Technical Requirement reactor coolant chemistry limits do not apply.

(2) During the Noble Metal Chemical Application and subsequent reactor coolant cleanup, CONDITIONS A, B, C, and D (including Required Actions and Completion Times) do not apply.

(3) During operation of HWC following the Noble Metal Chemical Application, CONDITION A (including Required Action and Completion Time) does not apply.

LCO 3.4.1
(continued)

Operation of Hydrogen Water Chemistry (HWC) following Noble Metal Chemical Application (NMCA)

During the first several weeks of HWC operation following NMCA, the hydrogen added to reactor coolant converts corrosion products (primarily iron) to a soluble form which increases conductivity and affects pH. Soluble corrosion products are not IGSCC initiators or contributors and, therefore, susceptibility to IGSCC is not increased. To aid in maintaining high HWC availability, special conductivity limits were added for returning HWC to service following NMCA. The chloride and lower pH limits for this condition are unchanged from 'Steaming Rates > 100,000 lb/hr.' The higher pH limit is increased from 8.6 to 8.8 to include possible pH values at a conductivity limit of 2.0 μmho/cm. Due to the benign effects of increased conductivity due to soluble metals, the time limit of 2 weeks per year for conductivity > 1.0 μmho/cm and sampling for chloride and pH every 8 hours when conductivity is > 1.0 μmho/cm do not apply to this condition.

BASES

TECHNICAL SURVEILLANCE REQUIREMENTS	<u>TSR 3.4.1.1</u> Reactor coolant conductivity shall be monitored continuously. If the continuous monitor becomes inoperable, the conductivity shall be checked every 4 hours when the reactor is not in MODE 4 or 5 and every 8 hours when the reactor is in MODE 4 or 5. <u>TSR 3.4.1.2</u> The continuous conductivity monitor shall be checked with an in-line flow cell every 7 days. If conductivity is > 1.0 micromhos/cm, this frequency is increased to 24 hours. <u>TSR 3.4.1.3</u> During startup and prior to pressurizing the reactor, conductivity and chloride concentration shall be verified to be within limits. <u>TSR 3.4.1.4</u> When the reactor is in MODE 1 or 2, the chloride ion content and pH shall be verified to be within limits every 96 hours. When the reactor is in MODE 1 or 2 and conductivity is > 1.0 micromhos/cm (except when in Table 3.4.1-1 Column E), the chloride ion content and pH shall be verified to be within limits every 8 hours. <u>TSR 3.4.1.5</u> During conditions with no steaming, there are much slower chemistry changes to the reactor water. Analyzing water samples every 96 hours is prudent and conservative.
REFERENCES	1. BFN Technical Specifications (version prior to standardized version)

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.1 Coolant Chemistry

LCO 3.4.1 Reactor coolant chemistry shall be maintained within the limits of Table 3.4.1-1.

APPLICABILITY: According to Table 3.4.1-1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Conductivity greater than the limit of Table 3.4.1-1 Column B but ≤ 10 μmho/cm at 25°C.	A.1 Verify by administrative means that conductivity has not been > 1.0 μmho/cm at 25°C for > 2 weeks in the past year.	Immediately
B. Chloride concentration greater than the limit of Table 3.4.1-1 Column B or E but ≤ 0.5 ppm.	B.1 Verify by administrative means that chloride concentration has not been > 0.2 ppm for > 2 weeks in the past year.	Immediately
C. pH not within limits of Table 3.4.1-1 Column A, B, and E.	C.1 Restore pH to within limits.	24 hours

(continued)

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.4.1.3	Verify reactor coolant conductivity and chloride concentration within limits of Table 3.4.1-1 Column A.	Once during startup prior to pressurizing the reactor above atmospheric pressure
TSR 3.4.1.4	------------------------NOTE------------------------ Only required when the reactor is operating in MODES 1 or 2. --- Verify chloride ion content and pH within the limits of Table 3.4.1-1.	96 hours <u>AND</u> 8 hours whenever the reactor conductivity is >1.0 μmho/cm at 25°C (not required for Column E.)
TSR 3.4.1.5	------------------------NOTE------------------------ Only required when the reactor is not pressurized with fuel in the reactor vessel. --- Verify conductivity, chloride ion content, and pH within the limits of Table 3.4.1-1.	96 hours

Table 3.4.1-1
Coolant Chemistry Limits[(1)]

CHEMISTRY PARAMETERS	COLUMN A APPLICABLE CONDITION Prior To Startup And At Steaming Rates < 100,000 lb/hr	COLUMN B APPLICABLE CONDITION Steaming Rates > 100,000 lb/hr	COLUMN C APPLICABLE CONDITION Reactor Not Pressurized With Fuel In Reactor Vessel, Except During Startup Condition	COLUMN D[(2)] APPLICABLE CONDITION Noble Metal Chemical Application and Subsequent Reactor Coolant Cleanup	COLUMN E[(3)] APPLICABLE CONDITION Operation of HWC Following Noble Metal Chemical Application
CHLORIDE (ppm)	≤ 0.1	≤ 0.2	≤ 0.5	≤ 0.1	≤ 0.2
CONDUCTIVITY (µmho/cm at 25°C)	≤ 2.0	≤ 1.0	≤ 10.0	≤ 20.0	≤ 2.0
pH	5.6-8.6	5.6-8.6	5.3-8.6	4.3-9.9	5.6-8.8

(1) When there is no fuel in the reactor vessel, Technical Requirement reactor coolant chemistry limits do not apply.

(2) During the Noble Metal Chemical Application and subsequent reactor coolant cleanup, CONDITIONS A, B, C, and D (including Required Actions and Completion Times) do not apply.

(3) During operation of HWC following the Noble Metal Chemical Application, CONDITION A (including Required Action and Completion Time) does not apply.

LCO 3.4.1
(continued)

Operation of Hydrogen Water Chemistry (HWC) following Noble Metal Chemical Application (NMCA)

During the first several weeks of HWC operation following NMCA, the hydrogen added to reactor coolant converts corrosion products (primarily iron) to a soluble form which increases conductivity and affects pH. Soluble corrosion products are not IGSCC initiators or contributors and, therefore, susceptibility to IGSCC is not increased. To aid in maintaining high HWC availability, special conductivity limits were added for returning HWC to service following NMCA. The chloride and lower pH limits for this condition are unchanged from 'Steaming Rates > 100,000 lb/hr.' The higher pH limit is increased from 8.6 to 8.8 to include possible pH values at a conductivity limit of 2.0 μmho/cm. Due to the benign effects of increased conductivity due to soluble metals, the time limit of 2 weeks per year for conductivity > 1.0 μmho/cm and sampling for chloride and pH every 8 hours when conductivity is > 1.0 μmho/cm do not apply to this condition.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.4.1.1

Reactor coolant conductivity shall be monitored continuously. If the continuous monitor becomes inoperable, the conductivity shall be checked every 4 hours when the reactor is not in MODE 4 or 5 and every 8 hours when the reactor is in MODE 4 or 5.

TSR 3.4.1.2

The continuous conductivity monitor shall be checked with an in-line flow cell every 7 days. If conductivity is > 1.0 micromhos/cm, this frequency is increased to 24 hours.

TSR 3.4.1.3

During startup and prior to pressurizing the reactor, conductivity and chloride concentration shall be verified to be within limits.

TSR 3.4.1.4

When the reactor is in MODE 1 or 2, the chloride ion content and pH shall be verified to be within limits every 96 hours. When the reactor is in MODE 1 or 2 and conductivity is > 1.0 micromhos/cm (except when in Table 3.4.1-1 Column E), the chloride ion content and pH shall be verified to be within limits every 8 hours.

TSR 3.4.1.5

During conditions with no steaming, there are much slower chemistry changes to the reactor water. Analyzing water samples every 96 hours is prudent and conservative.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)

Technical Requirements Manual

Revision 22

Structural Integrity

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.3 Structural Integrity

LCO 3.4.3 The structural integrity of ASME Code Class 1, 2, and 3 equivalent components shall be maintained in accordance with TSR 3.4.3.1, TSR 3.4.3.2, and TSR 3.4.3.3 throughout the life of the plant.

APPLICABILITY: MODES 1, 2, 3, 4, and 5.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met in MODE 1, 2, or 3.	A.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	48 hours
	<u>OR</u>	
	A.2 Isolate the affected component(s)	48 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	12 hours
	<u>OR</u>	
	B.2 Be in MODE 4.	36 hours

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Requirements of the LCO not met in MODE 4 or 5.	C.1 Initiate action to determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	Immediately
	AND	
	C.2.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	Prior to entering MODE 2 or 3
	OR	
	C.2.2 Isolate the affected components from service.	Prior to entering MODE 2 or 3

BASES

LCO 3.4.3	The standards set by the American Society of Mechanical Engineers and the requirements by the NRC to meet those standards are assured by compliance with these Technical Requirements.
APPLICABILITY	The only time these requirements may be temporarily suspended is when the reactor has been shutdown for a period of six months or more. The suspension will only allow an extension in the 10 year testing cycle for the amount of time the reactor was shutdown.

ACTIONS

A.1, B.1, B.2, C.1, and C.2

On finding an indication of a non-through-wall defect in a Class 1, 2, or 3 system, investigation is required. Pending completion of these investigations, no Technical Requirement (TR) is considered not met. For Class 1, 2, and high-energy Class 3 components with through-wall pressure boundary defects, structural integrity is assumed compromised. For the low-energy Class 3 components with through-wall defects, further investigation and evaluation is allowed.

At such time as the above evaluations determine that an indication represents a threat to structural integrity, a corrective action document will be written. In addition, the LCO will be considered not met and the specified Actions taken. If the indication is found to impact the OPERABILITY of the component or system, the appropriate corrective action based on the reactor MODE will be taken, which may include isolation of the affected component and, if applicable, any required Technical Specifications LCOs entered for the inoperable component. An acceptable means of exiting the TR LCO, though not explicitly stated as an Action, is to restore the structural integrity of the component by means of repair, replacement, adjustment, or modification.

Regarding the determination of corrective actions, additional requirements for the repair and replacement of ASME Section XI components is provided in Part D of SPP-9.1, "ASME Section XI."

BASES

ACTIONS

A.1, B.1, B.2, C.1, and C.2 (continued)

The provisions of Technical Specifications (TS) Section 3.4.4, Reactor Coolant System Leakage, must be adhered to in Modes 1, 2, and 3, and nothing in this TRM section should be construed to alter or affect the requirements of TS 3.4.4.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.4.3.1, TSR 3.4.3.2, and TSR 3.4.3.3

These surveillance requirements ensure that structural integrity of required components is inspected and maintained as required to meet regulatory requirements and detect reactor vessel component and piping defects.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)
2. BFNP FSAR Subsection 4.12, Inservice Inspection and Testing
3. Inservice Inspection of Nuclear Reactor Coolant Systems, Section XI, ASME Boiler and Pressure Vessel Code
4. ASME Boiler and Pressure Vessel Code, Section III (1968 Edition)
5. American Society for Nondestructive Testing No. SNT-TC-1A (1968 Edition)

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.3 Structural Integrity

LCO 3.4.3 The structural integrity of ASME Code Class 1, 2, and 3 equivalent components shall be maintained in accordance with TSR 3.4.3.1 and TSR 3.4.3.2 throughout the life of the plant.

APPLICABILITY: MODES 1, 2, 3, 4, and 5.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met in MODE 1, 2, or 3.	A.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s). <u>OR</u> A.2 Isolate the affected component(s)	48 hours 48 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. <u>OR</u> B.2 Be in MODE 4.	12 hours 36 hours

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Requirements of the LCO not met in MODE 4 or 5.	C.1 Initiate action to determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	Immediately
	AND	
	C.2.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	Prior to entering MODE 2 or 3
	OR	
	C.2.2 Isolate the affected components from service.	Prior to entering MODE 2 or 3

BASES

LCO 3.4.3

The standards set by the American Society of Mechanical Engineers and the requirements by the NRC to meet those standards are assured by compliance with these Technical Requirements.

APPLICABILITY

The only time these requirements may be temporarily suspended is when the reactor has been shutdown for a period of six months or more. The suspension will only allow an extension in the 10 year testing cycle for the amount of time the reactor was shutdown.

ACTIONS

A.1, B.1, B.2, C.1, and C.2

On finding an indication of a non-through-wall defect in a Class 1, 2, or 3 system, investigation is required. Pending completion of these investigations, no Technical Requirement (TR) is considered not met. For Class 1, 2, and high-energy Class 3 components with through-wall pressure boundary defects, structural integrity is assumed compromised. For the low-energy Class 3 components with through-wall defects, further investigation and evaluation is allowed.

At such time as the above evaluations determine that an indication represents a threat to structural integrity, a corrective action document will be written. In addition, the LCO will be considered not met and the specified Actions taken. If the indication is found to impact the OPERABILITY of the component or system, the appropriate corrective action based on the reactor MODE will be taken, which may include isolation of the affected component and, if applicable, any required Technical Specifications LCOs entered for the inoperable component. An acceptable means of exiting the TR LCO, though not explicitly stated as an Action, is to restore the structural integrity of the component by means of repair, replacement, adjustment, or modification.

Regarding the determination of corrective actions, additional requirements for the repair and replacement of ASME Section XI components is provided in Part D of SPP-9.1, "ASME Section XI."

ACTIONS	<u>A.1, B.1, B.2, C.1, and C.2</u> (continued) The provisions of Technical Specifications (TS) Section 3.4.4, Reactor Coolant System Leakage, must be adhered to in Modes 1, 2, and 3, and nothing in this TRM section should be construed to alter or affect the requirements of TS 3.4.4.
TECHNICAL SURVEILLANCE REQUIREMENTS	<u>TSR 3.4.3.1 and TSR 3.4.3.2</u> These surveillance requirements ensure that structural integrity of required components is inspected and maintained as required to meet regulatory requirements and detect reactor vessel component and piping defects.
REFERENCES	1. BFN Technical Specifications (version prior to standardized version) 2. BFNP FSAR Subsection 4.12, Inservice Inspection and Testing 3. Inservice Inspection of Nuclear Reactor Coolant Systems, Section XI, ASME Boiler and Pressure Vessel Code 4. ASME Boiler and Pressure Vessel Code, Section III (1968 Edition) 5. American Society for Nondestructive Testing No. SNT-TC-1A (1968 Edition)

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.3 Structural Integrity

LCO 3.4.3 The structural integrity of ASME Code Class 1, 2, and 3 equivalent components shall be maintained in accordance with TSR 3.4.3.1 and TSR 3.4.3.2 throughout the life of the plant.

APPLICABILITY: MODES 1, 2, 3, 4, and 5.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met in MODE 1, 2, or 3.	A.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	48 hours
	<u>OR</u>	
	A.2 Isolate the affected component(s)	48 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	12 hours
	<u>OR</u>	
	B.2 Be in MODE 4.	36 hours

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Requirements of the LCO not met in MODE 4 or 5.	C.1 Initiate action to determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	Immediately
	<u>AND</u>	
	C.2.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	Prior to entering MODE 2 or 3
	<u>OR</u>	
	C.2.2 Isolate the affected components from service.	Prior to entering MODE 2 or 3

BASES

LCO 3.4.3

The standards set by the American Society of Mechanical Engineers and the requirements by the NRC to meet those standards are assured by compliance with these Technical Requirements.

APPLICABILITY

The only time these requirements may be temporarily suspended is when the reactor has been shutdown for a period of six months or more. The suspension will only allow an extension in the 10 year testing cycle for the amount of time the reactor was shutdown.

ACTIONS

A.1, B.1, B.2, C.1, and C.2

On finding an indication of a non-through-wall defect in a Class 1, 2, or 3 system, investigation is required. Pending completion of these investigations, no Technical Requirement (TR) is considered not met. For Class 1, 2, and high-energy Class 3 components with through-wall pressure boundary defects, structural integrity is assumed compromised. For the low-energy Class 3 components with through-wall defects, further investigation and evaluation is allowed.

At such time as the above evaluations determine that an indication represents a threat to structural integrity, a corrective action document will be written. In addition, the LCO will be considered not met and the specified Actions taken. If the indication is found to impact the OPERABILITY of the component or system, the appropriate corrective action based on the reactor MODE will be taken, which may include isolation of the affected component and, if applicable, any required Technical Specifications LCOs entered for the inoperable component. An acceptable means of exiting the TR LCO, though not explicitly stated as an Action, is to restore the structural integrity of the component by means of repair, replacement, adjustment, or modification.

Regarding the determination of corrective actions, additional requirements for the repair and replacement of ASME Section XI components is provided in Part D of SPP-9.1, "ASME Section XI."

BASES

ACTIONS	A.1, B.1, B.2, C.1, and C.2 (continued) The provisions of Technical Specifications (TS) Section 3.4.4, Reactor Coolant System Leakage, must be adhered to in Modes 1, 2, and 3, and nothing in this TRM section should be construed to alter or affect the requirements of TS 3.4.4.
TECHNICAL SURVEILLANCE REQUIREMENTS	TSR 3.4.3.1 and TSR 3.4.3.2 These surveillance requirements ensure that structural integrity of required components is inspected and maintained as required to meet regulatory requirements and detect reactor vessel component and piping defects.
REFERENCES	1. BFN Technical Specifications (version prior to standardized version) 2. BFNP FSAR Subsection 4.12, Inservice Inspection and Testing 3. Inservice Inspection of Nuclear Reactor Coolant Systems, Section XI, ASME Boiler and Pressure Vessel Code 4. ASME Boiler and Pressure Vessel Code, Section III (1968 Edition) 5. American Society for Nondestructive Testing No. SNT-TC-1A (1968 Edition)

Technical Requirements Manual

Revision 23

TRM Revision 22 Correction

and

Unit 2 Core Operating Limits Report Revision

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.3 Structural Integrity

LCO 3.4.3 The structural integrity of ASME Code Class 1, 2, and 3 equivalent components shall be maintained in accordance with TSR 3.4.3.1, TSR 3.4.3.2, and TSR 3.4.3.3 throughout the life of the plant.

APPLICABILITY: MODES 1, 2, 3, 4, and 5.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met in MODE 1, 2, or 3.	A.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s). <u>OR</u> A.2 Isolate the affected component(s)	48 hours 48 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE 4.	12 hours 36 hours

(continued)

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.3 Structural Integrity

LCO 3.4.3 The structural integrity of ASME Code Class 1, 2, and 3 equivalent components shall be maintained in accordance with TSR 3.4.3.1 and TSR 3.4.3.2 throughout the life of the plant.

APPLICABILITY: MODES 1, 2, 3, 4, and 5.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met in MODE 1, 2, or 3.	A.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s).	48 hours
	<u>OR</u>	
	A.2 Isolate the affected component(s)	48 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	12 hours
	<u>AND</u>	
	B.2 Be in MODE 4.	36 hours

(continued)

TR 3.4 REACTOR COOLANT SYSTEM

TR 3.4.3 Structural Integrity

LCO 3.4.3 The structural integrity of ASME Code Class 1, 2, and 3 equivalent components shall be maintained in accordance with TSR 3.4.3.1 and TSR 3.4.3.2 throughout the life of the plant.

APPLICABILITY: MODES 1, 2, 3, 4, and 5.

ACTIONS

--NOTE--

Separate Condition entry is allowed for each event.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met in MODE 1, 2, or 3.	A.1 Determine that the structural integrity non-compliance has not adversely affected the OPERABILITY of the affected component(s). <u>OR</u> A.2 Isolate the affected component(s)	48 hours 48 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE 4.	12 hours 36 hours

(continued)

Browns Ferry Nuclear Plant
Unit 2, Cycle 12

CORE OPERATING LIMITS REPORT (COLR)

TENNESSEE VALLEY AUTHORITY
Nuclear Fuel Division
BWR Fuel Engineering Department

Prepared By: Earl E. Riley Date: 3/14/01
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PORC Chairman

Revision 0 (3/14/2001)

Initial Release
Pages Affected: All

Revision Log

Revision	Date	Description	Affected Pages
0	3/14/2001	Initial Release for New Cycle	All

1. INTRODUCTION

This Core Operating Limits Report for Browns Ferry Unit 2, Cycle 12 is prepared in accordance with the requirements of Browns Ferry Technical Specification 5.6.5. The core operating limits presented here were developed using NRC-approved methods (References 1 and 2). Results from the reload analyses for Browns Ferry Unit 2, Cycle 12 are documented in Reference 3.

The following core operating limits are included in this report:

a. Average Planar Linear Heat Generation Rate (APLHGR) Limit
(Technical Specifications 3.2.1 and 3.7.5)

b. Linear Heat Generation Rate (LHGR) Limit
(Technical Specification 3.2.3)

c. Minimum Critical Power Ratio Operating Limit (OLMCPR)
(Technical Specifications 3.2.2, 3.3.4.1, and 3.7.5)

d. Average Power Range Monitor (APRM) Flow Biased Rod Block Trip Setting
(Technical Requirements Manual Section 5.3.1 and Table 3.3.4-1)

e. Rod Block Monitor (RBM) Trip Setpoints and Operability
(Technical Specification Table 3.3.2.1-1)

f. Shutdown Margin (SDM) Limit
(Technical Specification 3.1.1)

2. APLHGR LIMIT (TECHNICAL SPECIFICATIONS 3.2.1 AND 3.7.5)

The APLHGR limits for full power and flow conditions for each type of fuel as a function of exposure are shown in Figures 1-5. The APLHGR limits for the GE13 assemblies are for the most limiting lattice (excluding natural uranium) at each exposure point. The specific values for each lattice are given in Reference 4.

These APLHGR limits are adjusted for off-rated power and flow conditions using the ARTS factors, MAPFAC(P) and MAPFAC(F). The reduced power factor, MAPFAC(P), is given in Figure 6. Similarly, adjustments for reduced flow operation are performed using the MAPFAC(F) corrections given in Figure 7. Both factors are multipliers used to reduce the standard APLHGR limit. The most limiting power-adjusted or flow-adjusted value is taken as the APLHGR operating limit for the off-rated condition.

The APLHGR limits in Figures 1-5 are applicable for both Turbine Bypass In-Service and Out-Of-Service. The off-rated power and flow corrections in Figures 6 and 7 bound both Turbine Bypass In-Service and Out-Of-Service operation. No corrections are required to the APLHGR limits for TBOOS for either rated or off-rated operation.

The APLHGR limits in Figures 1-5 are applicable for both Recirculation Pump Trip (RPT) In-Service and Out-Of-Service. The off-rated power and flow corrections in Figures 6 and 7 bound both RPT In-Service and Out-Of-Service operation. No corrections are required to the APLHGR limits for RPTOOS for either rated or off-rated operation.

For Single Recirculation Loop Operation (SLO), the most limiting of either the SLO multiplier or the off-rated MAPFAC correction is used to reduce the exposure dependent APLHGR limit. The SLO multiplier to be applied to this cycle is 0.84 (reference 3). It is not necessary to apply both the off-rated MAPFAC and SLO multiplier corrections at the same time.

3. LHGR LIMIT (TECHNICAL SPECIFICATION 3.2.3)

The LHGR limit is fuel type dependent. For Unit 2 Cycle 12 there is only one fuel type in the core. The limit for this type is shown below:

Fuel Type	LHGR Limit
GE13	14.4 kw/ft

4. OLMCPR (TECHNICAL SPECIFICATIONS 3.2.2, 3.3.4.1, AND 3.7.5)

a. **Rated Limits - OLMCPR(100):** The MCPR Operating Limit for rated power and flow conditions, OLMCPR(100), is equal to the fuel type and exposure dependent limit shown in Figures 8 and 9. These figures apply to GE13 fuel which is the only fuel type in the Unit 2 Cycle 12 Core.

Figure 8 applies to exposure up to 2000 MWD/ST prior to EOR (end of full power capability at rated flow with normal feedwater temperature) after which Figure 9 shall be used. It is acceptable to use the more restrictive Figure 9 limits at any point in the cycle.

As noted in Figures 8 and 9, an adder of 0.03 is applied for single loop operation.

The actual OLMCPR(100) value is dependent upon the scram time testing results, as described below (ref. 10):

$$\tau = 0.0 \quad \text{or} \quad \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B}, \quad \text{whichever is greater}$$

where; τ_A = **1.096** sec (analytical Option A scram time limit - based on dropout time for notch position 36)

$$\tau_{ave} = \frac{\sum_{i=1}^{n} \tau_i}{n}$$

$$\tau_B = \mu + 1.65 * \sigma * \left[\frac{N}{n}\right]^{\frac{1}{2}}$$

where; μ = **0.830** sec (mean scram time used in transient analysis - based on dropout time for notch position 36)

σ = **0.019** sec (standard deviation of μ)

N = Total number of active rods measured in Technical Specification Surveillance Requirement SR3.1.4.1

n = Number of surveillance rod tests performed to date in cycle

τ_i = Scram time (dropout time) from fully withdrawn to notch position 36 for the i^{th} rod

b. **Startup Limits:** Option A OLMCPR limits (**τ=1.0**) shall be used prior to the determination of τ in accordance with SR 3.1.4.1.

c. **Off-Rated Limits:** For off-rated power and flow conditions, power-adjusted and flow-adjusted operating limits are determined from Figures 10 and 11, respectively. The most limiting power-dependent or flow-dependent value is taken as the OLMCPR for the off-rated condition.

d. **Equipment Out-Of-Service OLMCPR Limits:** Rated power OLMCPR(100) limits are provided for Recirculation Pump Trip out-of-service (RPTOOS), Turbine Bypass out-of-service (TBOOS), and the combined RPTOOS/TBOOS condition in Figures 8 and 9 (reference 5). Additionally an off-rated MCPR(P) correction from Figure 10 (reference 5) shall be applied for TBOOS when the power is below Pbypass.

e. **Single Loop Operation (SLO) Limits:** As noted in section 4.a above, a correction of 0.03 is to be applied to the OLMCPR(100) limits for SLO as described in the footnote of Figures 8 and 9. The same adder applies to the off-rated MCPR(F) limit as noted in the footnote to Figure 11 and to the OLMCPR value below Pbypass from Figure 10.

5. APRM FLOW BIASED ROD BLOCK TRIP SETTING (TECHNICAL REQUIREMENTS MANUAL SECTION 5.3.1 AND TABLE 3.3.4-1)

The APRM Rod Block trip setting shall be:

$S_{RB} \leq (0.66(W-\Delta W) + 61\%)$ Allowable Value

$S_{RB} \leq (0.66(W-\Delta W) + 59\%)$ Nominal Trip Setpoint (NTSP)

where:

S_{RB} = Rod Block setting in percent of rated thermal power (3458 MWt)

W = Loop recirculation flow rate in percent of rated

ΔW = Difference between two-loop and single-loop effective recirculation flow at the same core flow (ΔW=0.0 for two-loop operation)

The APRM Rod Block trip setting is clamped at a maximum allowable value of 115% (corresponding to a NTSP of 113%).

6. ROD BLOCK MONITOR (RBM) TRIP SETPOINTS AND OPERABILITY (TECHNICAL SPECIFICATION TABLE 3.3.2.1-1)

The RBM trip setpoints and applicable power ranges shall be as follows (refs. 7-9):

RBM Trip Setpoint	Allowable Value (AV)	Nominal Trip Setpoint (NTSP)	
LPSP	27%	25%	
IPSP	62%	60%	
HPSP	82%	80%	
LTSP - unfiltered - filtered	118.7% 117.7%	117.0% 116.0%	(1),(2)
ITSP - unfiltered - filtered	113.7% 112.9%	112.0% 111.2%	(1),(2)
HTSP - unfiltered - filtered	108.7% 107.9%	107.0% 106.2%	(1),(2)
DTSP	90%	92%	

Notes: (1) These setpoints are based upon a MCPR operating limit of **1.25** using a safety limit of 1.07, as reported in references 6, 7, and 8. These setpoints bound the cycle specific minimum Option B MCPR operating limit of 1.29.

(2) The unfiltered setpoints are consistent with a nominal RBM filter setting of 0.0 seconds (reference 8). The filtered setpoints are consistent with a nominal RBM filter setting ≤ 0.5 seconds (reference 7).

The RBM setpoints in Technical Specification Table 3.3.2.1-1 are applicable when:

THERMAL POWER (% Rated)	Applicable MCPR [(1)]	Notes from Table 3.3.2.1-1	
$\geq 27\%$ and $< 90\%$	< 1.70 < 1.75	(a), (b), (f), (h) (a), (b), (f), (h)	dual loop operation single loop operation
$\geq 90\%$	< 1.40	(g)	dual loop operation [(2)]

Notes: (1) The MCPR values shown correspond to a SLMCPR of 1.07 for dual recirculation loop operation and 1.10 for single loop operation.

(2) Greater than 90% rated power is not attainable in single loop operation.

7. SHUTDOWN MARGIN (SDM) LIMIT (TECHNICAL SPECIFICATION 3.1.1)

The core shall be subcritical with the following margin with the strongest OPERABLE control rod fully withdrawn and all other OPERABLE control rods fully inserted.

SDM $\geq$ 0.38% dk/k

8. REFERENCES

1. NEDE-24011-P-A-14, "General Electric Standard Application for Reactor Fuel", June 2000.

2. NEDE-24011-P-A-14-US, "General Electric Standard Application for Reactor Fuel (Supplement for United States)", June 2000.

3. J11-03718-10-SRLR Rev. 0, "Supplemental Reload Licensing Report for Browns Ferry Nuclear Plant Unit 2 Reload 11 Cycle 12", January 2001.

4. J11-03718-10-MAPL Rev. 0, "Lattice-Dependent MAPLHGR Report for Browns Ferry Nuclear Plant Unit 2 Reload 11 Cycle 12", January 2001.

5. NEDC-32774P Supplement 1 Revision 0, "Browns Ferry Nuclear Plant Units 1, 2, and 3 Turbine Bypass and End-of-Cycle Recirculation Pump Trip Combination Mode Out-Of-Service", dated February 2001.

6. NEDC-32433P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Browns Ferry Nuclear Plant Unit 1, 2, and 3", dated April 1995.

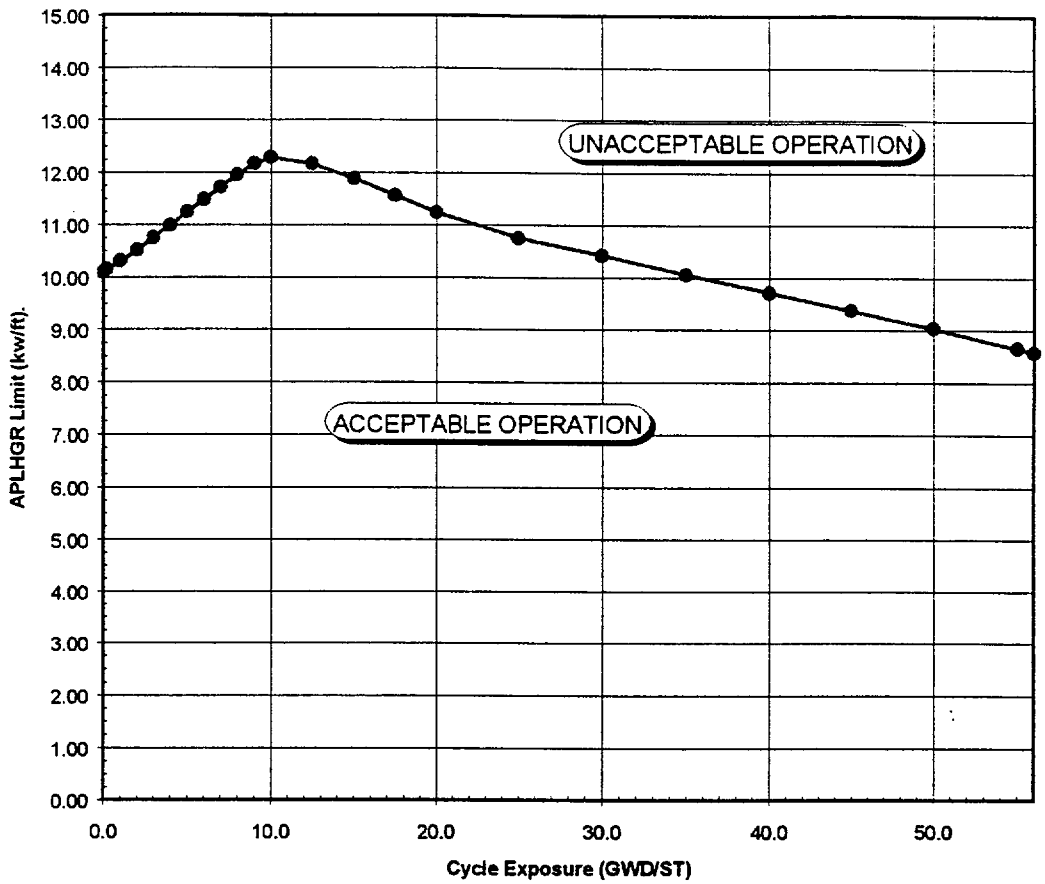
7. EDE-28-0990 Rev. 3 Supplement E, "PRNM (APRM, RBM, and RFM) Setpoint Calculations [ARTS/MELLL (NUMAC) - Power-Uprate Condition] for Tennessee Valley Authority Browns Ferry Nuclear Plant", dated October 1997.

8. EDE-28-0990 Rev. 2 Supplement E, "PRNM (APRM, RBM, and RFM) Setpoint Calculations [ARTS/MELLL (NUMAC) - Power-Uprate Condition] for Tennessee Valley Authority Browns Ferry Nuclear Plant", dated October 1997.

9. GE Letter LB#: 262-97-133, "Browns Ferry Nuclear Plant Rod Block Monitor Setpoint Clarification - GE Proprietary Information", dated September 12, 1997. [L32 970912 800]

10. GE Letter JAB-T8019a, "Technical Specification Changes for Implementation of Advanced Methods", dated June 4, 1998. [L32 980608 800]

Figure 1
APLHGR Limits for Bundle Type GE13-P9HTB384-12G4.0
(GE13)



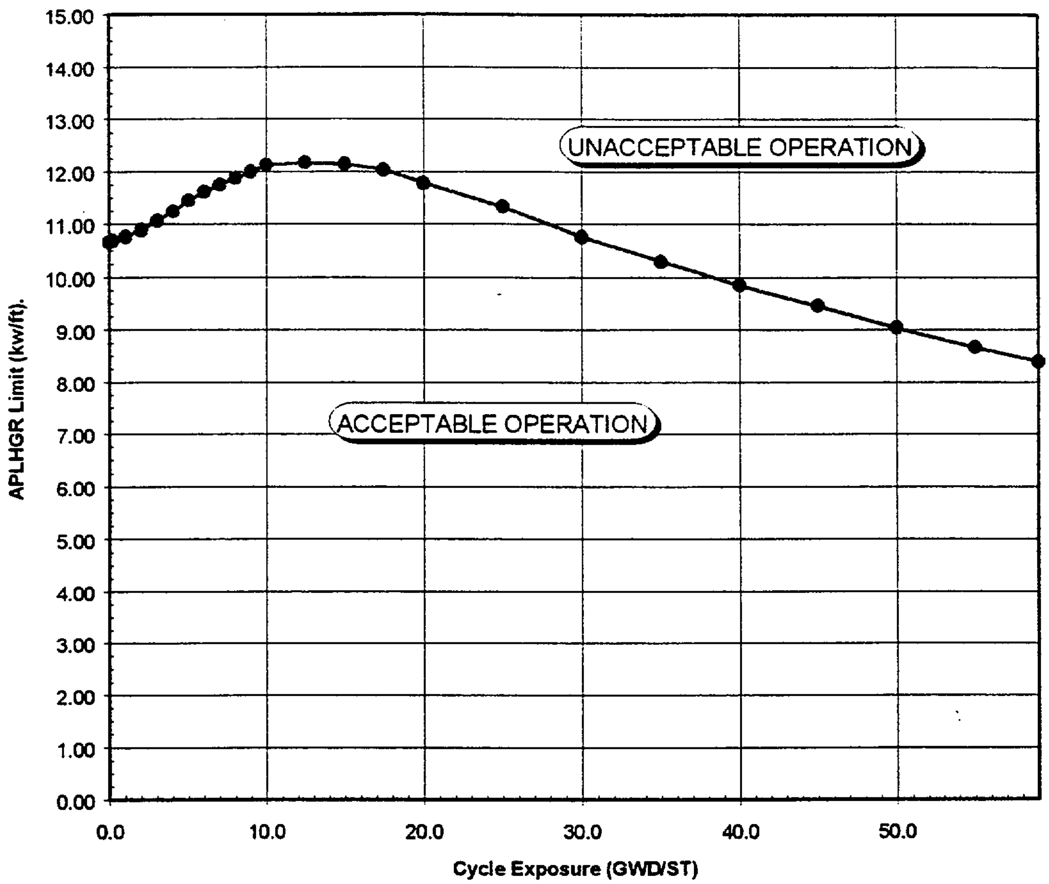
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.09	7.0	11.71	25.0	10.75
0.2	10.15	8.0	11.95	30.0	10.43
1.0	10.31	9.0	12.16	35.0	10.06
2.0	10.52	10.0	12.28	40.0	9.72
3.0	10.75	12.5	12.16	45.0	9.38
4.0	10.99	15.0	11.88	50.0	9.03
5.0	11.25	17.5	11.56	55.0	8.66
6.0	11.48	20.0	11.24	55.98	8.58

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 2
APLHGR Limits for Bundle Type GE13-P9DTB406-13GZ
(GE13)



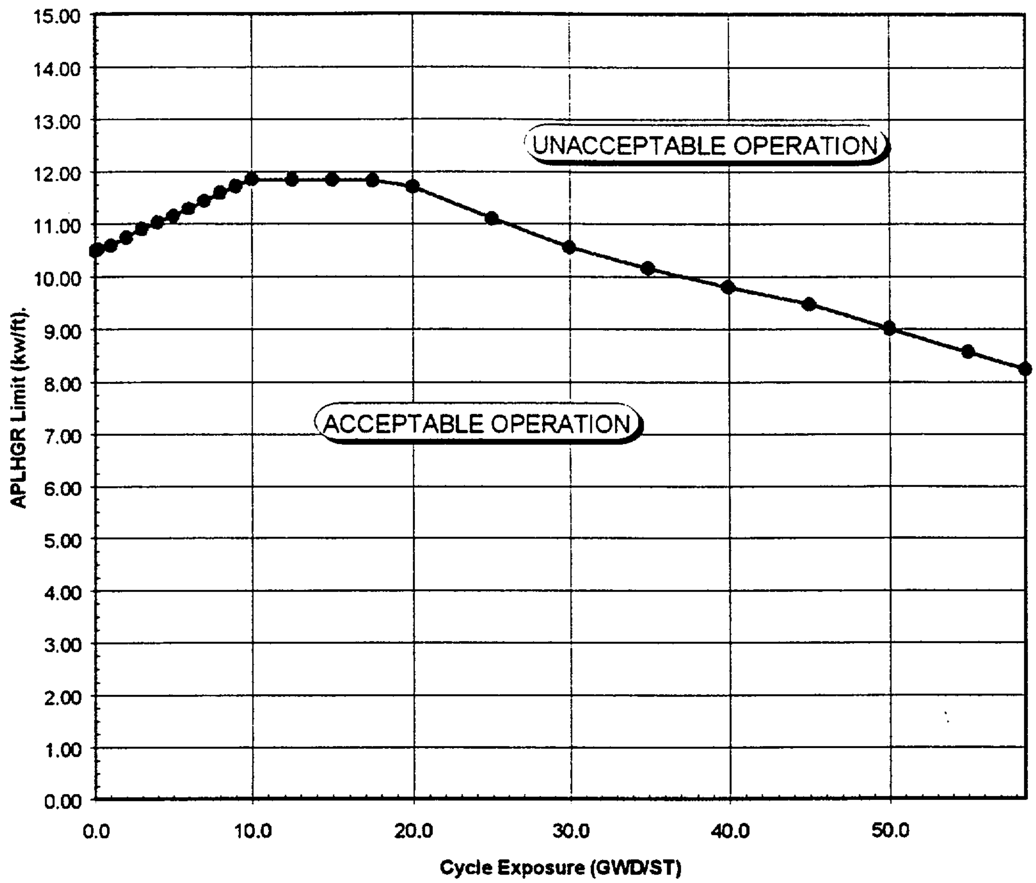
Most Limiting Lattice for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.66	7.0	11.75	25.0	11.33
0.2	10.69	8.0	11.87	30.0	10.76
1.0	10.76	9.0	11.99	35.0	10.29
2.0	10.89	10.0	12.12	40.0	9.85
3.0	11.06	12.5	12.16	45.0	9.45
4.0	11.24	15.0	12.14	50.0	9.03
5.0	11.45	17.5	12.03	55.0	8.66
6.0	11.61	20.0	11.78	59.01	8.38

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 3
APLHGR Limits for Bundle Type GE13-P9DTB401-14GZ
(GE13)



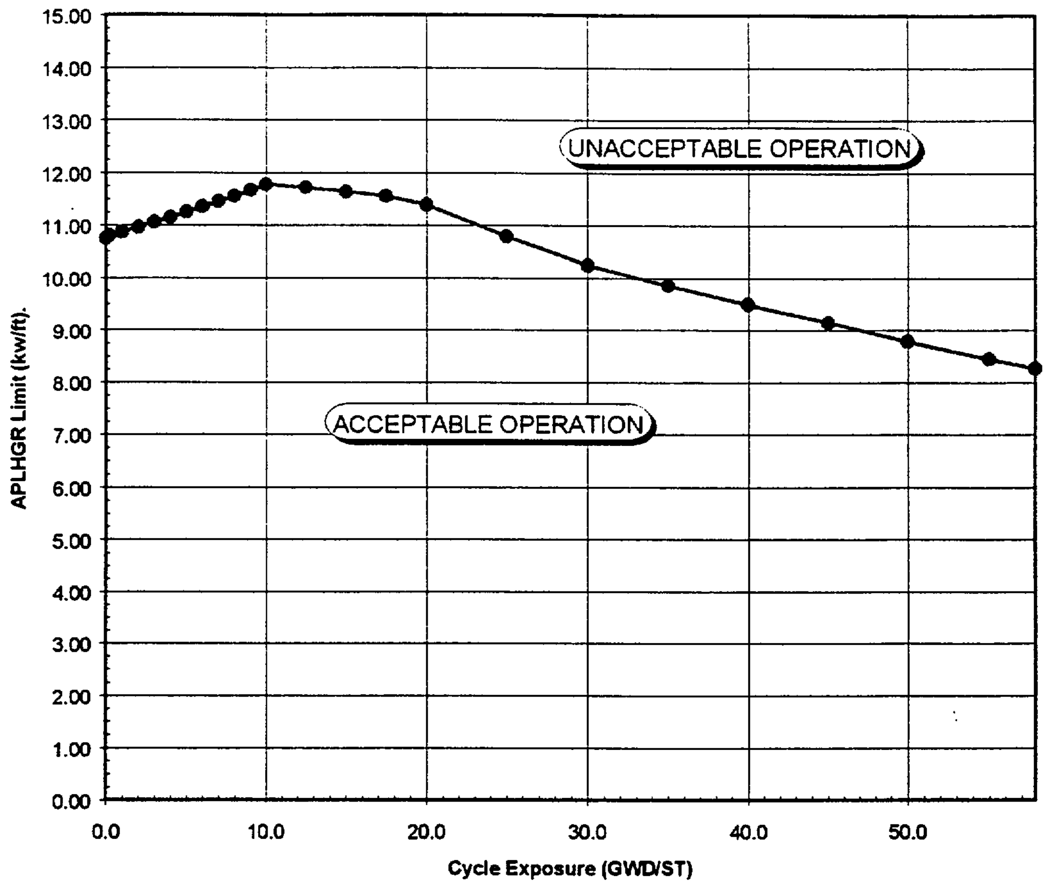
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.49	7.0	11.44	25.0	11.10
0.2	10.52	8.0	11.59	30.0	10.55
1.0	10.59	9.0	11.72	35.0	10.15
2.0	10.74	10.0	11.85	40.0	9.80
3.0	10.90	12.5	11.84	45.0	9.47
4.0	11.02	15.0	11.84	50.0	9.01
5.0	11.15	17.5	11.83	55.0	8.56
6.0	11.29	20.0	11.71	58.59	8.23

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 4
APLHGR Limits for Bundle Type GE13-P9DTB391-13GZ
(GE13)



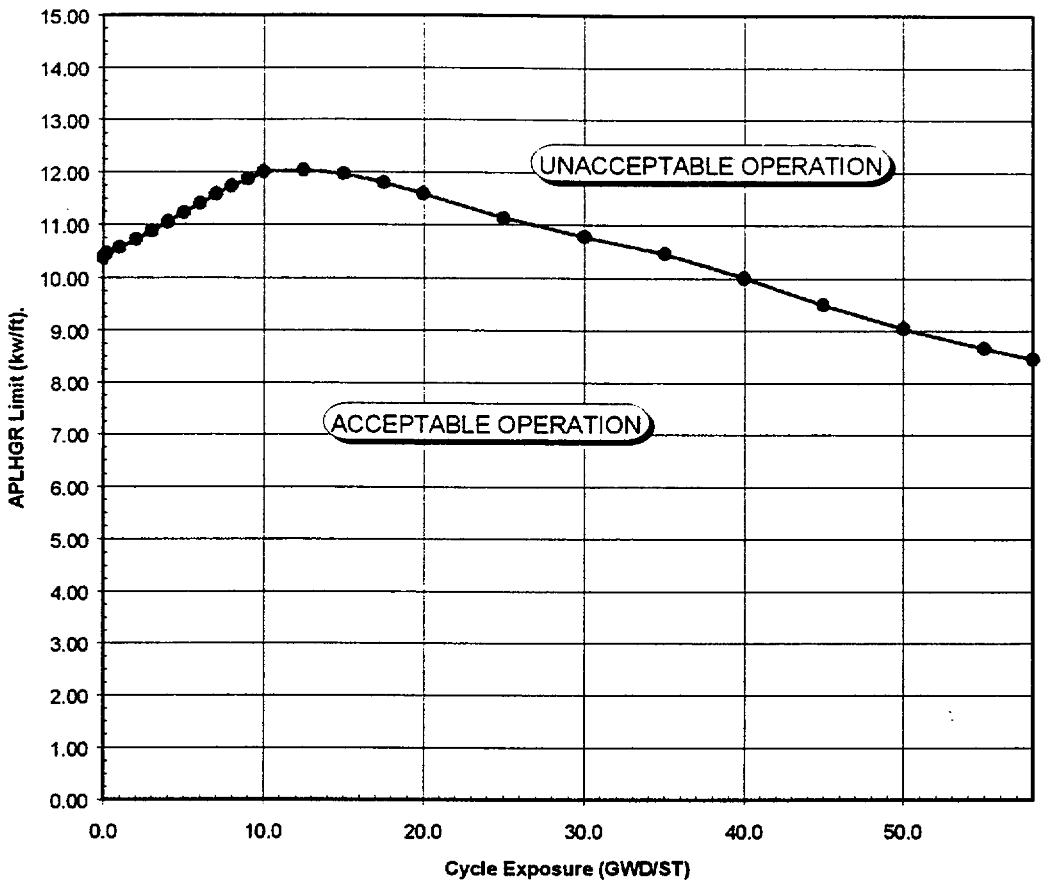
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.75	7.0	11.45	25.0	10.79
0.2	10.80	8.0	11.55	30.0	10.24
1.0	10.87	9.0	11.66	35.0	9.85
2.0	10.96	10.0	11.77	40.0	9.49
3.0	11.06	12.5	11.71	45.0	9.15
4.0	11.15	15.0	11.63	50.0	8.78
5.0	11.25	17.5	11.55	55.0	8.45
6.0	11.35	20.0	11.39	57.82	8.27

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 5
APLHGR Limits for Bundle Type GE13-P9DTB412-2G7.0/11G5.0
(GE13)



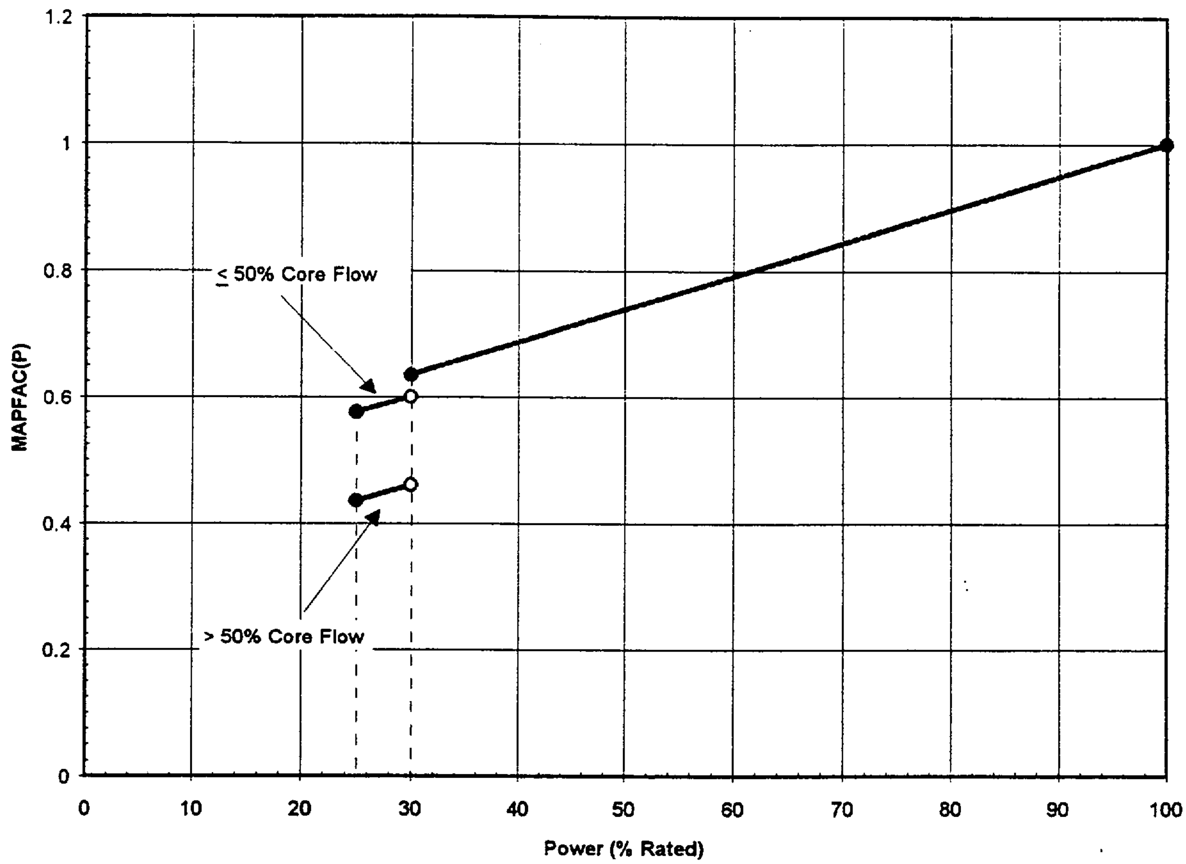
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.38	7.0	11.58	25.0	11.12
0.2	10.45	8.0	11.73	30.0	10.78
1.0	10.57	9.0	11.86	35.0	10.46
2.0	10.72	10.0	12.00	40.0	10.01
3.0	10.88	12.5	12.03	45.0	9.49
4.0	11.05	15.0	11.96	50.0	9.04
5.0	11.22	17.5	11.80	55.0	8.66
6.0	11.40	20.0	11.59	57.99	8.45

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 6
Power Dependent MAPLHGR Factor - MAPFAC(P)



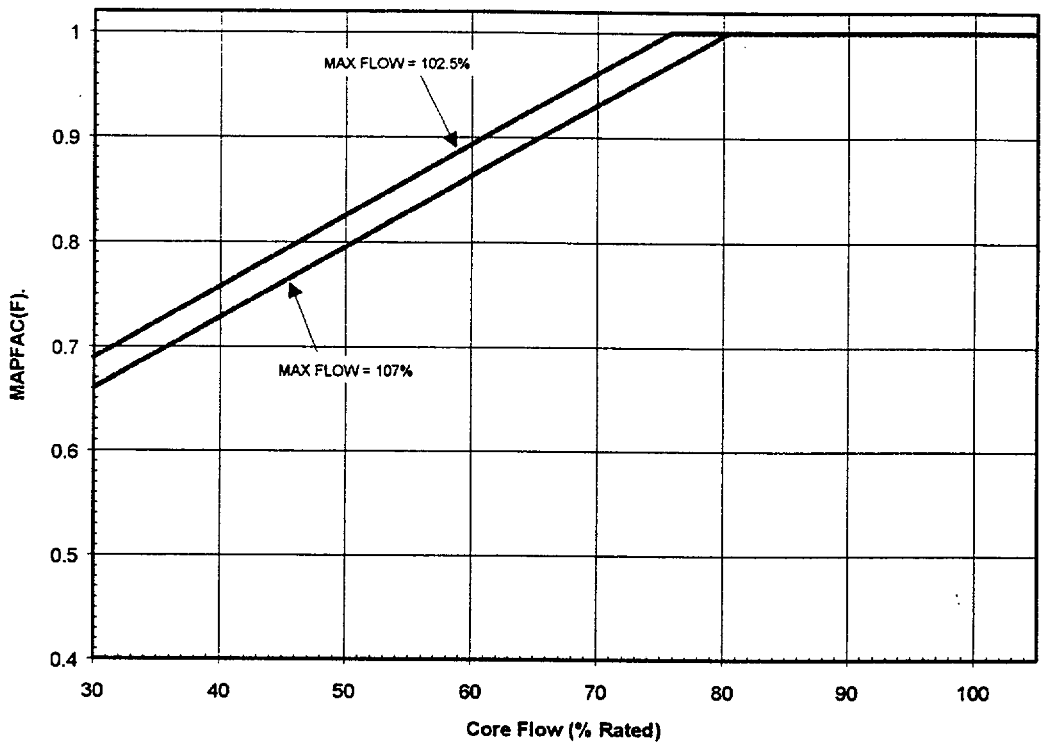
MAPLHGR(P) = MAPFAC(P) x MAPLHGRstd

MAPLHGRstd = Standard MAPLHGR Limits

For	**25% > P**	**: NO THERMAL LIMITS MONITORING REQUIRED** **NO LIMITS SPECIFIED**
For	**25% ≤ P < 30%**	**: MAPFAC(P) = 0.60 + 0.005(P-30%) For ≤ 50% CORE FLOW** **: MAPFAC(P) = 0.46 + 0.005(P-30%) For > 50% CORE FLOW**
For	**30% ≤ P**	**: MAPFAC(P) = 1.0 + 0.005224(P-100%)**

These values bound both Turbine Bypass In-Service and Out-Of-Service
These values bound both Recirculation Pump Trip In-Service and Out-Of-Service

Figure 7
Flow Dependent MAPLHGR Factor - MAPFAC(F)



FOR Wc (% Rated Core Flow) >= 30%

MAPLHGR(F) = MAPFAC(F) x MAPLHGRstd

MAPLHGRstd = Standard MAPLHGR Limits

MAPFAC(F) = MINIMUM(1.0 , Af * Wc /100 + Bf)

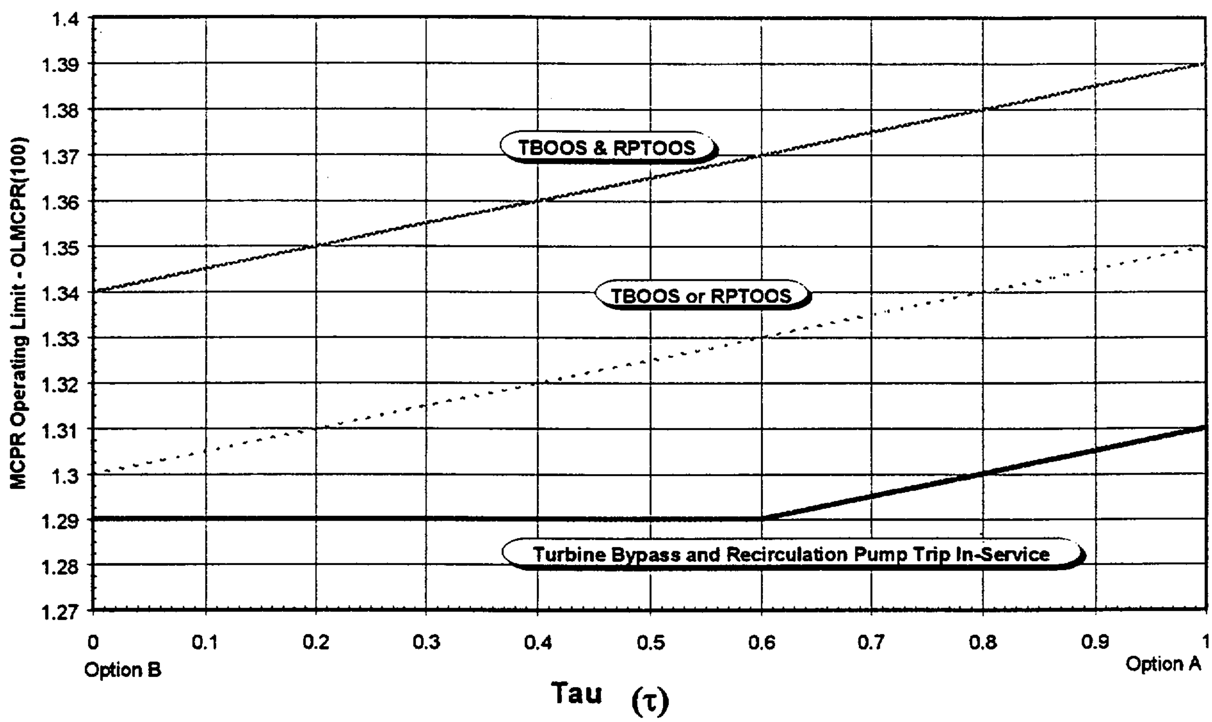
Af and Bf are Constants Given Below:

Maximum Core Flow (% Rated)	Af	Bf
102.5	0.6784	0.4861
107.0	0.6758	0.4574

These values bound both Turbine Bypass In-Service and Out-Of-Service.
These values bound both Recirculation Pump Trip In-Service and Out-Of-Service.

The 102.5% maximum flow line is used for operation up to 100% rated flow.
The 107% maximum flow line is used for operation up to 105% rated flow (ICF).

Figure 8
MCPR Operating Limit for All GE13 Bundles
For Cycle Exposures up to EOR-2000 MWD/ST (see note 3)

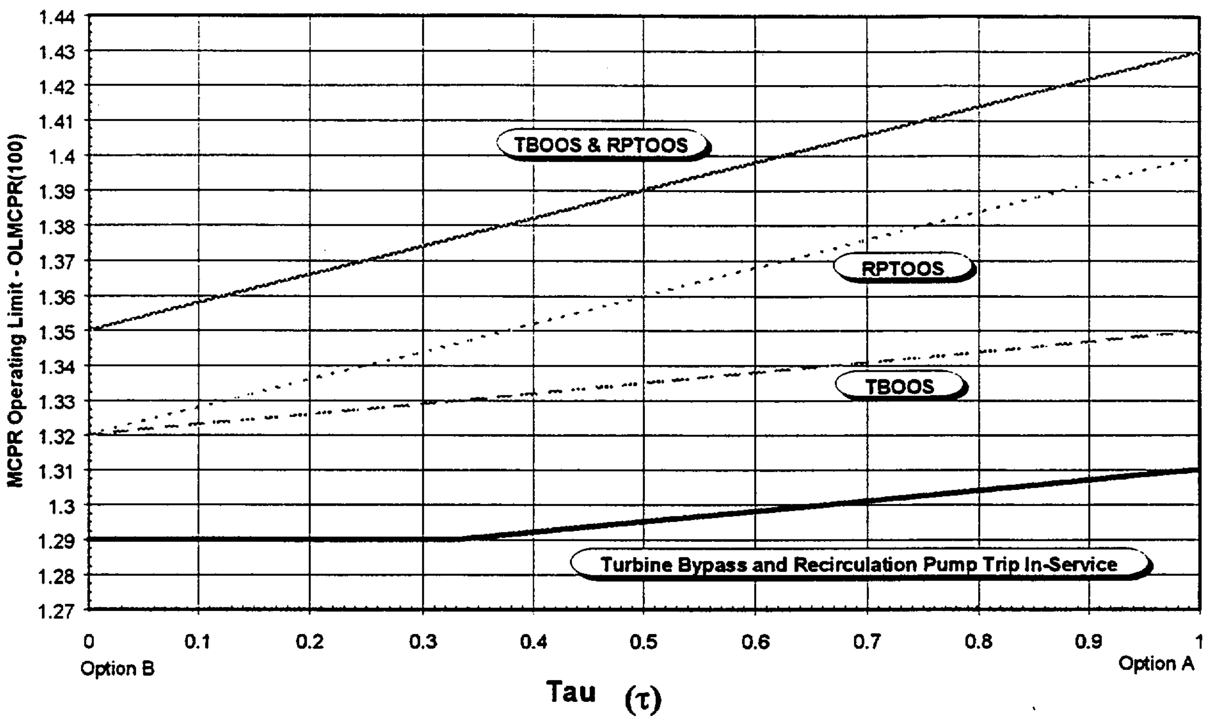


Exposure Range	Out-Of-Service	Option A (1) Tau=1.0	Option B Tau=0.0
BOC12 to (EOR-2000 MWD/ST)	na	1.31	1.29
BOC12 to (EOR-2000 MWD/ST)	Turbine Bypass (TBOOS)	1.35	1.30
BOC12 to (EOR-2000 MWD/ST)	Recirculation Pump Trip (RPTOOS)	1.35	1.30
BOC12 to (EOR-2000 MWD/ST)	TBOOS and RPTOOS	1.39	1.34

Notes
1. Use this value prior to performing scram time testing per SR 3.1.4.1.
2. The values shown are for dual recirculation loop operation (1.07 SLMCPR). Increase any value shown by 0.03 for Single Loop Operation (SLO:SLMCPR=1.10).
3. EOR refers to the end of Full Power Capability at Rated Flow with normal Feedwater Heating.

Figure 9
MCPR Operating Limit for All GE13 Bundles

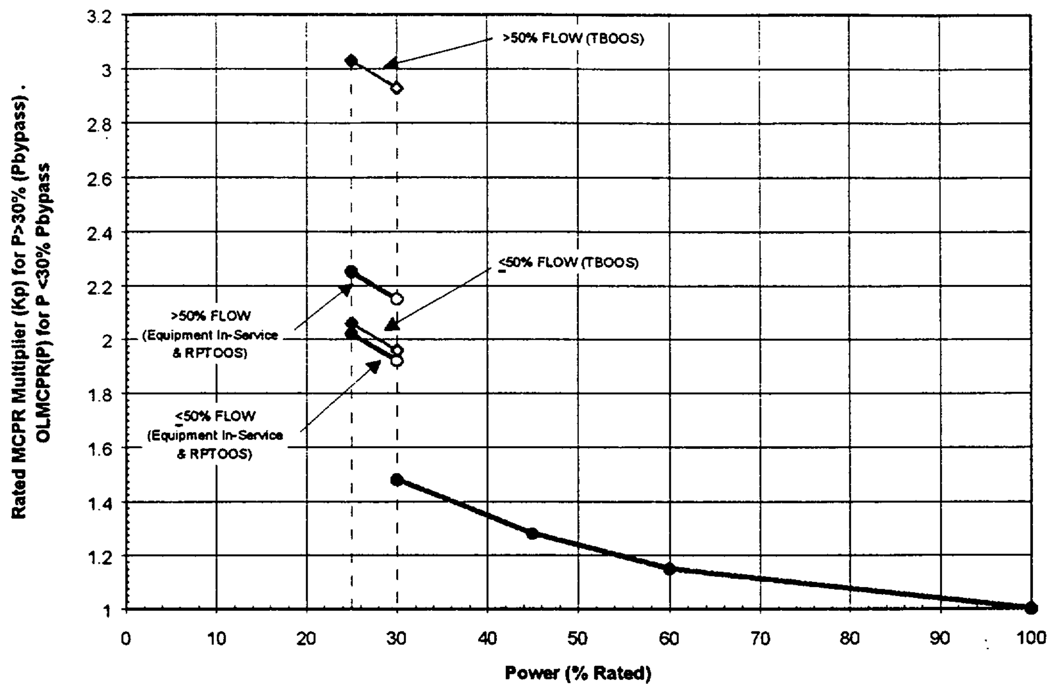
Optional for All Cycle Exposures - Required after EOR-2000 MWD/ST is reached (see note 3)



Exposure Range	Out-Of-Service	Option A (1) Tau=1.0	Option B Tau=0.0
BOC12 to (EOR-2000 MWD/ST)	na	1.31	1.29
BOC12 to (EOR-2000 MWD/ST)	Turbine Bypass (TBOOS)	1.35	1.32
BOC12 to (EOR-2000 MWD/ST)	Recirculation Pump Trip (RPTOOS)	1.40	1.32
BOC12 to (EOR-2000 MWD/ST)	TBOOS and RPTOOS	1.43	1.35

Notes
1. Use this value prior to performing scram time testing per SR 3.1.4.1.
2. The values shown are for dual recirculation loop operation (1.07 SLMCPR). Increase any value shown by 0.03 for Single Loop Operation (SLO:SLMCPR=1.10).
3. EOR refers to the end of Full Power Capability at Rated Flow with normal Feedwater Heating.

Figure 10
Power Dependent MCPR(P) Limits



OPERATING LIMIT MCPR(P) = Kp * OLMCPR(100)

For	**P < 25%**	**: NO THERMAL LIMITS MONITORING REQUIRED NO LIMITS SPECIFIED**
For	**25% ≤ P < Pbypass**	**: (Pbypass = 30%)**
		: Kp = [Kbyp + 0.02(30%-P)]/OLMCPR(100)

Turbine Bypass and RPT In-Service, or RPT Out-Of-Service (RPTOOS)

Kbyp = 1.92 For ≤ 50% CORE FLOW
Kbyp = 2.15 For > 50% CORE FLOW

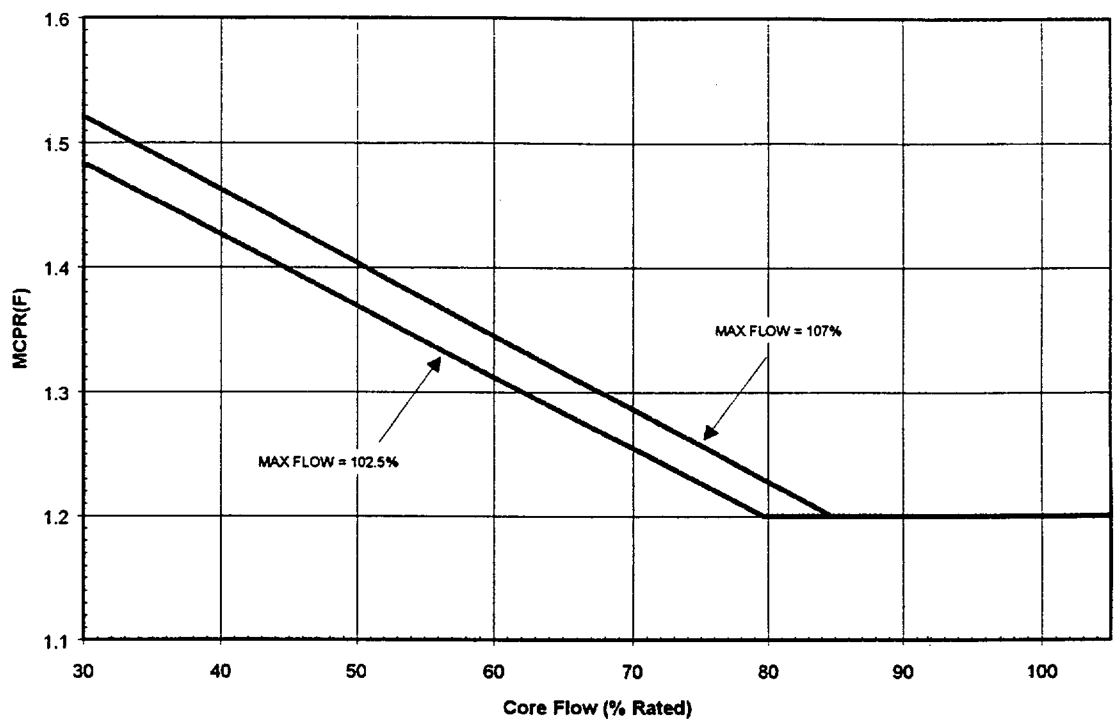
Turbine Bypass Out-Of-Service (TBOOS)

Kbyp = 1.96 For ≤ 50% CORE FLOW
Kbyp = 2.93 For > 50% CORE FLOW

For	**30% ≤ P < 45%**	**: Kp = 1.28 + 0.01340(45%-P)**
For	**45% ≤ P < 60%**	**: Kp = 1.15 + 0.00867(60%-P)**
For	**60% ≤ P**	**: Kp = 1.00 + 0.00375(100%-P)**

Note: **The OLMCPR below Pbypass is based upon the dual recirculation loop SLMCPR of 1.07. Add 0.03 to the OLMCPR in Single Loop Operation (SLO - SLMCPR=1.10).**

Figure 11
Flow Dependent MCPR Operating Limit - MCPR(F)



For Wc ≥ 30% : MCPR(F) = MAX(1.20, Af*Wc/100 + Bf)

Wc = % Rated Core Flow

Af and Bf are Constants Given Below:

Maximum Core Flow (% Rated)	Af	Bf
102.5	-0.571	1.655
107.0	-0.586	1.697

These values bound both Turbine Bypass In-Service and Out-Of-Service.
These values bound both Recirculation Pump Trip In-Service and Out-Of-Service

The 102.5% maximum flow line is used for operation up to 100% rated flow.
The 107% maximum flow line is used for operation up to 105% rated flow (ICF).

This figure is based upon the dual recirculation loop operation SLMCPR of 1.07.
Add 0.03 to these values for Single Loop Operation (SLO - SLMCPR=1.10).

Technical Requirements Manual

Revision 24

Unit 3 Residual Heat Removal System Cross Connect

TR 3.5 EMERGENCY CORE COOLING SYSTEMS

TR 3.5.1 RHR Cross-Connect

LCO 3.5.1 Two RHR pumps and associated heat exchangers and valves on an adjacent unit must be OPERABLE and capable of supplying cross-connect capability.

APPLICABILITY: MODES 1, 2, 3

-----NOTE-----
Because cross-connect capability is not a short-term requirement, a component is not considered inoperable if cross-connect capability can be restored to service within 5 hours.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required RHR pump or associated heat exchanger located on the unit cross-connection in the adjacent unit inoperable for any reason (including valve inoperability, pipe break, etc.).	-----NOTE----- The associated diesel generator must remain OPERABLE for the remaining RHR pump. Otherwise, Condition B shall be entered. -------------- A.1 Restore required pump and associated heat exchanger to OPERABLE status.	30 days
B. RHR cross-connection flow or heat removal capability is lost.	B.1 Restore RHR cross-connection flow and heat removal capability.	20 days
C. Required Action and associated Completion Time of Conditions A or B is not met.	C.1 Enter TRM LCO 3.0.3.	Immediately

ACTIONS

A.1

Should one of the required RHR pumps or associated heat exchangers located on the unit cross-connection in the adjacent unit become inoperable, an equal capability for long-term fluid makeup to the reactor and for cooling of the containment remains OPERABLE. Because of the availability of an equal makeup and cooling capability, a 30-day repair period is justified.

B.1

Should the capability for providing flow through the cross-connect lines be lost, a 20-day repair time is allowed before shutdown is required. This repair time is justified based on the very small probability for ever needing RHR pumps and heat exchangers to supply an adjacent unit.

C.1

The inability to repair the cross-connect capability within the required completion time requires the affected unit be shutdown in accordance with TRM LCO 3.0.3.

TECHNICAL SURVEILLANCE REQUIREMENTS

TSR 3.5.1.1

The RHR pumps on the adjacent units which supply cross-connect capability are required to be demonstrated to be OPERABLE in accordance with the Inservice Testing Program.

REFERENCES

1. BFN Technical Specifications (version prior to standardized version)
2. Section 4.8, 4.12, and Appendix F.7.15 of BFN FSAR
3. Design Criteria BFN-50-7074, "Residual Heat Removal System - Units 2 and 3"

Technical Requirements Manual

Revision 25

Unit 2 Core Operating Limits Report Revision

Browns Ferry Nuclear Plant
Unit 2, Cycle 12

CORE OPERATING LIMITS REPORT (COLR)

TENNESSEE VALLEY AUTHORITY
Nuclear Fuel Division
BWR Fuel Engineering Department

Prepared By: Earl E. Riley Date: 4-20-01
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Verified By: TD Beu Date: 4/20/01
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Reviewed By: JM Keck Date: 4/20/01
J. M. Keck, Supervisor
Browns Ferry Reactor Engineering

Reviewed By: Date: 4/20/01
PORC Chairman

Revision Log

Revision	Date	Description	Affected Pages
0	3/14/2001	Initial Release for New Cycle	All
1	4/20/2001	Revise Table under Figure 9 to correct typographical error BF PER 01-004088-000	1, 2, and 20

1. INTRODUCTION

This Core Operating Limits Report for Browns Ferry Unit 2, Cycle 12 is prepared in accordance with the requirements of Browns Ferry Technical Specification 5.6.5. The core operating limits presented here were developed using NRC-approved methods (References 1 and 2). Results from the reload analyses for Browns Ferry Unit 2, Cycle 12 are documented in Reference 3.

The following core operating limits are included in this report:

a. Average Planar Linear Heat Generation Rate (APLHGR) Limit
(Technical Specifications 3.2.1 and 3.7.5)

b. Linear Heat Generation Rate (LHGR) Limit
(Technical Specification 3.2.3)

c. Minimum Critical Power Ratio Operating Limit (OLMCPR)
(Technical Specifications 3.2.2, 3.3.4.1, and 3.7.5)

d. Average Power Range Monitor (APRM) Flow Biased Rod Block Trip Setting
(Technical Requirements Manual Section 5.3.1 and Table 3.3.4-1)

e. Rod Block Monitor (RBM) Trip Setpoints and Operability
(Technical Specification Table 3.3.2.1-1)

f. Shutdown Margin (SDM) Limit
(Technical Specification 3.1.1)

2. APLHGR LIMIT (TECHNICAL SPECIFICATIONS 3.2.1 AND 3.7.5)

The APLHGR limits for full power and flow conditions for each type of fuel as a function of exposure are shown in Figures 1-5. The APLHGR limits for the GE13 assemblies are for the most limiting lattice (excluding natural uranium) at each exposure point. The specific values for each lattice are given in Reference 4.

These APLHGR limits are adjusted for off-rated power and flow conditions using the ARTS factors, MAPFAC(P) and MAPFAC(F). The reduced power factor, MAPFAC(P), is given in Figure 6. Similarly, adjustments for reduced flow operation are performed using the MAPFAC(F) corrections given in Figure 7. Both factors are multipliers used to reduce the standard APLHGR limit. The most limiting power-adjusted or flow-adjusted value is taken as the APLHGR operating limit for the off-rated condition.

The APLHGR limits in Figures 1-5 are applicable for both Turbine Bypass In-Service and Out-Of-Service. The off-rated power and flow corrections in Figures 6 and 7 bound both Turbine Bypass In-Service and Out-Of-Service operation. No corrections are required to the APLHGR limits for TBOOS for either rated or off-rated operation.

The APLHGR limits in Figures 1-5 are applicable for both Recirculation Pump Trip (RPT) In-Service and Out-Of-Service. The off-rated power and flow corrections in Figures 6 and 7 bound both RPT In-Service and Out-Of-Service operation. No corrections are required to the APLHGR limits for RPTOOS for either rated or off-rated operation.

For Single Recirculation Loop Operation (SLO), the most limiting of either the SLO multiplier or the off-rated MAPFAC correction is used to reduce the exposure dependent APLHGR limit. The SLO multiplier to be applied to this cycle is 0.84 (reference 3). It is not necessary to apply both the off-rated MAPFAC and SLO multiplier corrections at the same time.

3. LHGR LIMIT (TECHNICAL SPECIFICATION 3.2.3)

The LHGR limit is fuel type dependent. For Unit 2 Cycle 12 there is only one fuel type in the core. The limit for this type is shown below:

Fuel Type	LHGR Limit
GE13	14.4 kw/ft

4. OLMCPR (TECHNICAL SPECIFICATIONS 3.2.2, 3.3.4.1, AND 3.7.5)

a. **Rated Limits - OLMCPR(100):** The MCPR Operating Limit for rated power and flow conditions, OLMCPR(100), is equal to the fuel type and exposure dependent limit shown in Figures 8 and 9. These figures apply to GE13 fuel which is the only fuel type in the Unit 2 Cycle 12 Core.

Figure 8 applies to exposure up to 2000 MWD/ST prior to EOR (end of full power capability at rated flow with normal feedwater temperature) after which Figure 9 shall be used. It is acceptable to use the more restrictive Figure 9 limits at any point in the cycle.

As noted in Figures 8 and 9, an adder of 0.03 is applied for single loop operation.

The actual OLMCPR(100) value is dependent upon the scram time testing results, as described below (ref. 10):

$$\tau = 0.0 \quad \text{or} \quad \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B}, \quad \text{whichever is greater}$$

where; τ_A = **1.096** sec (analytical Option A scram time limit - based on dropout time for notch position 36)

$$\tau_{ave} = \frac{\sum_{i=1}^{n} \tau_i}{n}$$

$$\tau_B = \mu + 1.65 * \sigma * \left[\frac{N}{n}\right]^{\frac{1}{2}}$$

where; μ = **0.830** sec (mean scram time used in transient analysis - based on dropout time for notch position 36)

σ = **0.019** sec (standard deviation of μ)

N = Total number of active rods measured in Technical Specification Surveillance Requirement SR3.1.4.1

n = Number of surveillance rod tests performed to date in cycle

τ_i = Scram time (dropout time) from fully withdrawn to notch position 36 for the i^{th} rod

b. **Startup Limits:** Option A OLMCPR limits (**τ=1.0**) shall be used prior to the determination of τ in accordance with SR 3.1.4.1.

c. **Off-Rated Limits:** For off-rated power and flow conditions, power-adjusted and flow-adjusted operating limits are determined from Figures 10 and 11, respectively. The most limiting power-dependent or flow-dependent value is taken as the OLMCPR for the off-rated condition.

d. **Equipment Out-Of-Service OLMCPR Limits:** Rated power OLMCPR(100) limits are provided for Recirculation Pump Trip out-of-service (RPTOOS), Turbine Bypass out-of-service (TBOOS), and the combined RPTOOS/TBOOS condition in Figures 8 and 9 (reference 5). Additionally an off-rated MCPR(P) correction from Figure 10 (reference 5) shall be applied for TBOOS when the power is below Pbypass.

e. **Single Loop Operation (SLO) Limits:** As noted in section 4.a above, a correction of 0.03 is to be applied to the OLMCPR(100) limits for SLO as described in the footnote of Figures 8 and 9. The same adder applies to the off-rated MCPR(F) limit as noted in the footnote to Figure 11 and to the OLMCPR value below Pbypass from Figure 10.

5. APRM FLOW BIASED ROD BLOCK TRIP SETTING (TECHNICAL REQUIREMENTS MANUAL SECTION 5.3.1 AND TABLE 3.3.4-1)

The APRM Rod Block trip setting shall be:

$S_{RB} \leq (0.66(W-\Delta W) + 61\%)$ Allowable Value

$S_{RB} \leq (0.66(W-\Delta W) + 59\%)$ Nominal Trip Setpoint (NTSP)

where:

S_{RB} = Rod Block setting in percent of rated thermal power (3458 MWt)

W = Loop recirculation flow rate in percent of rated

ΔW = Difference between two-loop and single-loop effective recirculation flow at the same core flow (ΔW=0.0 for two-loop operation)

The APRM Rod Block trip setting is clamped at a maximum allowable value of 115% (corresponding to a NTSP of 113%).

6. ROD BLOCK MONITOR (RBM) TRIP SETPOINTS AND OPERABILITY (TECHNICAL SPECIFICATION TABLE 3.3.2.1-1)

The RBM trip setpoints and applicable power ranges shall be as follows (refs. 7-9):

RBM Trip Setpoint	Allowable Value (AV)	Nominal Trip Setpoint (NTSP)	
LPSP	27%	25%	
IPSP	62%	60%	
HPSP	82%	80%	
LTSP - unfiltered - filtered	118.7% 117.7%	117.0% 116.0%	(1),(2)
ITSP - unfiltered - filtered	113.7% 112.9%	112.0% 111.2%	(1),(2)
HTSP - unfiltered - filtered	108.7% 107.9%	107.0% 106.2%	(1),(2)
DTSP	90%	92%	

Notes: (1) These setpoints are based upon a MCPR operating limit of **1.25** using a safety limit of 1.07, as reported in references 6, 7, and 8. These setpoints bound the cycle specific minimum Option B MCPR operating limit of 1.29.

(2) The unfiltered setpoints are consistent with a nominal RBM filter setting of 0.0 seconds (reference 8). The filtered setpoints are consistent with a nominal RBM filter setting $\leq$ 0.5 seconds (reference 7).

The RBM setpoints in Technical Specification Table 3.3.2.1-1 are applicable when:

THERMAL POWER (% Rated)	Applicable MCPR (1)	Notes from Table 3.3.2.1-1	
$\geq$ 27% and < 90%	< 1.70 < 1.75	(a), (b), (f), (h) (a), (b), (f), (h)	dual loop operation single loop operation
$\geq$ 90%	$\leq$ 1.40	(g)	dual loop operation (2)

Notes: (1) The MCPR values shown correspond to a SLMCPR of 1.07 for dual recirculation loop operation and 1.10 for single loop operation.

(2) Greater than 90% rated power is not attainable in single loop operation.

7. SHUTDOWN MARGIN (SDM) LIMIT (TECHNICAL SPECIFICATION 3.1.1)

The core shall be subcritical with the following margin with the strongest OPERABLE control rod fully withdrawn and all other OPERABLE control rods fully inserted.

SDM $\geq$ 0.38% dk/k

8. REFERENCES

1. NEDE-24011-P-A-14, "General Electric Standard Application for Reactor Fuel", June 2000.

2. NEDE-24011-P-A-14-US, "General Electric Standard Application for Reactor Fuel (Supplement for United States)", June 2000.

3. J11-03718-10-SRLR Rev. 0, "Supplemental Reload Licensing Report for Browns Ferry Nuclear Plant Unit 2 Reload 11 Cycle 12", January 2001.

4. J11-03718-10-MAPL Rev. 0, "Lattice-Dependent MAPLHGR Report for Browns Ferry Nuclear Plant Unit 2 Reload 11 Cycle 12", January 2001.

5. NEDC-32774P Supplement 1 Revision 0, "Browns Ferry Nuclear Plant Units 1, 2, and 3 Turbine Bypass and End-of-Cycle Recirculation Pump Trip Combination Mode Out-Of-Service", dated February 2001.

6. NEDC-32433P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Browns Ferry Nuclear Plant Unit 1, 2, and 3", dated April 1995.

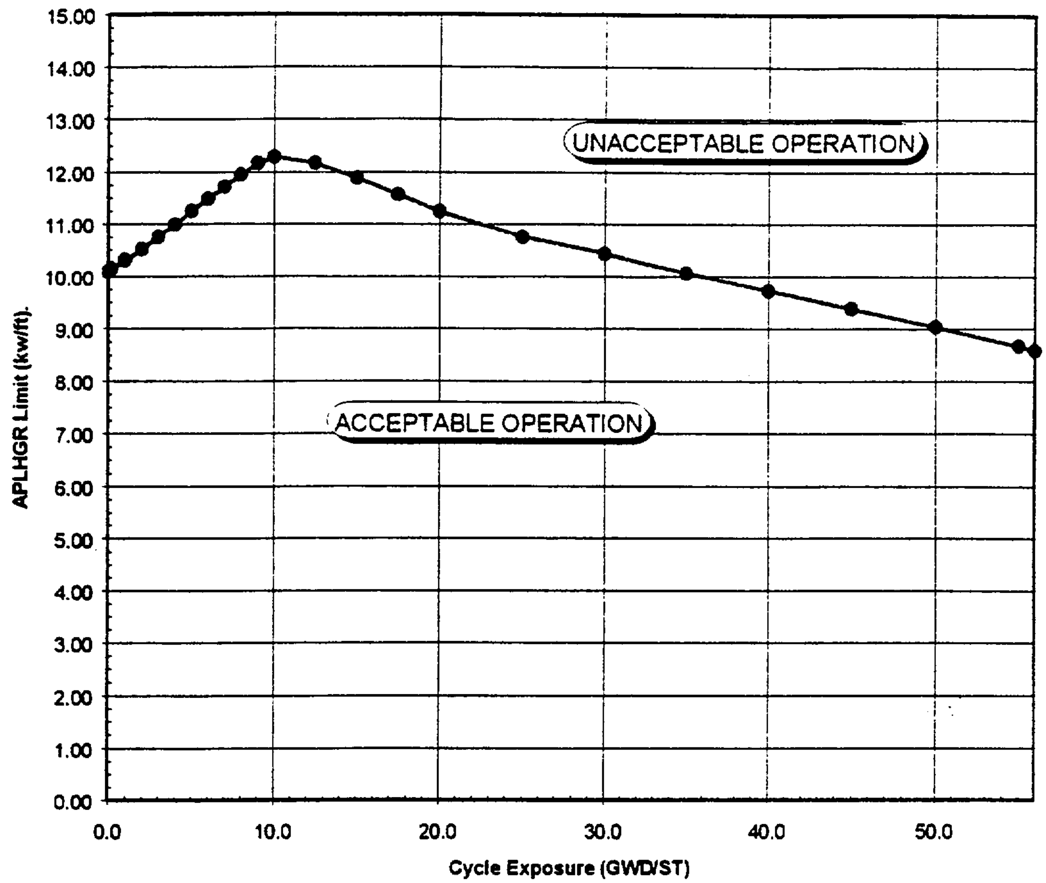
7. EDE-28-0990 Rev. 3 Supplement E, "PRNM (APRM, RBM, and RFM) Setpoint Calculations [ARTS/MELLL (NUMAC) - Power-Uprate Condition] for Tennessee Valley Authority Browns Ferry Nuclear Plant", dated October 1997.

8. EDE-28-0990 Rev. 2 Supplement E, "PRNM (APRM, RBM, and RFM) Setpoint Calculations [ARTS/MELLL (NUMAC) - Power-Uprate Condition] for Tennessee Valley Authority Browns Ferry Nuclear Plant", dated October 1997.

9. GE Letter LB#: 262-97-133, "Browns Ferry Nuclear Plant Rod Block Monitor Setpoint Clarification - GE Proprietary Information", dated September 12, 1997. [L32 970912 800]

10. GE Letter JAB-T8019a, "Technical Specification Changes for Implementation of Advanced Methods", dated June 4, 1998. [L32 980608 800]

Figure 1
APLHGR Limits for Bundle Type GE13-P9HTB384-12G4.0
(GE13)



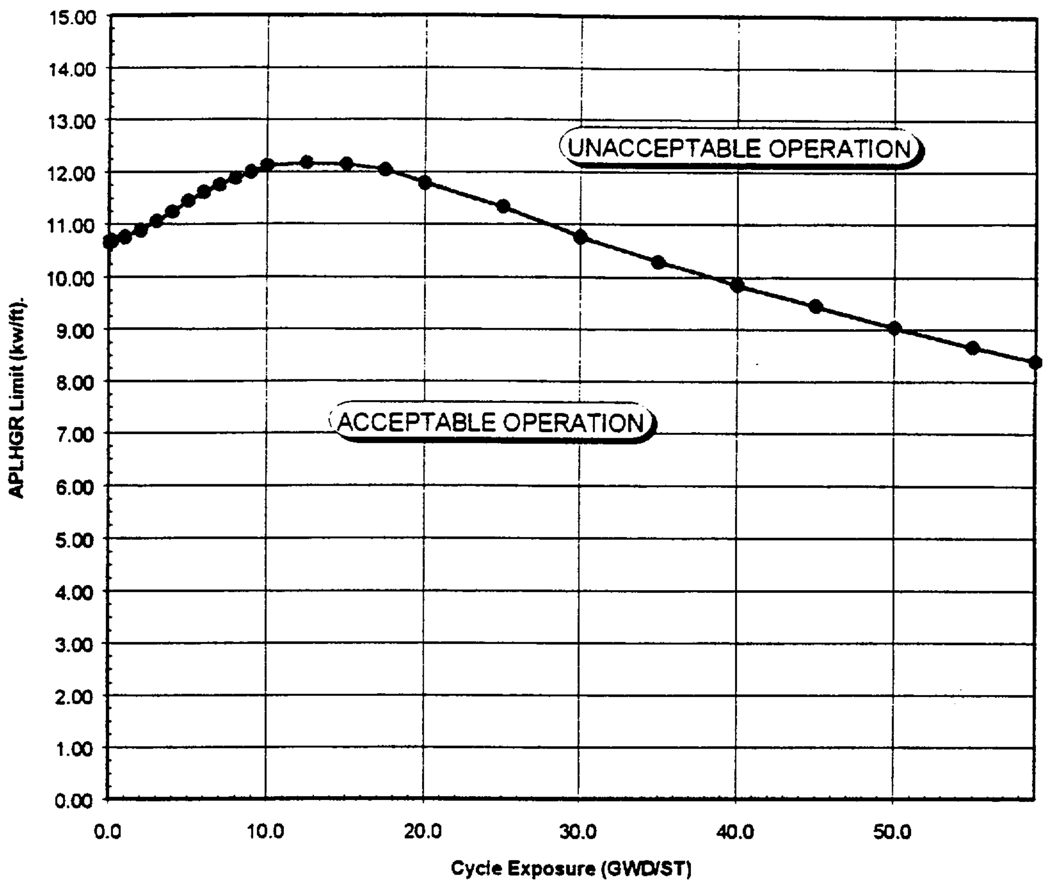
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.09	7.0	11.71	25.0	10.75
0.2	10.15	8.0	11.95	30.0	10.43
1.0	10.31	9.0	12.16	35.0	10.06
2.0	10.52	10.0	12.28	40.0	9.72
3.0	10.75	12.5	12.16	45.0	9.38
4.0	10.99	15.0	11.88	50.0	9.03
5.0	11.25	17.5	11.56	55.0	8.66
6.0	11.48	20.0	11.24	55.98	8.58

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 2
APLHGR Limits for Bundle Type GE13-P9DTB406-13GZ
(GE13)



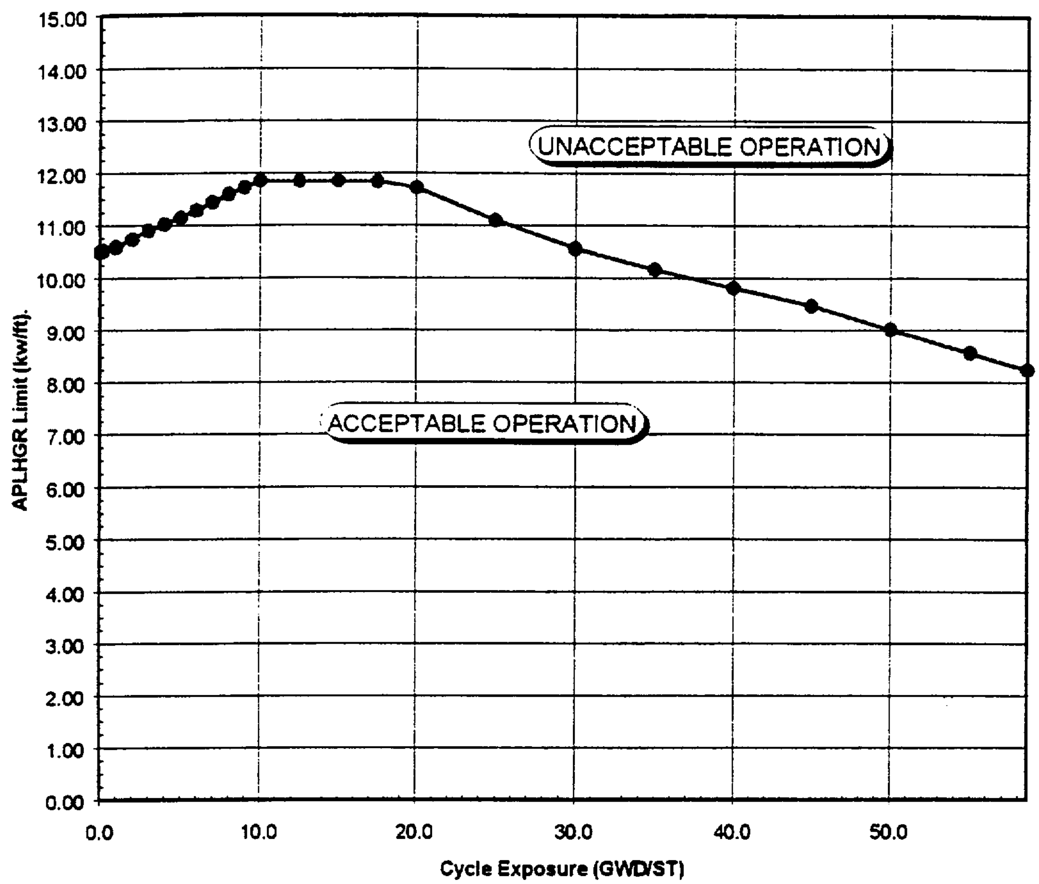
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.66	7.0	11.75	25.0	11.33
0.2	10.69	8.0	11.87	30.0	10.76
1.0	10.76	9.0	11.99	35.0	10.29
2.0	10.89	10.0	12.12	40.0	9.85
3.0	11.06	12.5	12.16	45.0	9.45
4.0	11.24	15.0	12.14	50.0	9.03
5.0	11.45	17.5	12.03	55.0	8.66
6.0	11.61	20.0	11.78	59.01	8.38

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 3
APLHGR Limits for Bundle Type GE13-P9DTB401-14GZ
(GE13)



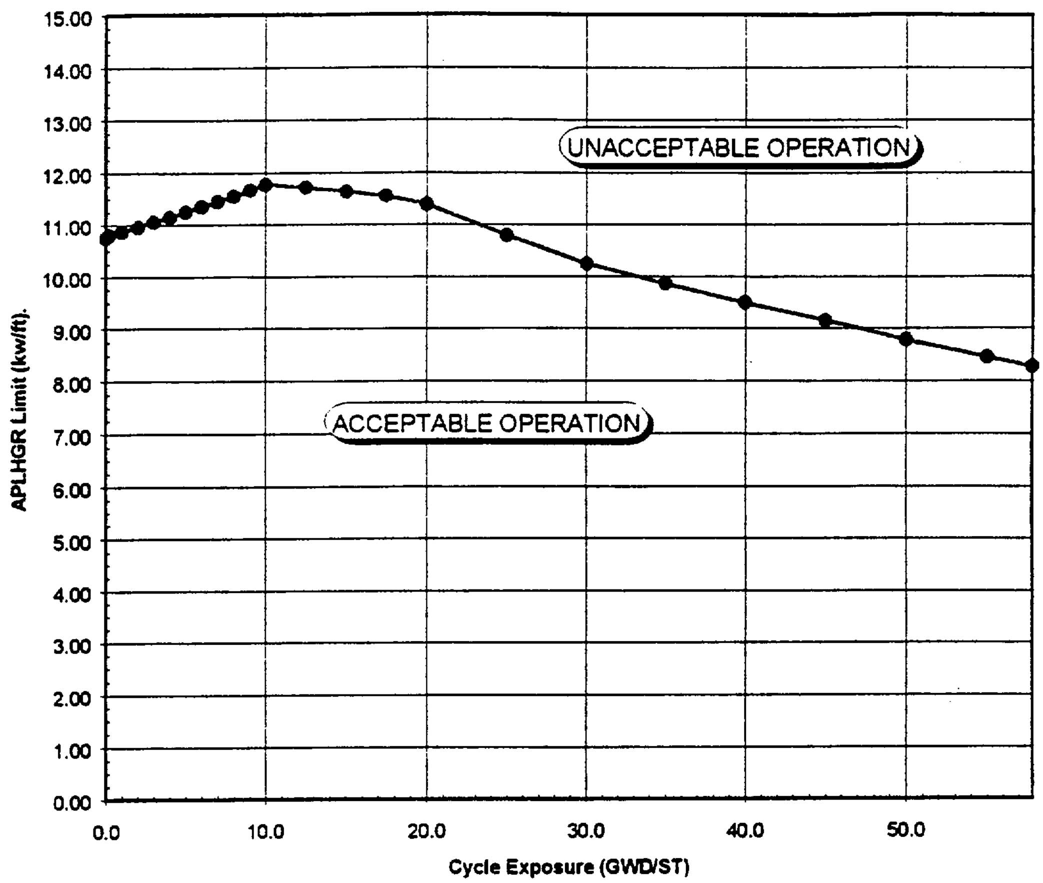
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.49	7.0	11.44	25.0	11.10
0.2	10.52	8.0	11.59	30.0	10.55
1.0	10.59	9.0	11.72	35.0	10.15
2.0	10.74	10.0	11.85	40.0	9.80
3.0	10.90	12.5	11.84	45.0	9.47
4.0	11.02	15.0	11.84	50.0	9.01
5.0	11.15	17.5	11.83	55.0	8.56
6.0	11.29	20.0	11.71	58.59	8.23

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 4
APLHGR Limits for Bundle Type GE13-P9DTB391-13GZ
(GE13)



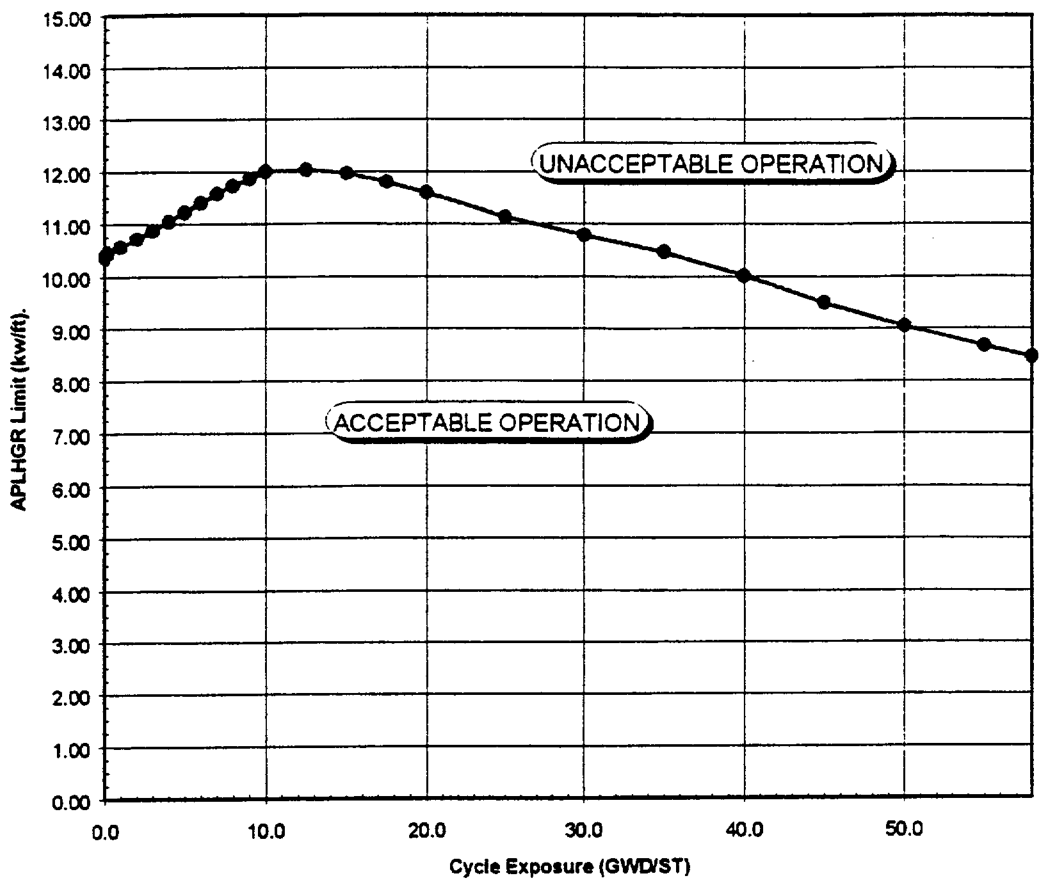
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.75	7.0	11.45	25.0	10.79
0.2	10.80	8.0	11.55	30.0	10.24
1.0	10.87	9.0	11.66	35.0	9.85
2.0	10.96	10.0	11.77	40.0	9.49
3.0	11.06	12.5	11.71	45.0	9.15
4.0	11.15	15.0	11.63	50.0	8.78
5.0	11.25	17.5	11.55	55.0	8.45
6.0	11.35	20.0	11.39	57.82	8.27

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 5
APLHGR Limits for Bundle Type GE13-P9DTB412-2G7.0/11G5.0
(GE13)



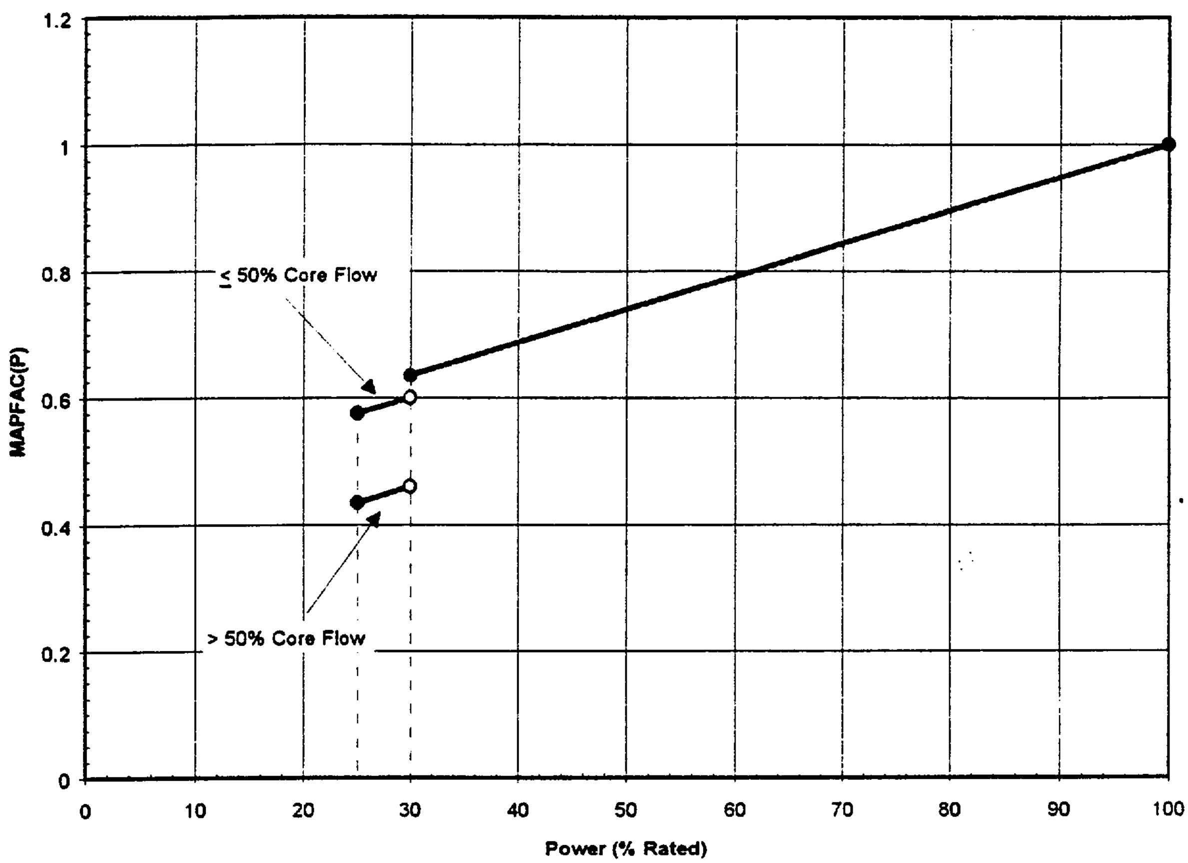
Most Limiting Lattice
for Each Exposure Point

Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)	Average Planar Exposure (GWD/ST)	LHGR Limit (kw/ft)
0.0	10.38	7.0	11.58	25.0	11.12
0.2	10.45	8.0	11.73	30.0	10.78
1.0	10.57	9.0	11.86	35.0	10.46
2.0	10.72	10.0	12.00	40.0	10.01
3.0	10.88	12.5	12.03	45.0	9.49
4.0	11.05	15.0	11.96	50.0	9.04
5.0	11.22	17.5	11.80	55.0	8.66
6.0	11.40	20.0	11.59	57.99	8.45

These values apply to both Turbine Bypass In-Service and Out-Of-Service.
These values apply to both Recirculation Pump Trip In-Service and Out-Of-Service.

The APLHGR limits shown are for dual recirculation loop operation. For single loop operation, these values should be multiplied by the most limiting of either 0.84 or the MAPFAC correction, as described in Section 2.

Figure 6
Power Dependent MAPLHGR Factor - MAPFAC(P)



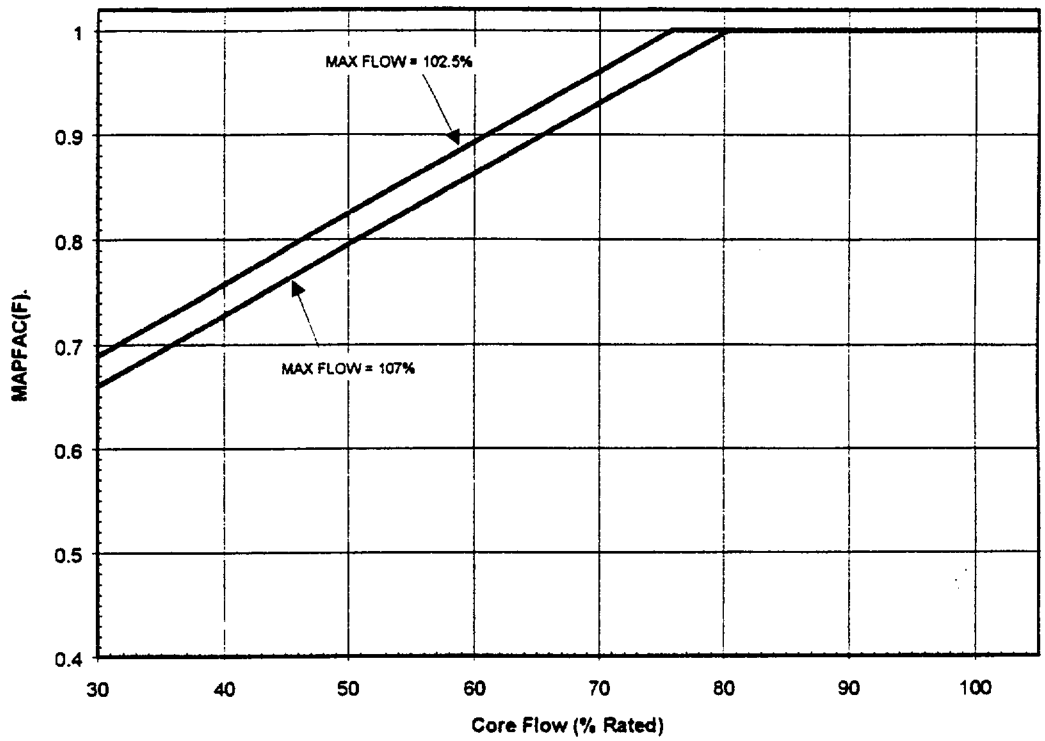
MAPLHGR(P) = MAPFAC(P) x MAPLHGRstd

MAPLHGRstd = Standard MAPLHGR Limits

For	**25% > P**	**: NO THERMAL LIMITS MONITORING REQUIRED NO LIMITS SPECIFIED**
For	**25% ≤ P < 30%**	**: MAPFAC(P) = 0.60 + 0.005(P-30%) For ≤ 50% CORE FLOW : MAPFAC(P) = 0.46 + 0.005(P-30%) For > 50% CORE FLOW**
For	**30% ≤ P**	**: MAPFAC(P) = 1.0 + 0.005224(P-100%)**

These values bound both Turbine Bypass In-Service and Out-Of-Service
These values bound both Recirculation Pump Trip In-Service and Out-Of-Service

Figure 7
Flow Dependent MAPLHGR Factor - MAPFAC(F)



FOR Wc (% Rated Core Flow) >= 30%

MAPLHGR(F) = MAPFAC(F) x MAPLHGRstd

MAPLHGRstd = Standard MAPLHGR Limits

MAPFAC(F) = MINIMUM(1.0 , Af * Wc /100 + Bf)

Af and Bf are Constants Given Below:

Maximum Core Flow (% Rated)	Af	Bf
102.5	0.6784	0.4861
107.0	0.6758	0.4574

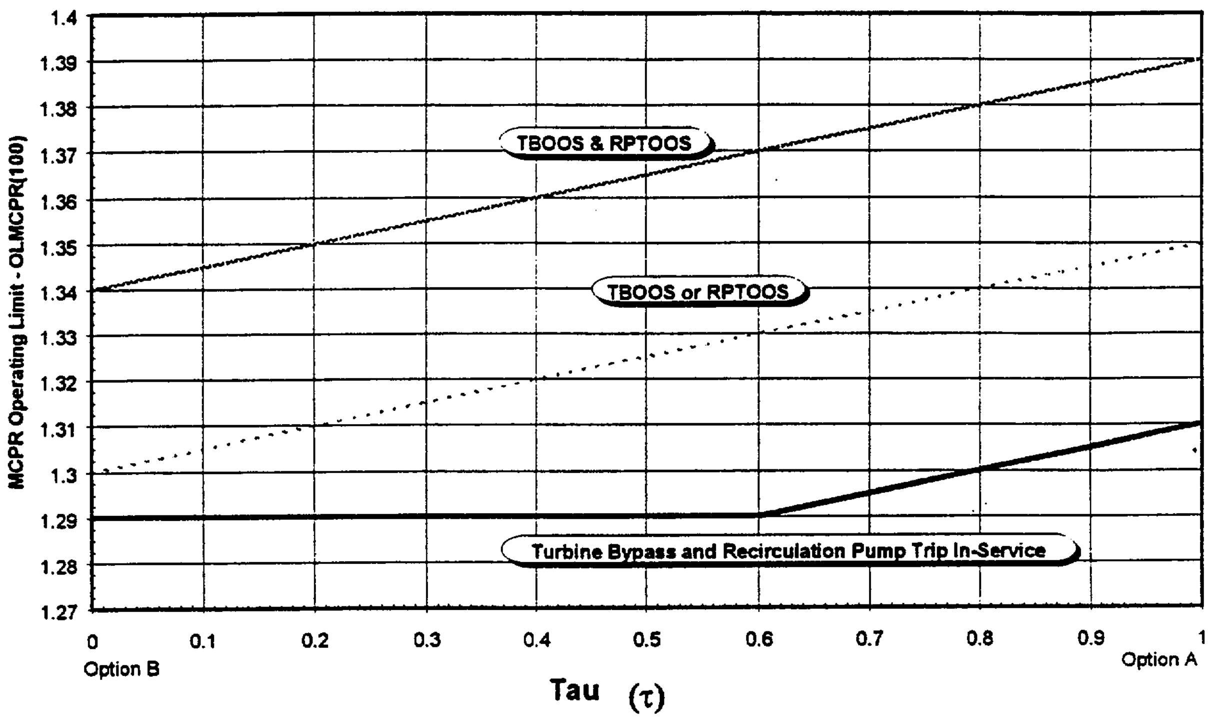
These values bound both Turbine Bypass In-Service and Out-Of-Service.
These values bound both Recirculation Pump Trip In-Service and Out-Of-Service.

The 102.5% maximum flow line is used for operation up to 100% rated flow.
The 107% maximum flow line is used for operation up to 105% rated flow (ICF).

Figure 8

MCPR Operating Limit for All GE13 Bundles

For Cycle Exposures up to EOR-2000 MWD/ST (see note 3)



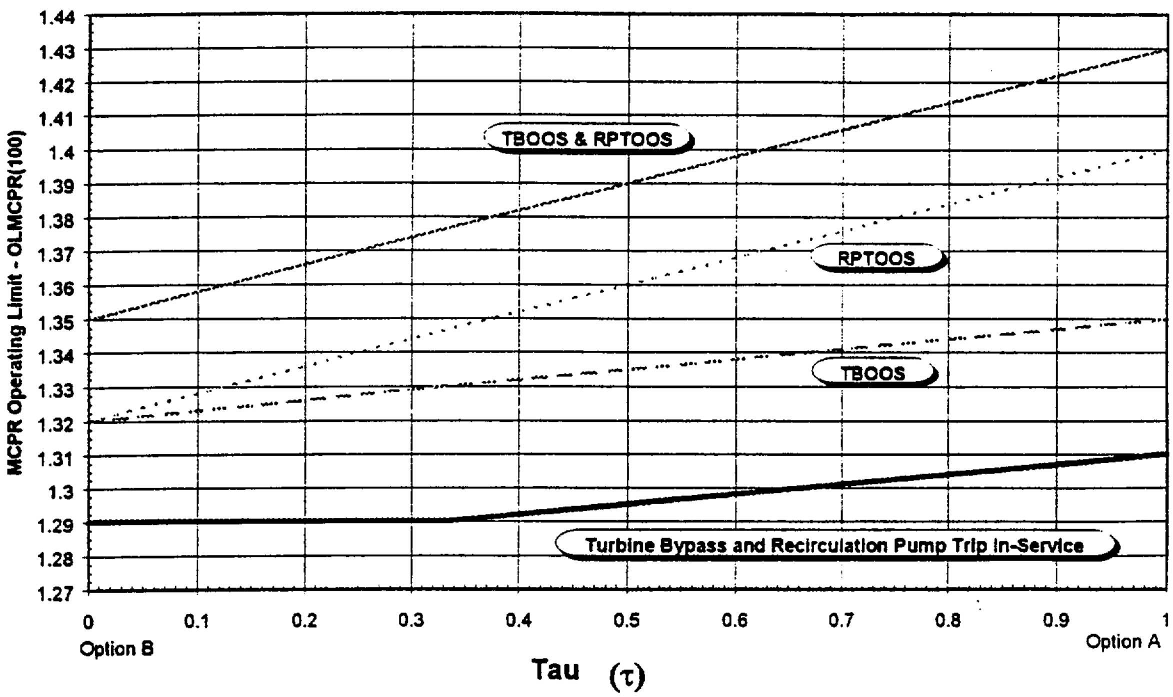
Exposure Range	Out-Of-Service	Option A (1) Tau=1.0	Option B Tau=0.0
BOC12 to (EOR-2000 MWD/ST)	na	1.31	1.29
BOC12 to (EOR-2000 MWD/ST)	Turbine Bypass (TBOOS)	1.35	1.30
BOC12 to (EOR-2000 MWD/ST)	Recirculation Pump Trip (RPTOOS)	1.35	1.30
BOC12 to (EOR-2000 MWD/ST)	TBOOS and RPTOOS	1.39	1.34

Notes
1. Use this value prior to performing scram time testing per SR 3.1.4.1.
2. The values shown are for dual recirculation loop operation (1.07 SLMCPR). Increase any value shown by 0.03 for Single Loop Operation (SLO:SLMCPR=1.10).
3. EOR refers to the end of Full Power Capability at Rated Flow with normal Feedwater Heating.

Figure 9

MCPR Operating Limit for All GE13 Bundles

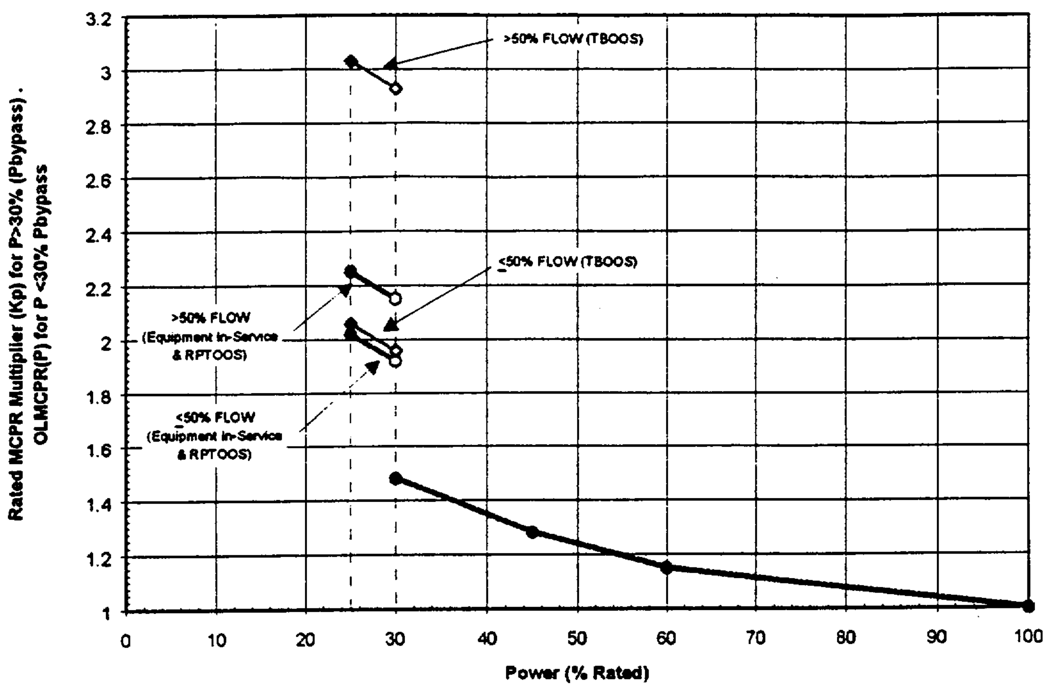
Optional for All Cycle Exposures - Required after EOR-2000 MWD/ST is reached (see note 3)



Exposure Range	Out-Of-Service	Option A (1) Tau=1.0	Option B Tau=0.0
BOC12 to EOC12	na	1.31	1.29
BOC12 to EOC12	Turbine Bypass (TBOOS)	1.35	1.32
BOC12 to EOC12	Recirculation Pump Trip (RPTOOS)	1.40	1.32
BOC12 to EOC12	TBOOS and RPTOOS	1.43	1.35

Notes
1. Use this value prior to performing scram time testing per SR 3.1.4.1.
2. The values shown are for dual recirculation loop operation (1.07 SLMCPR). Increase any value shown by 0.03 for Single Loop Operation (SLO:SLMCPR=1.10).
3. EOR refers to the end of Full Power Capability at Rated Flow with normal Feedwater Heating.

Figure 10
Power Dependent MCPR(P) Limits



OPERATING LIMIT MCPR(P) = Kp * OLMCPR(100)

For $P < 25\%$		**: NO THERMAL LIMITS MONITORING REQUIRED NO LIMITS SPECIFIED**
For $25\% \leq P < \text{Pbypass}$		**: (Pbypass = 30%)**
		: Kp = [Kbyp + 0.02(30%-P)]/OLMCPR(100)

Turbine Bypass and RPT In-Service, or RPT Out-Of-Service (RPTOOS)

Kbyp = 1.92	**For ≤ 50% CORE FLOW**
Kbyp = 2.15	**For > 50% CORE FLOW**

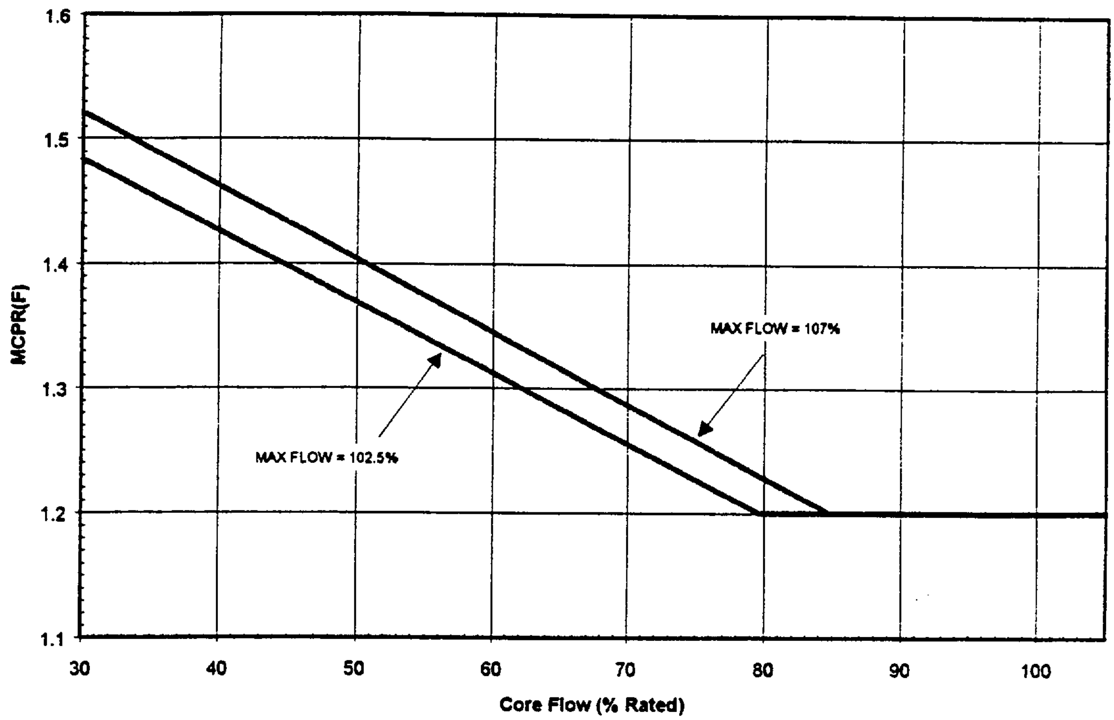
Turbine Bypass Out-Of-Service (TBOOS)

Kbyp = 1.96	**For ≤ 50% CORE FLOW**
Kbyp = 2.93	**For > 50% CORE FLOW**

For $30\% \leq P < 45\%$	**:** $Kp = 1.28 + 0.01340(45\%-P)$
For $45\% \leq P < 60\%$	**:** $Kp = 1.15 + 0.00867(60\%-P)$
For $60\% \leq P$	**:** $Kp = 1.00 + 0.00375(100\%-P)$

Note: **The OLMCPR below Pbypass is based upon the dual recirculation loop SLMCPR of 1.07. Add 0.03 to the OLMCPR in Single Loop Operation (SLO - SLMCPR=1.10).**

Figure 11
Flow Dependent MCPR Operating Limit - MCPR(F)



For Wc $\geq$ 30% : MCPR(F) = MAX(1.20, Af*Wc/100 + Bf)

Wc = % Rated Core Flow

Af and Bf are Constants Given Below:

Maximum Core Flow (% Rated)	Af	Bf
102.5	-0.571	1.655
107.0	-0.586	1.697

These values bound both Turbine Bypass In-Service and Out-Of-Service.
These values bound both Recirculation Pump Trip In-Service and Out-Of-Service

The 102.5% maximum flow line is used for operation up to 100% rated flow.
The 107% maximum flow line is used for operation up to 105% rated flow (ICF).

This figure is based upon the dual recirculation loop operation SLMCPR of 1.07.
Add 0.03 to these values for Single Loop Operation (SLO - SLMCPR=1.10).