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Revision 34 dated 04/24/00

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Technical Requirements Manual

Volume I

Detroit Edison

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TR 3.3 INSTRUMENTATION

TR 3.3.1.1 Reactor Protection System (RPS) Instrumentation

The RPS instrumentation trip setpoints and response times are listed in Table TR3.3.1.1-1.

TABLE TR3.3.1.1-1 (Page 1 of 2)
Reactor Protection System Instrumentation

FUNCTION	TRIP SETPOINT	RESPONSE TIME (seconds)
1. Intermediate Range Monitors		
a. Neutron Flux - High	≤ 120/125 divisions of full scale	NA
b. Inop	NA	NA
2. Average Power Range Monitors[a]		
a. Neutron Flux-Upscale (Setdown)	≤ 15% RTP	NA
b. Simulated Thermal Power - Upscale		NA
1. Flow Biased	≤ 0.63 (W-ΔW)[b] + 61.4%,	
2. High Flow Clamped	with a maximum of ≤ 113.5% of RTP	
c. Neutron Flux - Upscale	≤ 118% RTP	NA
d. Inop	NA	NA
e. 2-out-of-4 Voters	NA	≤ 0.05[a]
f. OPRM-Upscale		NA
1. Confirmation Count and	14	
2. Amplitude	1.11	
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4. Amplitude	1.3	

(continued)

(a) Neutron detectors, APRM channel, and 2-out-of-4 Trip Voter digital electronics are exempt from response time testing. Response time shall be measured from activation of the 2-out-of-4 Trip Voter output relay.

(b) ΔW = 0% for two loop operation. ΔW = 8% for single loop operation.

TABLE TR3.3.1.1-1 (Page 2 of 2)
Reactor Protection System Instrumentation

	FUNCTION	TRIP SETPOINT	RESPONSE TIME (seconds)
3.	Reactor Vessel Steam Dome Pressure - High	≤ 1093 psig	≤ 0.55[c]
4.	Reactor Vessel Water Level - Low, Level 3	≥ 173.4 inches[d]	≤ 1.05[c]
5.	Main Steam Isolation Valve - Closure	≤ 8% closed	≤ 0.06
6.	Main Steam Line Radiation - High	≤ 3.0 x full power background	NA
7.	Drywell Pressure - High	≤ 1.68 psig	NA
8.	Scram Discharge Volume Water Level - High		
	a. Level Transmitter	≤ 592 ft. 6 inches	NA
	b. Float Switch	≤ 594 ft. 8 inches	NA
9.	Turbine Stop Valve-Closure	≤ 5% closed	≤ 0.06
10.	Turbine Control Valve Fast Closure	Initiation of fast closure	≤ 0.08[e]

(c) The sensor response time need not be measured and may be assumed to be the design sensor response time. Prior to return to service of a new transmitter or following refurbishment of a transmitter (e.g., sensor cell or variable damping components), a hydraulic response time test will be performed to determine an initial sensor-specific response time value.

(d) As referenced to instrument zero Top of Active Fuel (TAF).

(e) Measured from de-energization of K37 relay, which inputs the turbine control valve closure signal, to the RPS.

TR 3.4 REACTOR COOLANT SYSTEM (RCS)

TR 3.4.1.1 Recirculation Loops Operating - Regions

TRLCO 3.4.1.1 The reactor core shall not exhibit core thermal-hydraulic instablity or operate in the "Scram" or "Exit" Regions.

APPLICABILITY: MODE 1, within TS Action Statement 3.3.1.1.J for RPS function 2.f. inoperable.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Reactor core operating in the "Exit" Region.	----------NOTE---------- Restart of an idle recirculation loop or resetting a recirculation flow limiter is not allowed. ---------- A.1 Initiate action to insert control rods or increase core flow to restore operation outside the "Exit" Region.	Immediately
B. No recirculation loops operating while in MODE 1. OR Reactor core operating in the "Scram" Region OR Core thermal hydraulic instability evidenced.	B.1. Place the reactor mode switch in the shutdown position.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TRSR 3.4.1.1.1	----------NOTE---------- Only required to be performed when operating in the "Stability Awareness" Region ---------- Verify the reactor core is not exhibiting core thermal-hydraulic instability.	1 hour

TR B3.4 REACTOR COOLANT SYSTEM (RCS)

TR B3.4.1.1 Recirculation Loops Operating - Regions

BASES

BACKGROUND

GDC 12 of 10 CFR 50 Appendix A (Reference 1) states that the reactor core and associated coolant, control, and protection systems shall be designed to assure that power oscillations which can result in exceeding specified fuel design limits are not possible or can be reliably detected and suppressed.

BWR cores typically operate with the presence of global flux noise in a stable mode which is due to random boiling and flow noise. As the power/flow conditions are changed, along with other system parameters (xenon, subcooling, power distribution, etc.) the thermal-hydraulic/reactor kinetic feedback mechanism can be enhanced such that perturbations may result in sustained limit cycle or divergent oscillations in power and flow.

Two major modes of oscillations have been observed in BWRs. The first mode is the fundamental or core-wide oscillation mode in which the entire core oscillates in phase in a given axial plane. The second mode involves regional oscillation in which one half of the core oscillates 180 degrees out of phase with the other half. Studies have indicated that adequate margin to the Safety Limit MCPR may not exist during regional oscillations.

APPLICABLE SAFETY ANALYSES

Thermal-hydraulic stability analysis (Reference 2) has concluded that procedures for detecting and suppressing power oscillations that might be induced by a thermal-hydraulic instability are necessary to provide reasonable assurance that the requirements of Reference 1 are satisfied in the absence of an operable OPRM function (APRM function 2.f).

LCO

Operations that exhibit core thermal-hydraulic instability are not permitted. Additionally, in order to avoid potential power oscillations due to thermal-hydraulic instability, operation at certain combinations of power and flow are not permitted. These restricted power and flow regions are referred to as the "Scram" and "Exit" regions and are defined by Bases Figure B 3.4.1-1.

BASES

ACTIONS

A.1

When operating in the "Exit" region (refer to Bases Figure B 3.4.1-1), the potential for thermal-hydraulic instabilities is increased and sufficient margin may not be available for operator response to suppress potential power oscillations. Therefore, action must be initiated immediately to restore operation outside of the "Exit" region. Control rod insertion and/or core flow increases are designated as the means to accomplish this objective.

Required Action A.1 is modified by a Note that precludes core flow increases by restart of an idle recirculation loop, or by resetting a recirculation flow limiter. Core flow increases by these means would not support timely completion of the action to restore operation outside the "Exit" Region.

B.1

If operating with no recirculation pumps in operation in MODE 1 or operating in the "Scram" region (refer to Bases Figure B 3.4.1-1), or if core thermal-hydraulic instability is detected, then unacceptable power oscillations may result. Therefore, the reactor mode switch must be immediately placed in the shutdown position to terminate the potential for unacceptable power oscillations.

Thermal-hydraulic instability is evidenced by a sustained increase in APRM or LPRM peak to peak noise level reaching 2 or more times its initial level and occurring with a characteristic period of less than 3 seconds.

If entry into this condition is an unavoidable and well known consequence of an event, early initiation of the Required Action is appropriate. Also, it is recognized that during certain abnormal conditions, it may become operationally necessary to enter the "Scram" or "Exit" region for the purpose of: 1) protecting plant equipment, which if it were to fail could impact plant safety, or 2) protecting a safety or fuel operating limit. In these cases, the appropriate actions for the region entered would be performed as required.

These requirements are consistent with References 2 and 3.

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1.1

This SR provides frequent periodic monitoring for core thermal-hydraulic instability by monitoring APRM and LPRM signals for a sustained increase in APRM or LPRM peak to peak noise level reaching 2 or more times its initial level and occurring with a characteristic period of less than 3 seconds. The 1 hour frequency is based on the small potential for core thermal-hydraulic oscillations to occur outside the "Scram" or

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

"Exit" regions. Therefore, frequent monitoring of the APRM and LPRM signals is appropriate when operating in the "Stability Awareness" region.

This SR is modified by a Note that states performance is only required when operating in the "Stability Awareness" region (refer to Bases Figure B 3.4.1-1) (i.e., in the power-to-flow region that is near regions of higher probability for core thermal-hydraulic instabilities). This is acceptable because outside the "Stability Awareness" region, power and flow conditions are such that sufficient margin exists to the potential for core thermal-hydraulic instability to allow routine core monitoring. Any unanticipated entry into the "Stability Awareness" region would require immediate verification of core stability since the Surveillance would not be current.

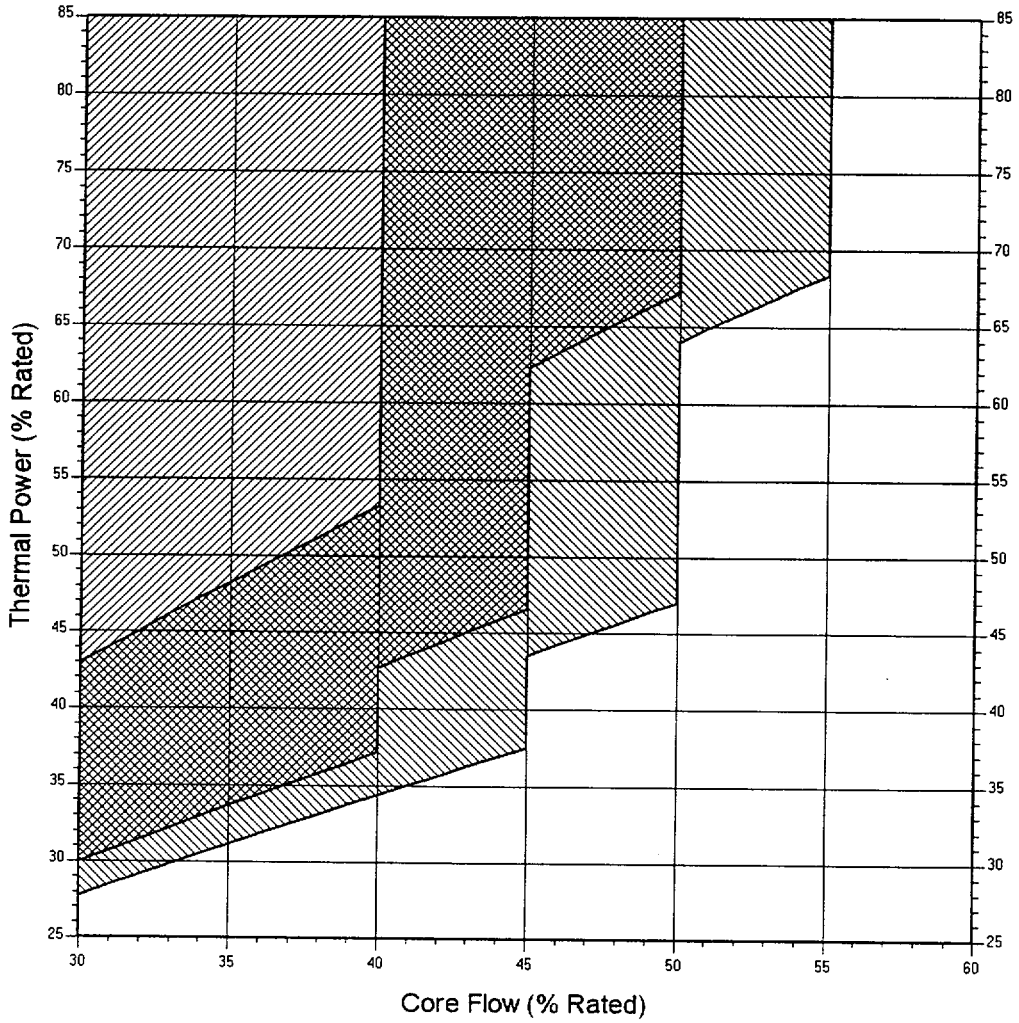
REFERENCES

1. 10 CFR 50, Appendix A, GDC 12

2. NRC Generic Letter 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal Hydraulic Instabilities in Boiling Water Reactors," July 1994.

3. BWROG Letter 94078, "BWR Owners' Group Guidelines for Interim Corrective Action," June 1994.

BASES



Stability Region Descriptions		
	Scram Region:	>96% Rod Line, <40% Core Flow
	Exit Region: Not in Scram Region -and-	>67% Rod Line, <40% Core Flow >77% Rod LIne, <45% Core Flow >103% Rod Line, <50% Core Flow
	Stablility Awareness Region: Not in Scram or Exit Region -and-	>62% Rod Line, <45% Core Flow >72% Rod LIne, <50% Core Flow >98% Rod Line, <55% Core Flow

THERMAL POWER vs CORE FLOW

Figure B 3.4.1-1