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LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

BASES

LIST OF FIGURES

END-OF-CYCLE RECIRCULATION PUMP TRIP SYSTEM RESPONSE TIME

1.13 The END-OF-CYCLE RECIRCULATION PUMP TRIP SYSTEM RESPONSE TIME shall be that time interval to energization of the recirculation pump circuit breaker trip coil from when the monitored parameter exceeds its trip setpoint at the channel sensor of the associated:

a. Turbine throttle valves channel sensor contact opening, and

b. Turbine governor valves initiation of valve fast closure.

The response time may be measured by any series of sequential, overlapping or total steps such that the entire response time is measured.

FRACTION OF LIMITING POWER DENSITY

1.14 The FRACTION OF LIMITING POWER DENSITY (FLPD) shall be the LHGR existing at a given location divided by the specified LHGR limit for that bundle type.

FRACTION OF RATED THERMAL POWER

1.15 The FRACTION OF RATED THERMAL POWER (FRTP) shall be the measured THERMAL POWER divided by the RATED THERMAL POWER.

FREQUENCY NOTATION

1.16 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.1.

GASEOUS RADWASTE TREATMENT SYSTEM

1.17 A GASEOUS RADWASTE TREATMENT SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

IDENTIFIED LEAKAGE

1.18 IDENTIFIED LEAKAGE shall be:

a. Leakage into collection systems, such as pump seal or valve packing leaks, that is captured and conducted to a sump or collecting tank, or

b. Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of the leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE.

Insert A →

ISOLATION SYSTEM RESPONSE TIME

1.~~19~~ 20 The ISOLATION SYSTEM RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its isolation actuation setpoint at the channel sensor until the isolation valves travel to their required positions. Times shall include diesel generator starting and sequence loading delays where applicable. The response time may be measured by any series of sequential, overlapping or total steps such that the entire response time is measured.

INSERT A

IMMEDIATELY

1.19 IMMEDIATELY shall mean as soon as practical within the constraints of maintaining status and control of the reactor core and plant systems, but in all cases within 15 minutes.

LIMITING CONTROL ROD PATTERN

1.20 A LIMITING CONTROL ROD PATTERN shall be a pattern which results in the 21 core being on a thermal hydraulic limit, i.e., operating on a limiting value for APLHGR, LHGR, or MCPR.

LINEAR HEAT GENERATION RATE

1.21 LINEAR HEAT GENERATION RATE (LHGR) shall be the heat generation per unit 22 length of fuel rod. It is the integral of the heat flux over the heat transfer area associated with the unit length.

LOGIC SYSTEM FUNCTIONAL TEST

1.22 A LOGIC SYSTEM FUNCTIONAL TEST shall be a test of all logic components, 23 i.e., all relays and contacts, all trip units, solid state logic elements, etc, of a logic circuit, from sensor through and including the actuated device, to verify OPERABILITY. The LOGIC SYSTEM FUNCTIONAL TEST may be performed by any series of sequential, overlapping or total system steps such that the entire logic system is tested.

MAXIMUM FRACTION OF LIMITING POWER DENSITY

1.23 The MAXIMUM FRACTION OF LIMITING POWER DENSITY (MFLPD) shall be 24 highest value of the FLPD which exists in the core.

MAXIMUM TOTAL PEAKING FACTOR

1.24 The MAXIMUM TOTAL PEAKING FACTOR (MTPF) shall be the largest TPF which 25 exists in the core for a given class of fuel for a given operating condition.

MEMBER(S) OF THE PUBLIC

1.25 MEMBER(S) OF THE PUBLIC shall include all persons who are not occupationally 26 associated with the plant. This category does not include employees of the utility, its contractors or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational or other purposes not associated with the plant.

MINIMUM CRITICAL POWER RATIO

1.26 The MINIMUM CRITICAL POWER RATIO (MCPR) shall be the smallest CPR which 27 exists in the core.

OFFSITE DOSE CALCULATION MANUAL

1.27 The OFFSITE DOSE CALCULATION MANUAL (ODCM) shall contain the current 28 methodology and parameters used in the calculation of offsite doses due to radioactive gaseous and liquid effluents in the calculation of gaseous and liquid effluent monitoring alarm/trip setpoints and in the conduct of the environmental radiological monitoring program.

OPERABLE - OPERABILITY

1.28 A system, subsystem, train, component or device shall be OPERABLE or have
29 OPERABILITY when it is capable of performing its specified function(s) and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

OPERATIONAL CONDITION - CONDITION

1.29 An OPERATIONAL CONDITION, i.e., CONDITION, shall be any one inclusive
30 combination of mode switch position and average reactor coolant temperature as specified in Table 1.2.

PHYSICS TESTS

1.30 PHYSICS TESTS shall be those tests performed to measure the fundamental
31 nuclear characteristics of the reactor core and related instrumentation as (1) described in Chapter 14 of the FSAR, (2) authorized under the provisions of 10 CFR 50.59, or (3) otherwise approved by the Commission.

PRESSURE BOUNDARY LEAKAGE

1.31 PRESSURE BOUNDARY LEAKAGE shall be leakage through a non-isolable fault
32 in a reactor coolant system component body, pipe wall, or vessel wall.

PRIMARY CONTAINMENT INTEGRITY

1.32 PRIMARY CONTAINMENT INTEGRITY shall exist when:
33

a. All primary containment penetrations required to be closed during accident conditions are either:

   1. Capable of being closed by an OPERABLE primary containment automatic isolation system, or

   2. Closed by at least one manual valve, blind flange, or deactivated automatic valve secured in its closed position, except as provided in Table 3.6.3-1 of Specification 3.6.3.

b. All primary containment equipment hatches are closed and sealed.

c. Each primary containment air lock is in compliance with the requirements of Specification 3.6.1.3.

d. The primary containment leakage rates are within the limits of Specification 3.6.1.2.

e. The suppression chamber is in compliance with the requirements of Specification 3.6.2.1.

f. The sealing mechanism associated with each primary containment penetration; e.g., welds, bellows, or O-rings, is OPERABLE.

PROCESS CONTROL PROGRAM

1.33 The PROCESS CONTROL PROGRAM (PCP) shall contain the sampling, analysis,
34 and formulation determination by which SOLIDIFICATION of radioactive wastes from liquid systems is assured.

PURGE - PURGING

1.34 PURGE or PURGING shall be the controlled process of discharging air
35 or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is required to purify the confinement.

RATED THERMAL POWER

1.35 RATED THERMAL POWER shall be a total reactor core heat transfer rate to
36 the reactor coolant of 3323 MWt.

REACTOR PROTECTION SYSTEM RESPONSE TIME

1.36 REACTOR PROTECTION SYSTEM RESPONSE TIME shall be the time interval from
37 when the monitored parameter exceeds its trip setpoint at the channel sensor until deenergization of the scram pilot valve solenoids. The response time may be measured by any series of sequential, overlapping, or total steps such that the entire response time is measured.

REPORTABLE EVENT

1.37 A REPORTABLE EVENT shall be any of those conditions specified in
38 Section 50.73 to 10 CFR Part 50.

ROD DENSITY

1.38 ROD DENSITY shall be the number of control rod notches inserted as a
39 fraction of the total number of control rod notches. All rods fully inserted is equivalent to 100% ROD DENSITY.

SECONDARY CONTAINMENT INTEGRITY

1.39 SECONDARY CONTAINMENT INTEGRITY shall exist when:
40

a. All secondary containment penetrations required to be closed during accident conditions are either:

   1. Capable of being closed by an OPERABLE secondary containment automatic isolation system, or

   2. Closed by at least one manual valve, blind flange, or deactivated automatic valve secured in its closed position.

b. All secondary containment hatches and blowout panels are closed and sealed.

c. The standby gas treatment system is in compliance with the requirements of Specification 3.6.5.3.

SECONDARY CONTAINMENT INTEGRITY (Continued)

d. At least one door in each access to the secondary containment is closed.

e. The sealing mechanism associated with each secondary containment penetration, e.g., welds, bellows, or O-rings, is OPERABLE.

f. The pressure within the secondary containment is less than or equal to the value required by Specification 4.6.5.1.a.

SHUTDOWN MARGIN

1.40 41 SHUTDOWN MARGIN shall be the amount of reactivity by which the reactor is subcritical or would be subcritical assuming all control rods are fully inserted except for the single control rod of highest reactivity worth which is assumed to be fully withdrawn and the reactor is in the shutdown condition; cold, i.e., 68°F; and xenon free.

SITE BOUNDARY

1.41 42 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.

SOLIDIFICATION

1.42 43 SOLIDIFICATION shall be the conversion of radioactive wastes from liquid systems to a homogeneous (uniformly distributed), monolithic, immobilized solid with definite volume and shape, bounded by a stable surface of distinct outline on all sides (free-standing).

SOURCE CHECK

1.43 44 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

STAGGERED TEST BASIS

1.44 45 A STAGGERED TEST BASIS shall consist of:

a. A test schedule for n systems, subsystems, trains, or other designated components obtained by dividing the specified test interval into n equal subintervals.

b. The testing of one system, subsystem, train, or other designated component at the beginning of each subinterval.

THERMAL POWER

1.45 THERMAL POWER shall be the total reactor core heat transfer rate to the
46 reactor coolant.

TOTAL PEAKING FACTOR

1.46 The TOTAL PEAKING FACTOR (TPF) shall be the ratio of local LHGR for any
47 specific location on a fuel rod divided by the core average LHGR associated with the fuel bundles of the same type operating at the core average bundle power.

TURBINE BYPASS SYSTEM RESPONSE TIME

1.47 The TURBINE BYPASS SYSTEM RESPONSE TIME shall be that time interval from
48 when the turbine bypass control unit generates a turbine bypass valve flow signal until the turbine bypass valves travel to their required positions. The response time may be measured by any series of sequential, overlapping, or total steps such that the entire response time is measured.

UNIDENTIFIED LEAKAGE

1.48 UNIDENTIFIED LEAKAGE shall be all leakage which is not IDENTIFIED LEAKAGE.
49

UNRESTRICTED AREA

1.49 An UNRESTRICTED AREA shall be any area at or beyond the SITE BOUNDARY
50 access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, or any area within the site boundary used for residential quarters or for industrial, commercial, institutional, and/or recreational purposes.

VENTILATION EXHAUST TREATMENT SYSTEM

1.50 A VENTILATION EXHAUST TREATMENT SYSTEM shall be any system designed and
51 installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal adsorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment (such a system is not considered to have any effect on noble gas effluents). Engineered Safety Features (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

VENTING

1.51 VENTING shall be the controlled process of discharging air or gas from
52 a confinement to maintain temperature, pressure, humidity, concentration, or other operating condition, in such a manner that replacement air or gas is not provided or required during VENTING. Vent, used in system names, does not imply a VENTING process.

POWER DISTRIBUTION LIMITS

3/4.2.6 POWER/FLOW INSTABILITY

LIMITING CONDITION FOR OPERATION

3.2.6 Operation with THERMAL POWER/core flow conditions which lay in ~~the crosshatched region~~ Region A of Figure 3.2.6-1 is prohibited.

APPLICABILITY: OPERATIONAL CONDITION 1, 2

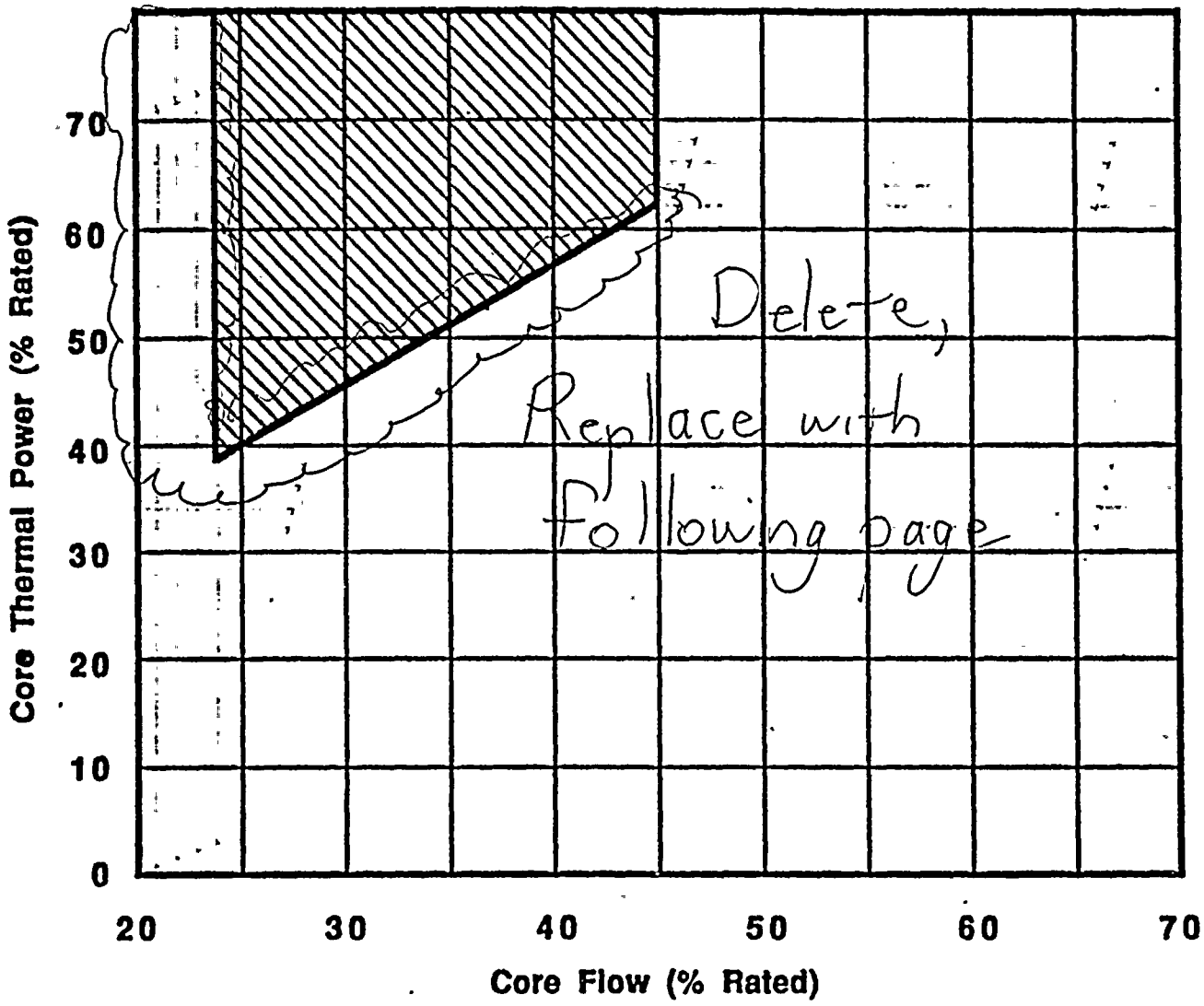
~~When~~ THERMAL POWER is greater than 39% of RATED THERMAL POWER and core flow is less than or equal to 45% of rated core flow.

ACTION:

With THERMAL POWER/core flow conditions which lay in ~~the crosshatched region~~ Region A of Figure 3.2.6-1, initiate ~~corrective action within 15 minutes to establish a THERMAL POWER/core flow condition which lays outside the crosshatched region within 2 hours.~~ IMMEDIATELY a MANUAL SCRAM.

SURVEILLANCE REQUIREMENTS

4.2.6 The THERMAL POWER/core flow conditions shall be verified to lay outside ~~the crosshatched region~~ Region A of Figure 3.2.6-1 once per 24 hours when operating in the region of APPLICABILITY.



Operating Region Limits of Specification 3.2.6
Figure 3.2.6-1

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POWER DISTRIBUTION LIMITS

3/4.2.7 NEUTRON FLUX NOISE MONITORING

LIMITING CONDITION FOR OPERATION

3.2.7 The APRM and LPRM neutron flux noise levels shall not exceed three (3) times their established baseline values when operating in the region of APPLICABILITY.

APPLICABILITY: OPERATIONAL CONDITION 1 with THERMAL POWER/core flow in Region B of Figure 3.2.7-1, with two reactor coolant system recirculation loops in operation and total core flow less than 45% of rated total core flow, or with one reactor coolant system recirculation loop not in operation.

ACTION:

a. If baseline APRM and LPRM neutron flux noise levels have not been established for the appropriate reactor coolant system condition (one or two loop operation) since the most recent CORE ALTERATION, then:

   Within 2 hours exit the region of APPLICABILITY. Establish baseline APRM and LPRM neutron flux noise levels prior to re-entering Region B of Figure 3.2.7-1.

b. If baseline APRM and LPRM neutron flux noise levels have been established for the appropriate reactor coolant system condition (one or two loop operation) since the most recent CORE ALTERATION, then:

   With the APRM or LPRM neutron flux noise levels greater than three (3) times their established noise levels, initiate corrective action within 15 minutes to restore the noise levels to within the required limits within 2 hours or reduce THERMAL POWER to below the region of APPLICABILITY within the next 2 hours.

SURVEILLANCE REQUIREMENTS

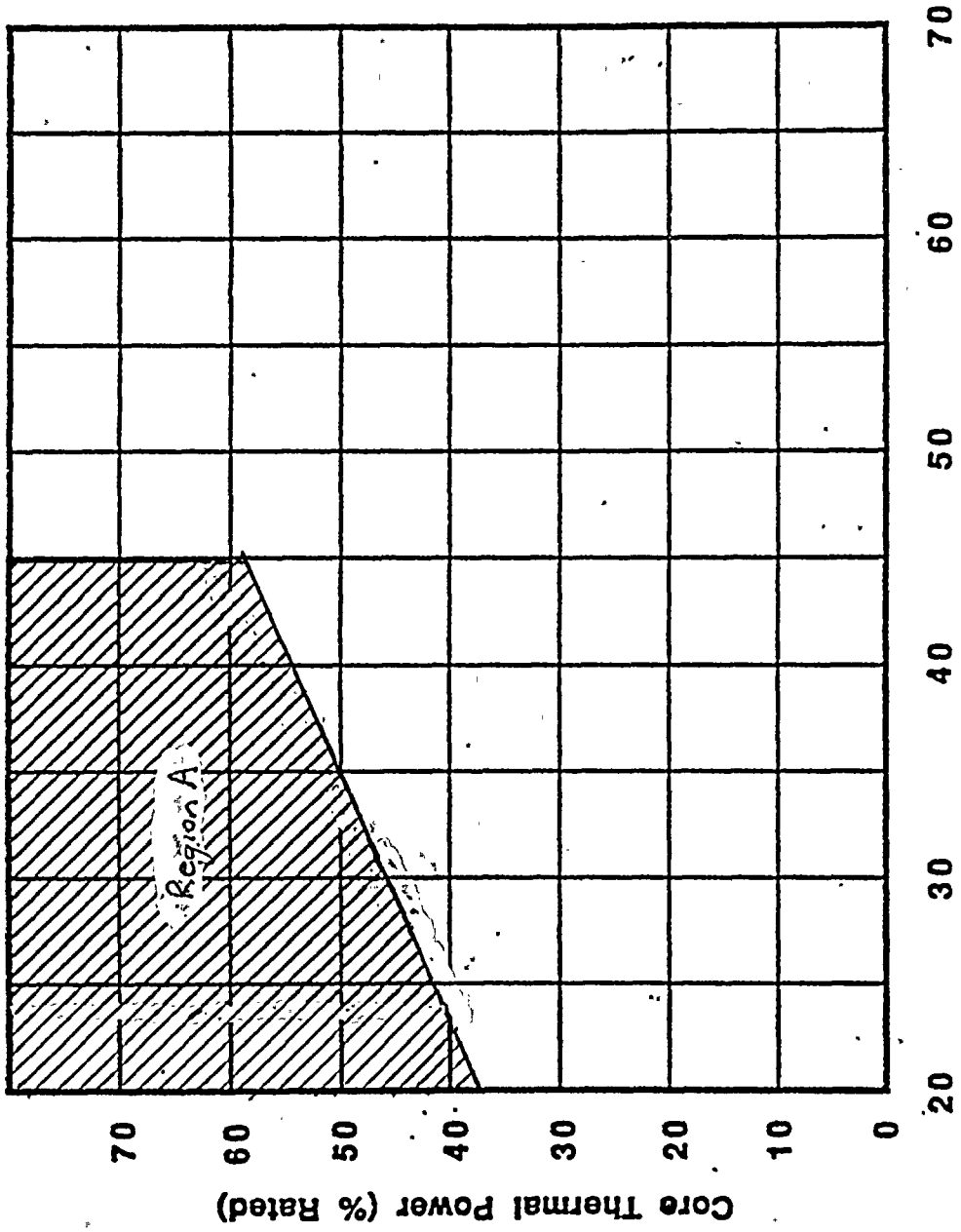
4.2.7.1 The provisions of Specification 4.0.4 are not applicable.

4.2.7.2 The APRM and LPRM neutron flux noise levels shall be determined to be less than or equal to three (3) times their established baseline values:

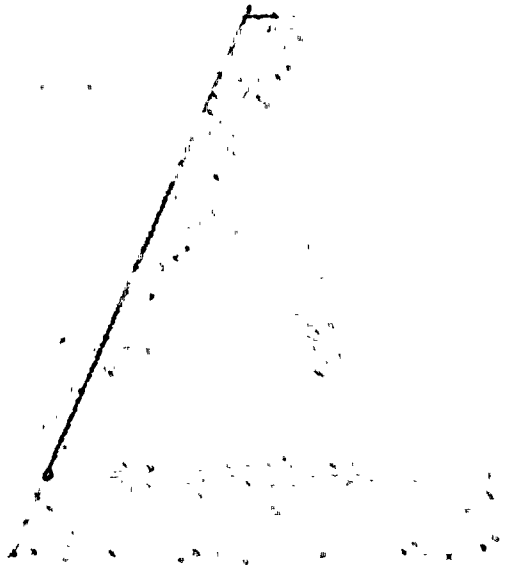
   a. At least once per 8 hours, and

   b. Within 30 minutes after completion of a THERMAL POWER increase of greater than or equal to 5% of rated THERMAL POWER.

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



Operating Region Limits of Specification 3.2.6
Figure 3.2.6-1



3/4.2 POWER DISTRIBUTION LIMITS

3/4.2.7 STABILITY MONITORING - TWO LOOP OPERATION

LIMITING CONDITION FOR OPERATION

3.2.7 The stability monitoring system shall be operable* and the decay ratio of the neutron signals shall be less than .75 when operating in the region of APPLICABILITY.

APPLICABILITY: OPERATIONAL CONDITION 1, with two recirculation loops in operation and THERMAL POWER/core flow conditions which lay in Region B of Figure 3.2.7-1

ACTION:

a. With decay ratios of any two (2) neutron signals greater than .75 or with two (2) consecutive decay ratios on any single neutron signal greater than .75:

   IMMEDIATELY initiate action to reduce the decay ratio by either decreasing THERMAL POWER with control rod insertion or increasing core flow with recirculation flow control valve manipulation. The starting or shifting of a recirculation pump for the purpose of decreasing decay ratio is specifically prohibited.

b. With the stability monitoring system inoperable and when operating in the region of APPLICABILITY:

   IMMEDIATELY initiate action to exit the region of APPLICABILITY by either decreasing THERMAL POWER with control rod insertion or increasing core flow with recirculation flow control valve manipulation. The starting or shifting of a recirculation pump for the purpose of exiting the region of APPLICABILITY when the stability monitoring system is inoperable is specifically prohibited. Exit the region of APPLICABILITY within one (1) hour.

SURVEILLANCE REQUIREMENTS:

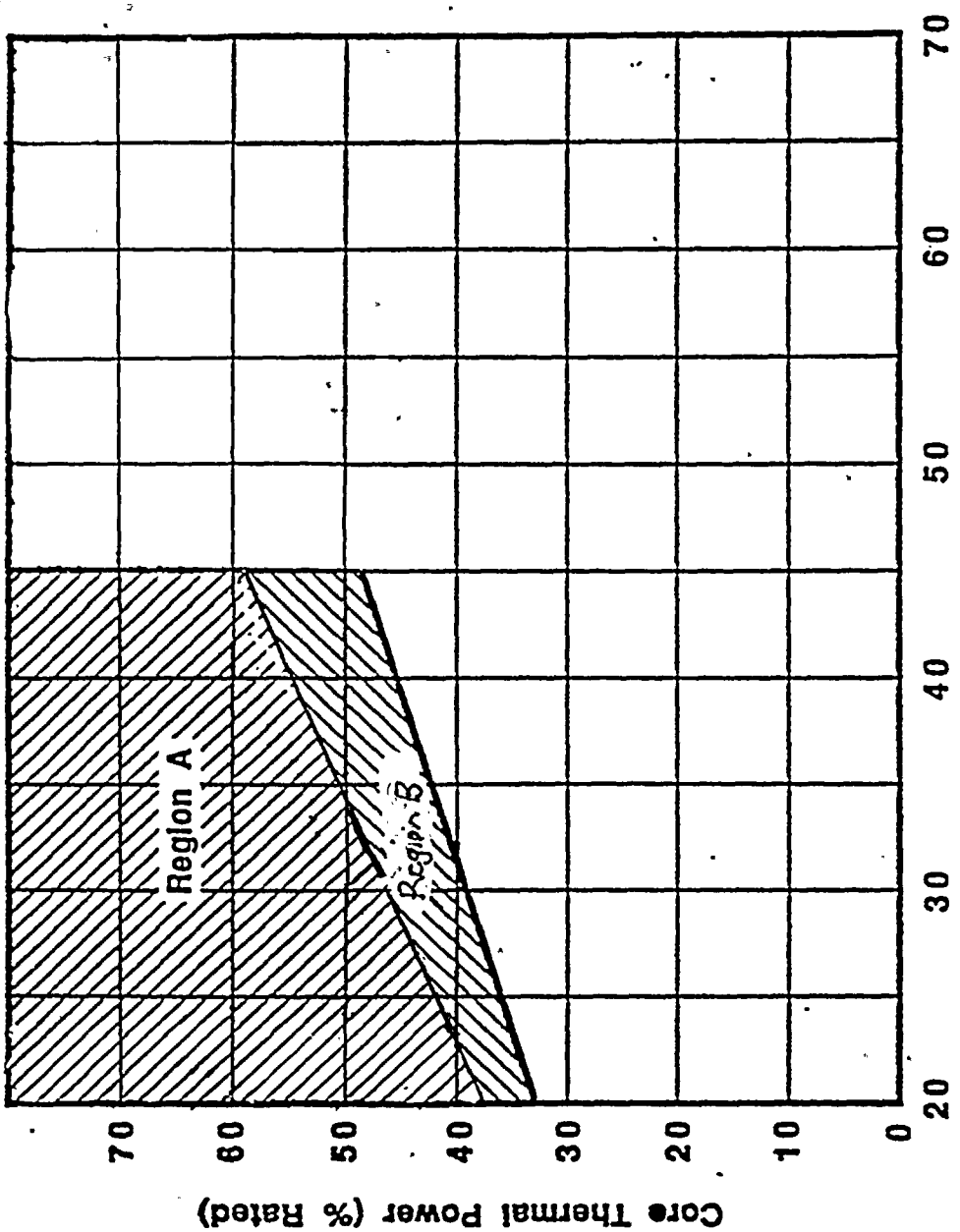
4.2.7.1 The provisions of Specification 4.0.4 are not applicable.

4.2.7.2 The stability monitoring system shall be demonstrated operable* within one (1) hour prior to entry into the region of APPLICABILITY.

4.2.7.3 The decay ratios from the stability monitoring system shall be monitored following reactivity manipulation when operating in the region of APPLICABILITY.

4.2.7.4 The decay ratios from the stability monitoring system shall be demonstrated to be less than 0.75 once every 24 hours when operating in the region of APPLICABILITY.

*Detector levels A and C (or B and D) of one LPRM string in each of the nine core regions (a total of 18 LPRM detectors) shall be monitored. A minimum of four (4) APRMs shall also be monitored.



Operating Region Limits of Specification 3.2.7
Figure 3.2.7-1

3/4.2 POWER DISTRIBUTION LIMIT

3/4.2.8 STABILITY MONITORING - SINGLE LOOP OPERATION

LIMITING CONDITION FOR OPERATION

3.2.8 The stability monitoring system shall be operable* and the decay ratio of the neutron signals shall be less than .75 when operating in the region of APPLICABILITY.

APPLICABILITY: OPERATIONAL CONDITION 1, with one recirculation loop in operation and THERMAL POWER/core flow conditions lay in Region C of Figure 3.2.8-1.

ACTION:

a. With decay ratios of any two (2) neutron signals greater than .75 or with two (2) consecutive decay ratios on any single neutron signal greater than .75:

   IMMEDIATELY initiate action to reduce the decay ratio by either decreasing THERMAL POWER with control rod insertion or increasing core flow with recirculation flow control valve manipulation. The starting or shifting of a recirculation pump for the purpose of decreasing decay ratio is specifically prohibited.

b. With the stability monitoring system inoperable and when operating in the region of APPLICABILITY:

   IMMEDIATELY initiate action to exit the region of APPLICABILITY by decreasing THERMAL POWER via control rod insertion. Exit the region of APPLICABILITY within one (1) hour.

SURVEILLANCE REQUIREMENTS:

4.2.8.1 The provisions of Specification 4.0.4 are not applicable.

4.2.8.2 The stability monitoring system shall be demonstrated operable* within one (1) hour prior to entry into the region of APPLICABILITY.

4.2.8.3 The decay ratios from the stability monitoring system shall be monitored following reactivity manipulation when operating in the region of APPLICABILITY.

4.2.8.4 The decay ratios from the stability monitoring system shall be demonstrated to be less then 0.75 once every 24 hours when operating in the region of APPLICABILITY.

*Detector levels A and C (or B and D) of one LPRM string in each of the nine core regions (a total of 18 LPRM detectors) shall be monitored. A minimum of four (4) APRMs should also be monitored.

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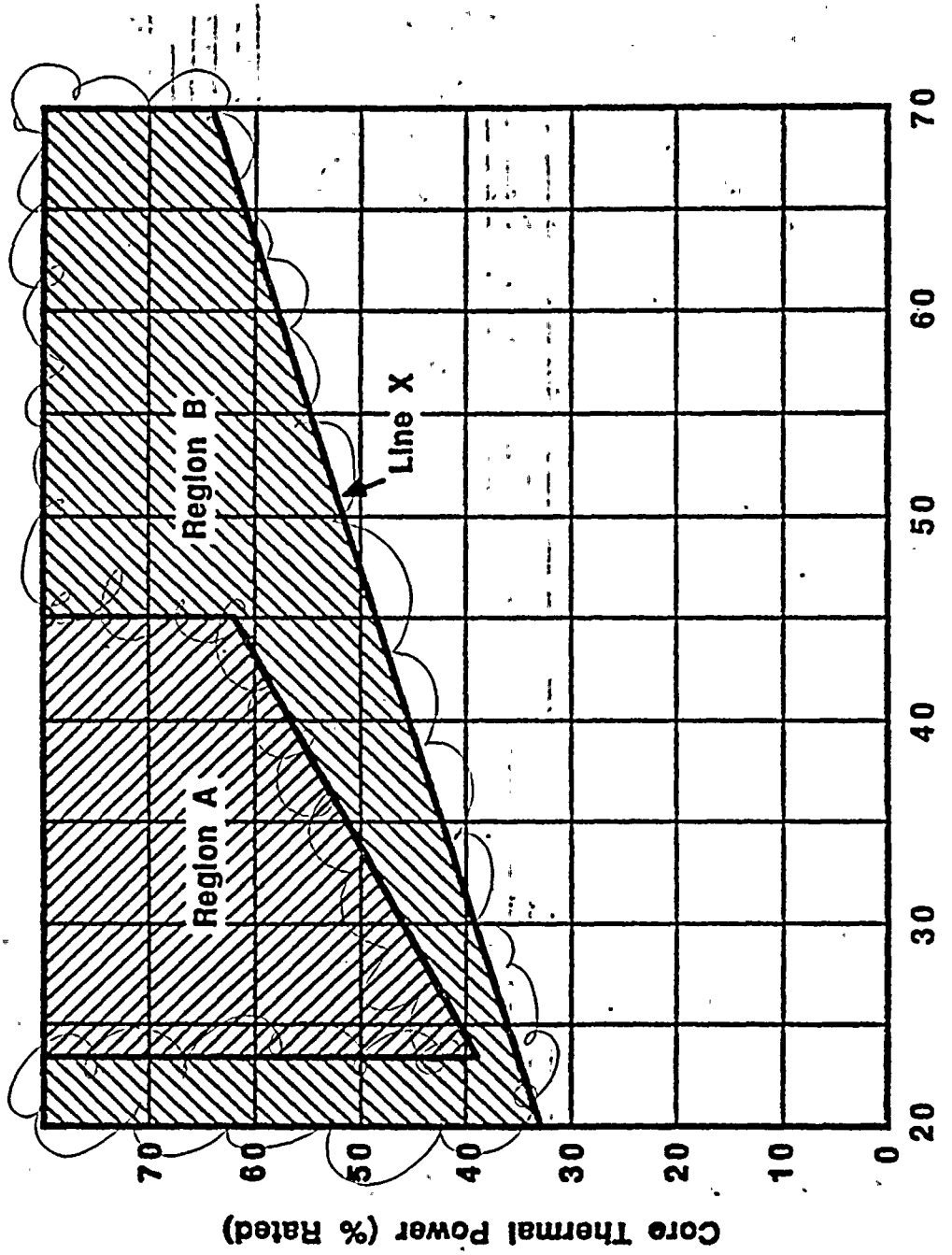
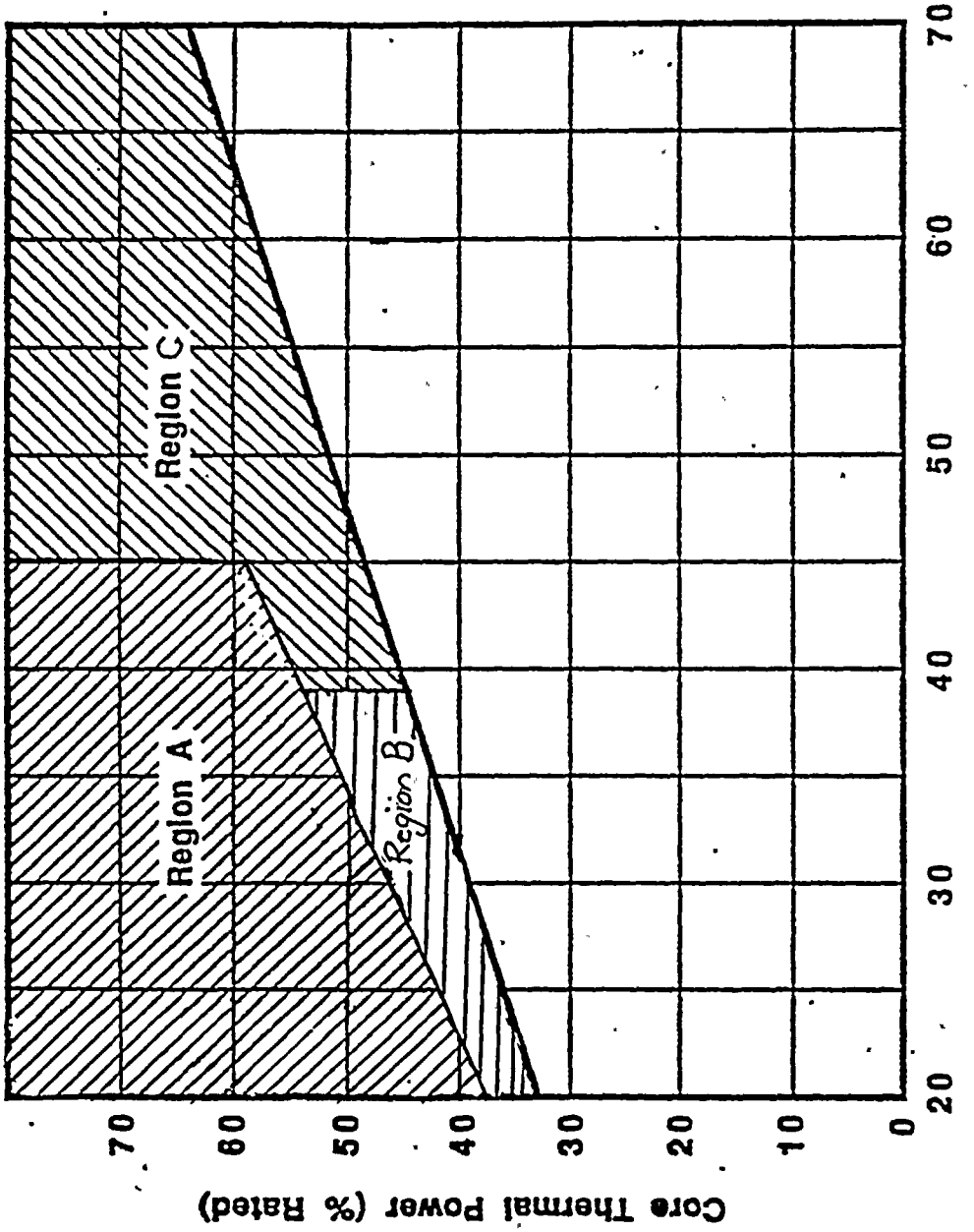


Operating Region Limits of Specification 3.2.7
Figure 3.2.7-1



Operating Region Limits of Specification 3.2.7
Figure 3.2.7-1

3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

RECIRCULATION LOOPS

LIMITING CONDITION FOR OPERATION

3.4.1.1 Two reactor coolant system recirculation loops shall be in operation.

APPLICABILITY: OPERATIONAL CONDITIONS 1* and 2*.

ACTION:

a. With one reactor coolant system recirculation loop not in operation:

1. Within 15 minutes:

a. Verify that core flow is greater than or equal to 39% of rated core flow or that THERMAL POWER/core flow conditions lay below the line in Figure 3.4.1.1-1. With core flow less than 39% of rated core flow and THERMAL POWER/core flow conditions above the line in Figure 3.4.1.1-1, initiate action to reduce THERMAL POWER to below the line in Figure 3.4.1.1-1 or increase core flow to greater than or equal to 39% of rated core flow within the next 4 hours.

1. b. Verify that the requirements of LCO 3.2.6 and LCO 3.2.8 are met, or comply with the associated ACTION statement(s) within the specified time limits.

Insert B →

3.2. Within 4 hours:

a) Place the recirculation flow control system in the Local Manual (Position Control) mode, and

b) Increase the MINIMUM CRITICAL POWER RATIO (MCPR) Safety Limit by 0.01 to 1.07 per Specification 2.1.2, and,

c) Reduce the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) for General Electric fuel limit to a value of 0.84 times the two recirculation loop operation limit per Specification 3.2.1, and,

d) Reduce the volumetric flow rate of the operating recirculation loop to $\leq$ 41,725** gpm.

*See Special Test Exception 3.10.4.
**This value represents the actual volumetric recirculation loop flow which produces 100% core flow at 100% THERMAL POWER. This value was determined during the Startup Test Program.

INSERT B

2. Verify that THERMAL POWER/core flow conditions lay outside Region B of Figure 3.4.1.1-1.

   With THERMAL POWER/core flow conditions which lay in Region B of Figure 3.4.1.1-1, IMMEDIATELY initiate action to exit Region B by either decreasing THERMAL POWER with control rod insertion or increasing core flow with flow control valve manipulation. Within 1 hour exit Region B. The starting or shifting of a recirculation pump for the purpose of exiting Region B is specifically prohibited.

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

e) Perform Surveillance Requirement 4.4.1.1.2 if THERMAL POWER is ≤ 25%*** of RATED THERMAL POWER or the recirculation loop flow in the operating loop is ≤ 10%*** of rated loop flow.

f) Reduce recirculation loop flow in the operating loop until the core plate ΔP noise does not deviate from the established core plate ΔP noise patterns by more than 100%.

4 B. The provisions of Specification 3.0.4 are not applicable.

5 A. Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

b. With no reactor coolant system recirculation loops in operation, immediately initiate measures to place the unit in at least HOT SHUTDOWN within the next 6 hours.

change to All CAPS

SURVEILLANCE REQUIREMENTS

4.4.1.1.1 With one reactor coolant system recirculation loop not in operation, at least once per 8 hours verify that:

a. The recirculation flow control system is in the Local Manual (Position Control) mode, and

b. The volumetric flow rate of the operating loop is ≤ 41,725 gpm.**

**This value represents the actual volumetric recirculation loop flow which produces 100% core flow at 100% THERMAL POWER. This value was determined during the Startup Test Program.

***Final values were determined during Startup Testing based upon actual THERMAL POWER and recirculation loop flow which will sweep the cold water from the vessel bottom head preventing stratification.

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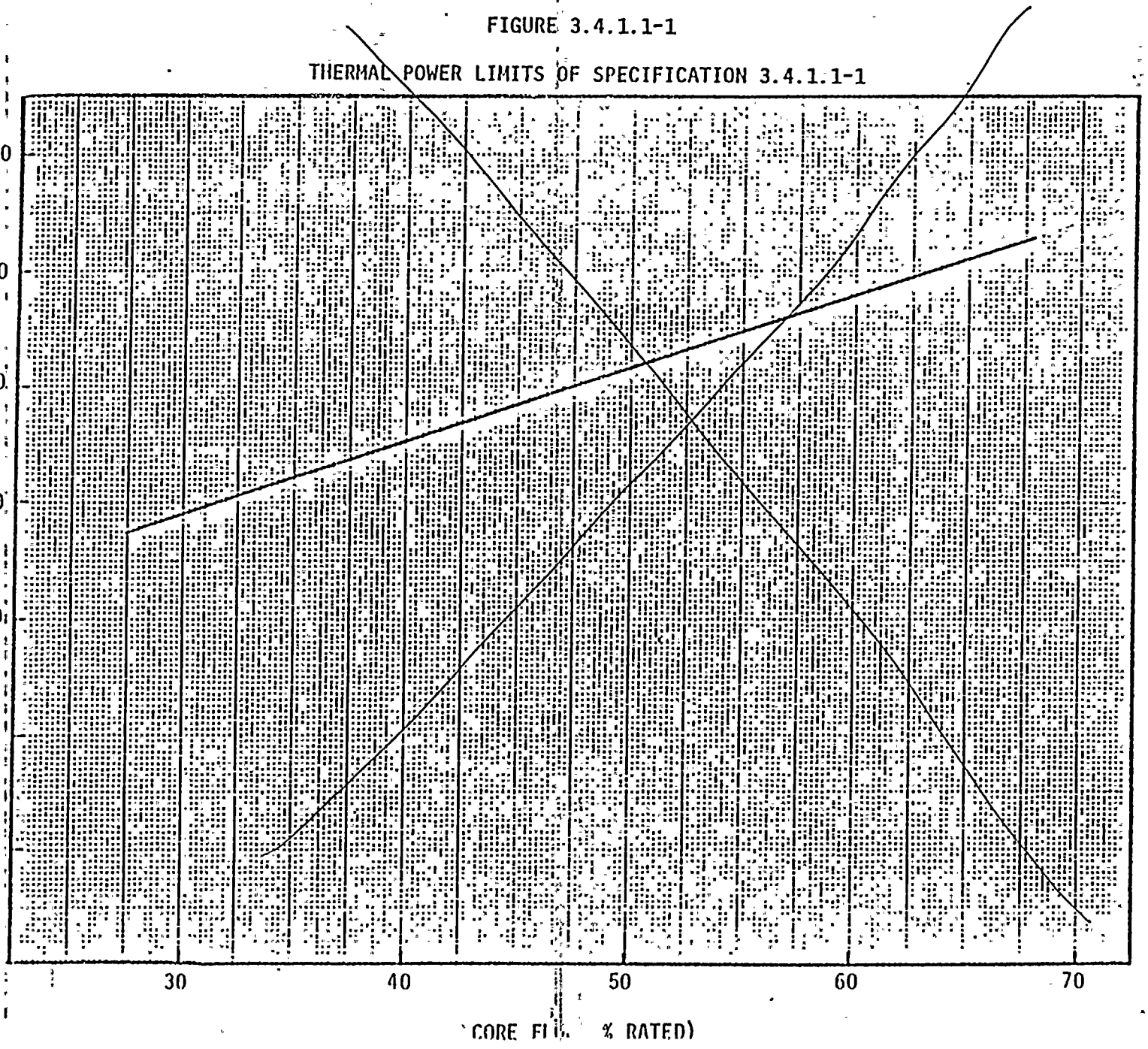
FIGURE 3.4.1.1-1

THERMAL POWER LIMITS OF SPECIFICATION 3.4.1.1-1



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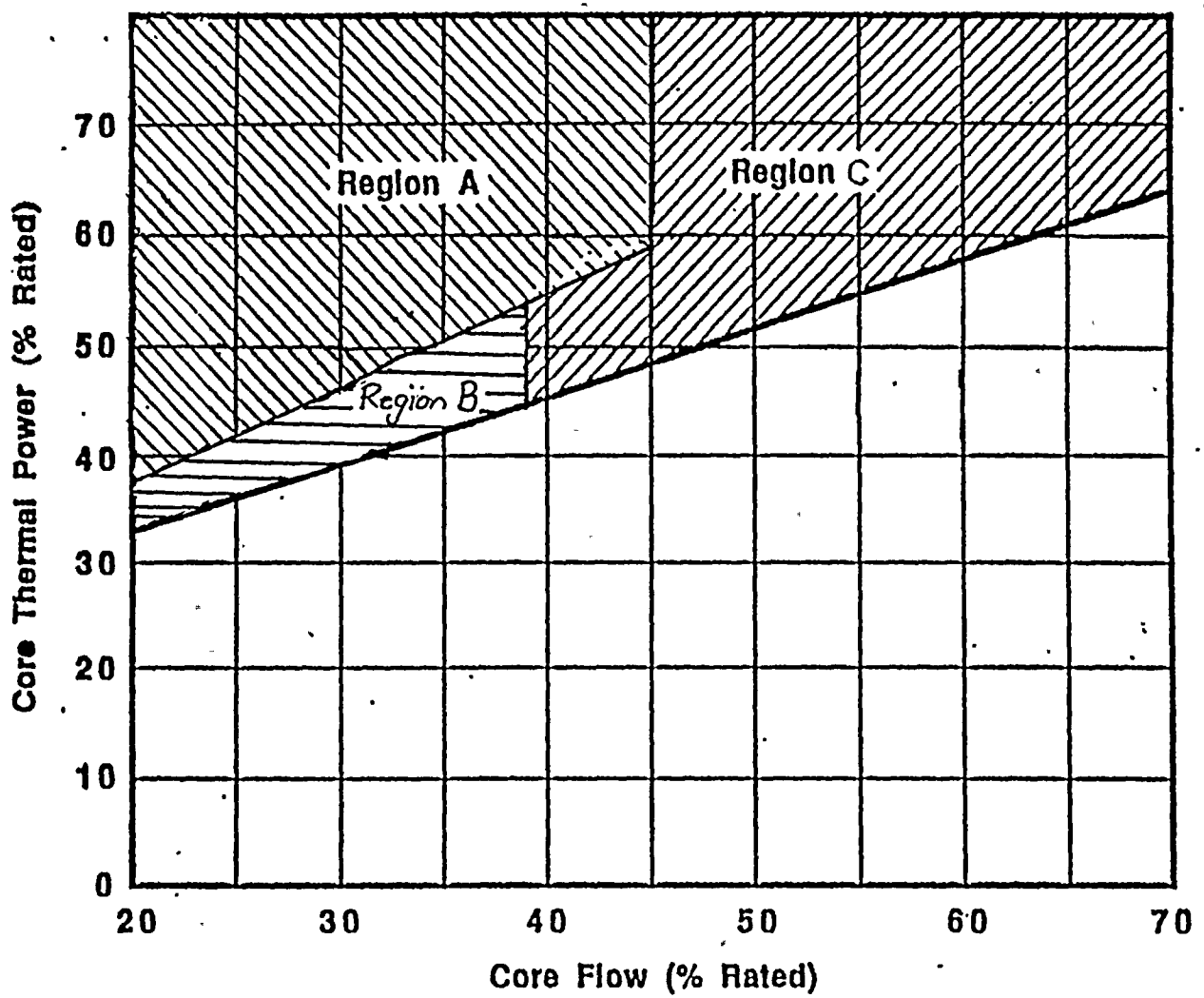

Operating Region Limits of Specification 3.4.1.1
Figure 3.4.1.1-1

POWER/FLOW INSTABILITY (Continued)

Predicated on the SIL 380 endorsement, WNP-2 has divided the power/flow map on the following boundary lines:

1. 80% rod line
2. 45% core flow line
3. ~~APRM rod block line minus 3% power~~ 100% rod line
4. Natural Circulation flow line
5. Minimum Forced Circulation for normal recirculation lineup.

replace: the more conservative of either the 100% rodline or a line defining a calculated decay ratio of 0.9

This division conforms to the SIL 380 recommendations ~~with a 3% power penalty on the APRM rod block line.~~ For LCO 3.2.6, the region of concern is bounded by ~~the APRM rod block line, minus 3% power,~~ the natural circulation flow line, and the 45% core flow line. Calculated decay ratios between the two flow lines and on the APRM rod block line minus 3% must be less than .9. Operation in the region between the two flow lines and above ~~the rod block line minus 3%~~ is forbidden due to the potential for boiling instabilities.

~~For the ease of annual licensing submittals, a 3% margin from the rod block line is taken to avail the opportunity to submit with no Technical Specification changes under the provisions of 10 CFR 50.59. This 3% provides margin to assure that vendor stability calculations can easily support the allowable operating region. For calculational ease the power boundary is linearized between two points, (24% Flow, 39% Power) and (45% Flow, 62% Power).~~

3/4.2.7 ~~NEUTRON FLUX NOISE~~ STABILITY MONITORING — TWO LOOP OPERATION

At the high power/low flow corner of the operating domain, a small probability of limit cycle neutron flux oscillations exists depending on combinations of operating conditions (e.g., rod patterns, power shape). To provide assurance that neutron flux limit cycle oscillations are detected and suppressed, APRM and LPRM neutron flux ~~noise levels~~ signal decay ratios should be monitored while operating in this region.

Stability tests at operating BWRs were reviewed to determine a generic region of the power/flow map in which surveillance of neutron flux noise levels should be performed. A conservative decay ratio of 0.75 was chosen as the basis for determining the generic region for surveillance to account for the plant to plant variability of decay ratio with core and fuel designs. This generic region has been determined to correspond to a core flow of less than or equal to 45% of rated core flow and a thermal power greater than that specified in Figure 3.4.1.1-1 (Reference).

Neutron flux noise limits are also established to ensure early detection of limit cycle neutron flux oscillations. BWR cores typically operate with neutron flux noise caused by random boiling and flow noise. Typical neutron flux noise levels of 1-12% of rated power (peak-to-peak) have been reported for the range of low to high recirculation loop flow during both single and dual

Insert C

INSERT C

Stability monitoring is performed utilizing the ANNA system. The ANNA system shall be used to monitor APRM and LPRM signal decay ratios when operating in the region of concern.

3/4.2.8 STABILITY MONITORING - SINGLE LOOP OPERATION

The basis for stability monitoring during single loop operation is consistent with that given above for two loop operation. The defined region where surveillance is required is larger for single loop operation due to a potential reduction in the stabilizing effect of forced circulation.

NEUTRON FLUX NOISE MONITORING (Continued)

recirculation loop operation. Stability tests at operating BWRs have demonstrated that when stability related neutron flux limit cycle oscillations occur they result in peak-to-peak neutron flux limit cycles of 5-10 times the typical values. Therefore, actions taken to reduce neutron flux noise levels exceeding three (3) times the typical value are sufficient to ensure early detection of limit cycle neutron flux oscillations.

Typically, neutron flux noise levels show a gradual increase in absolute magnitude as core flow is increased (constant control rod pattern) with two reactor recirculation loops in operation. Therefore, the baseline neutron flux noise level obtained at a specific core flow can be applied over a range of core flows. To maintain a reasonable variation between the low flow and high flow ends of the flow range, the range over which a specific baseline is applied should not exceed 20% of rated core flow with two recirculation loops in operation. Data from tests and operating plants indicate that a range of 20% of rated core flow will result in approximately a 50% increase in neutron flux noise level during operation with two recirculation loops. Baseline data should be taken near the maximum rod line at which the majority of operation will occur. However, baseline data taken at lower rod lines (i.e., lower power) will result in a conservative value since the neutron flux noise level is proportional to the power level at a given core flow.

In the case of single loop operation (SLO), the normal neutron flux noise may increase more rapidly when reverse flow occurs in the inactive jet pumps. This justifies a smaller flow range under high flow SLO conditions. Baseline data should be taken at flow intervals which correspond to less than a 50% increase in APRM neutron flux noise level. If baseline data are not specifically available for SLO, then baseline data with two recirculation loops in operation can be conservatively applied to SLO since for the same core flow SLO will exhibit higher neutron flux noise levels than operation with two loops. However, because of reverse flow characteristics of SLO, the core flow/drive flow relationship is different than the two loop relationship and therefore the baseline data for SLO should be based on the active loop recirculation drive flow, and not the core flow. Because of the uncertainties involved in SLO at high reverse flows, baseline data should be taken at or below the power specified in Figure 3.4.1.1-1. This will result in approximately a 25% conservative baseline value if compared to baseline data taken near the rated rod line and will therefore not result in an overly restrictive baseline value, while providing sufficient margin to cover uncertainties associated with SLO.