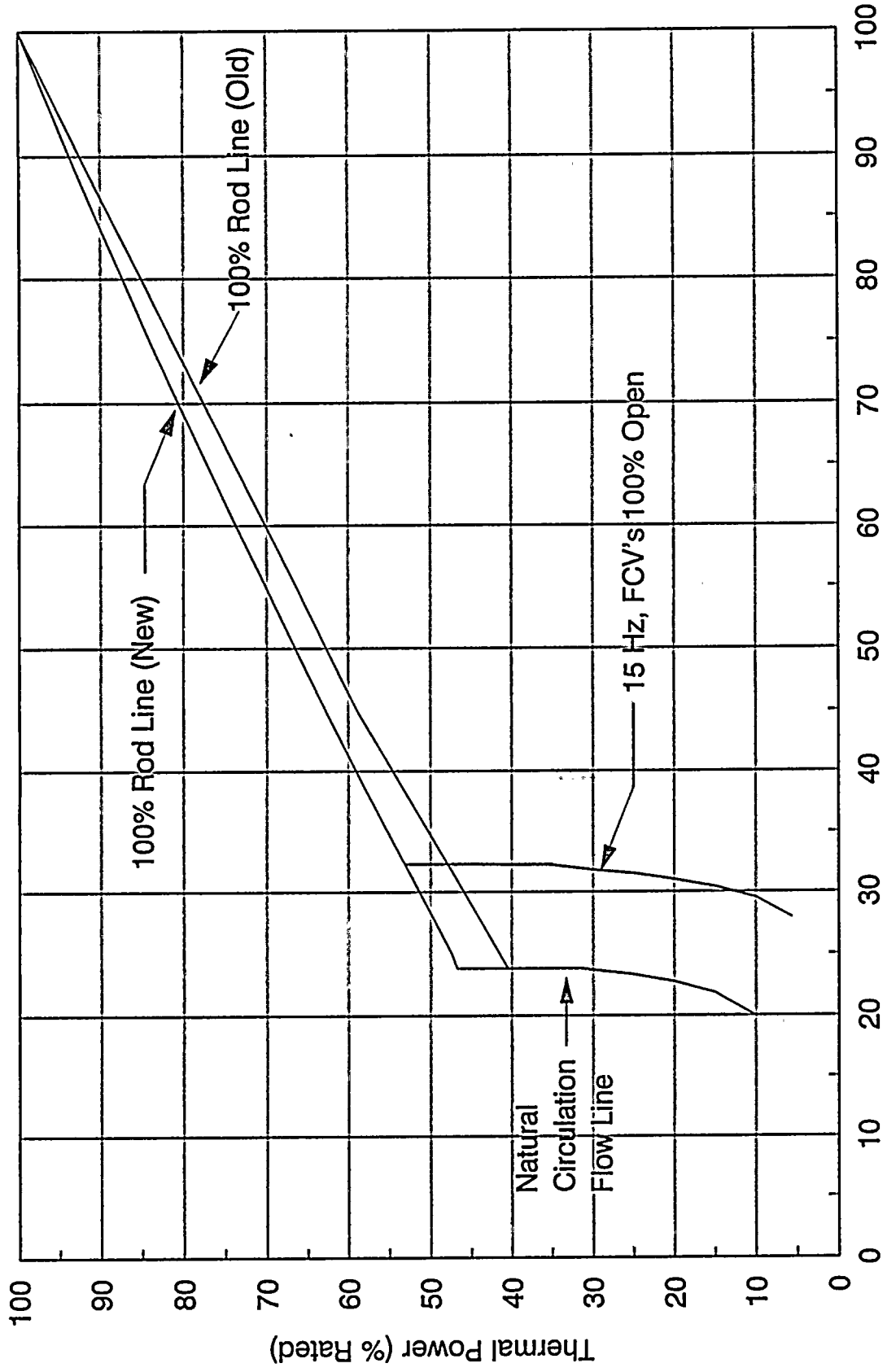

Power Flow Map
Figure 1

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PDR ADOCK 05000397
P PDR

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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 Region A of Figure 3.2.6-1 is prohibited.

APPLICABILITY: OPERATIONAL CONDITION 1, when THERMAL POWER is greater than ~~39%~~ 36% 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 Region A of Figure 3.2.6-1, then as soon as practical, but in all cases within 15 minutes, initiate a MANUAL SCRAM.

SURVEILLANCE REQUIREMENTS

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

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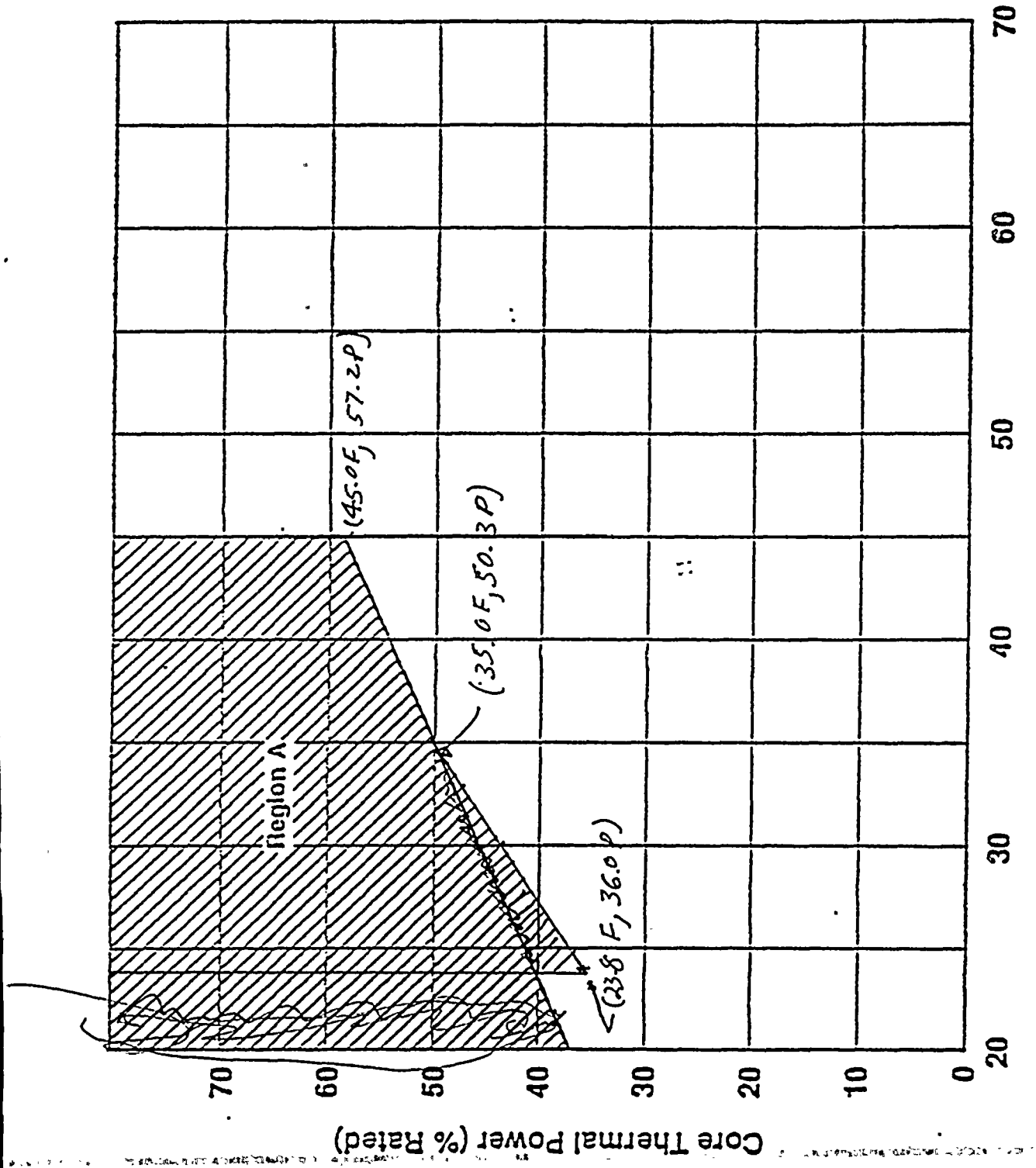
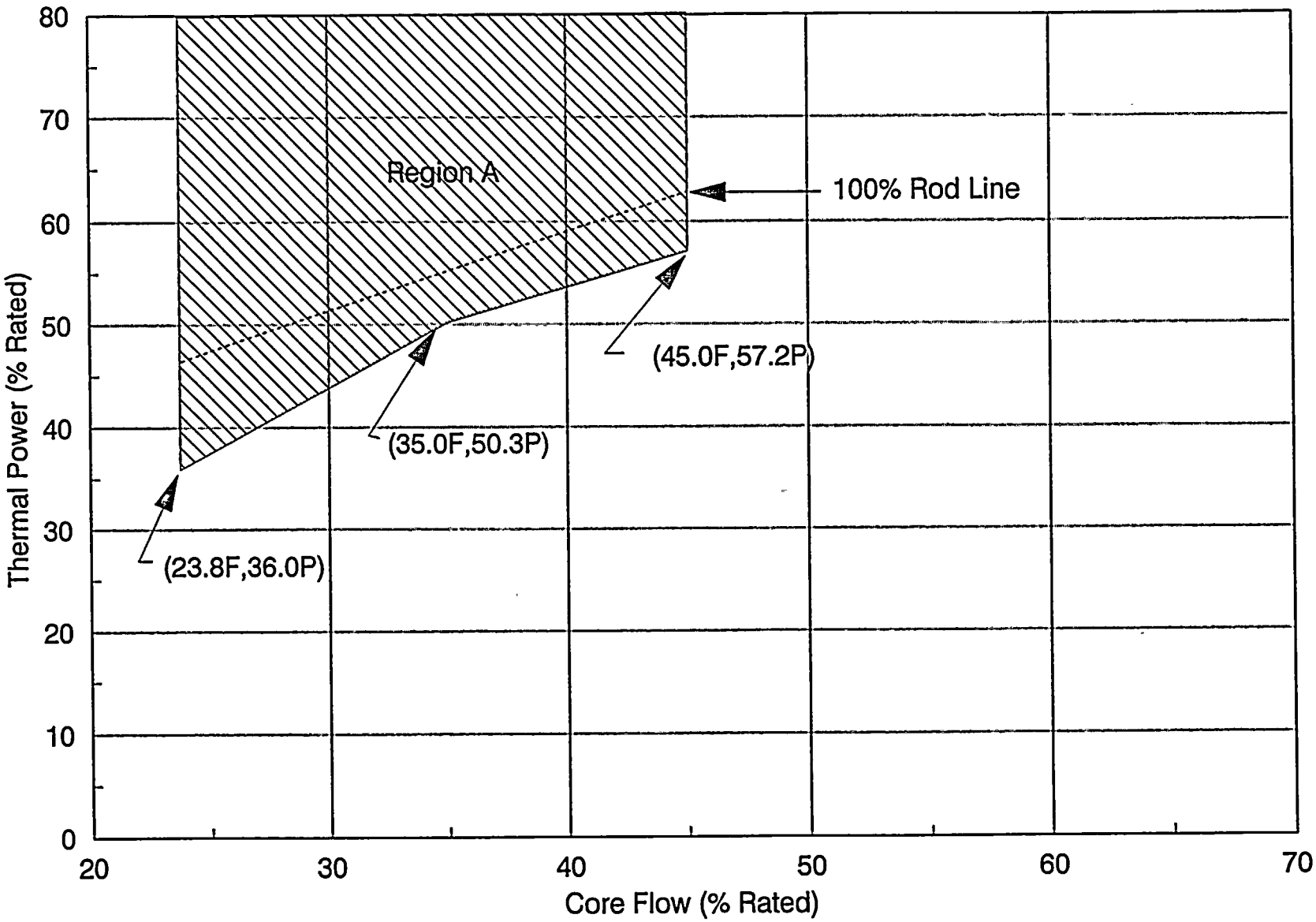


Operating Region Limits of Specification 3.2.6
Figure 3.2.6-1

REPLACE



Operating Region Limits of Specification 3.2.6

Figure 3.2.6-1

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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 0.75 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 C of Figure 3.2.7-1.

ACTION:

a. With decay ratios of any two (2) neutron signals greater than or equal to 0.75 or with two (2) consecutive decay ratios on any single neutron signal greater than or equal to 0.75:

As soon as practical, but in all cases within 15 minutes, 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:

As soon as practical, but in all cases within 15 minutes, 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 Decay ratio and peak-to-peak noise values calculated by the stability monitoring system shall be monitored when operating in the region of APPLICABILITY.

---

*Verify that the stability monitoring system data acquisition and calculational modules are functioning, and that displayed values of signal decay ratio and peak-to-peak noise are being updated. 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.

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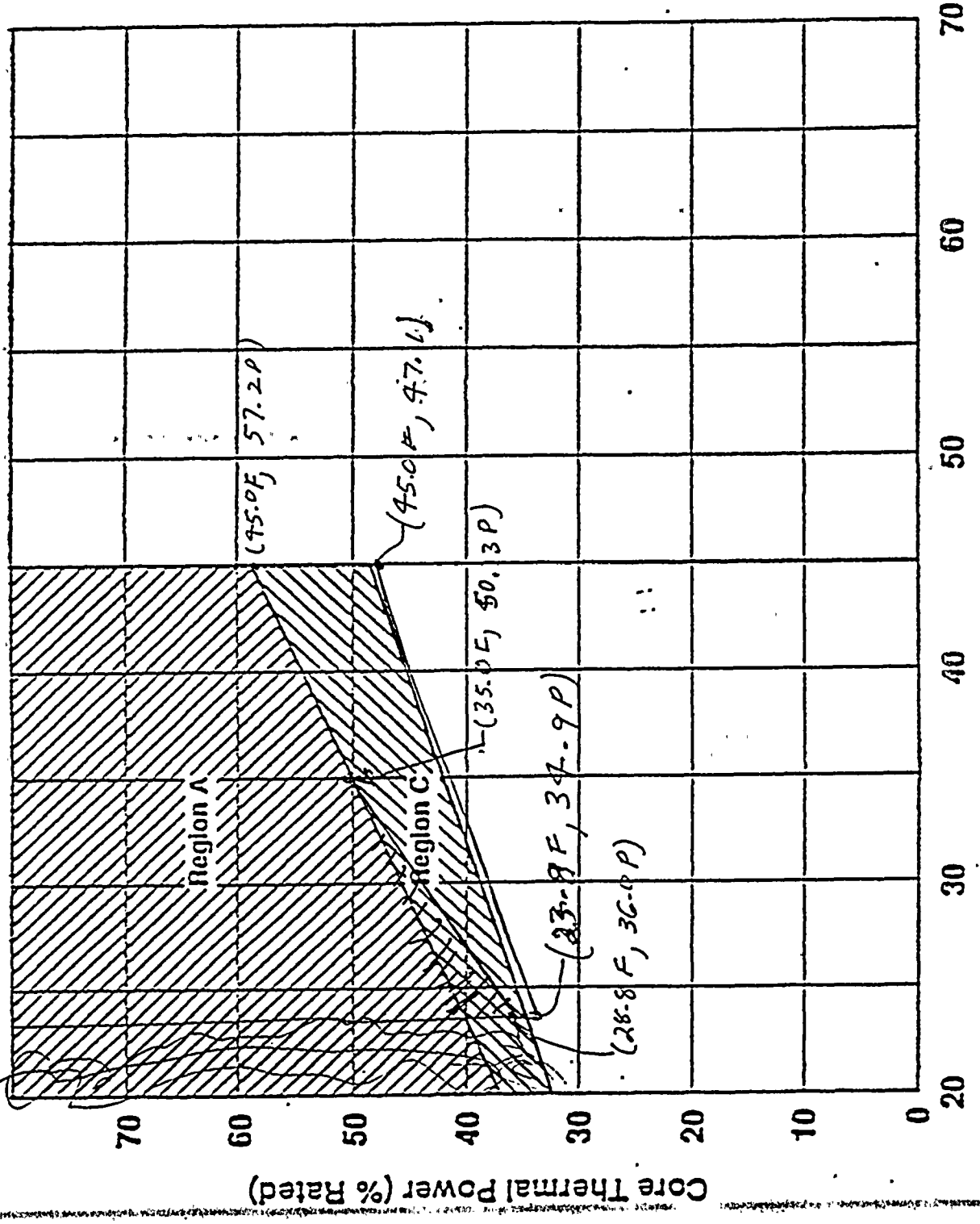
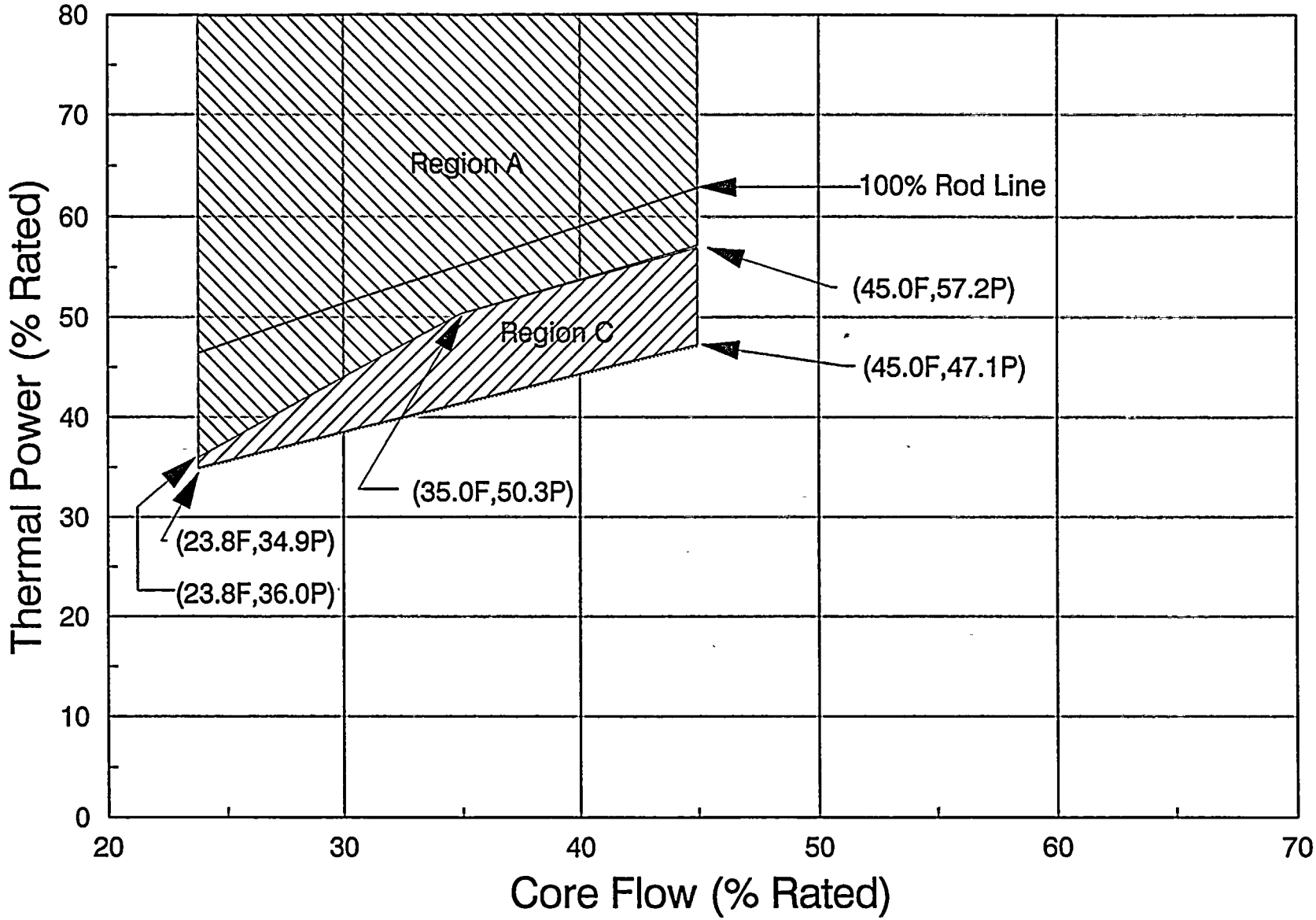


Operating Region Limits of Specification 3.2.7
Figure 3.2.7-1

REPLACE



Operating Region Limits of Specification 3.2.7

Figure 3.2.7-1

CONTROLLED COPY

3/4.2 POWER DISTRIBUTION LIMITS

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 0.75 when operating in the region of APPLICABILITY.

APPLICABILITY: OPERATIONAL CONDITION 1, with one recirculation loop in operation and THERMAL POWER/core flow conditions which 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 equal to 0.75 or with two (2) consecutive decay ratios on any single neutron signal greater than ~~.75~~ or equal to 0.75:

   As soon as practical, but in all cases within 15 minutes, 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:

   As soon as practical, but in all cases within 15 minutes, initiate action to exit the region of APPLICABILITY by decreasing THERMAL POWER with 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 Decay ratio and peak-to-peak noise values calculated by the stability monitoring system shall be monitored when operating in the region of APPLICABILITY.

---

*Verify that the stability monitoring system data acquisition and calculational modules are functioning, and that displayed values of signal decay ratio and peak-to-peak noise are being updated. 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.

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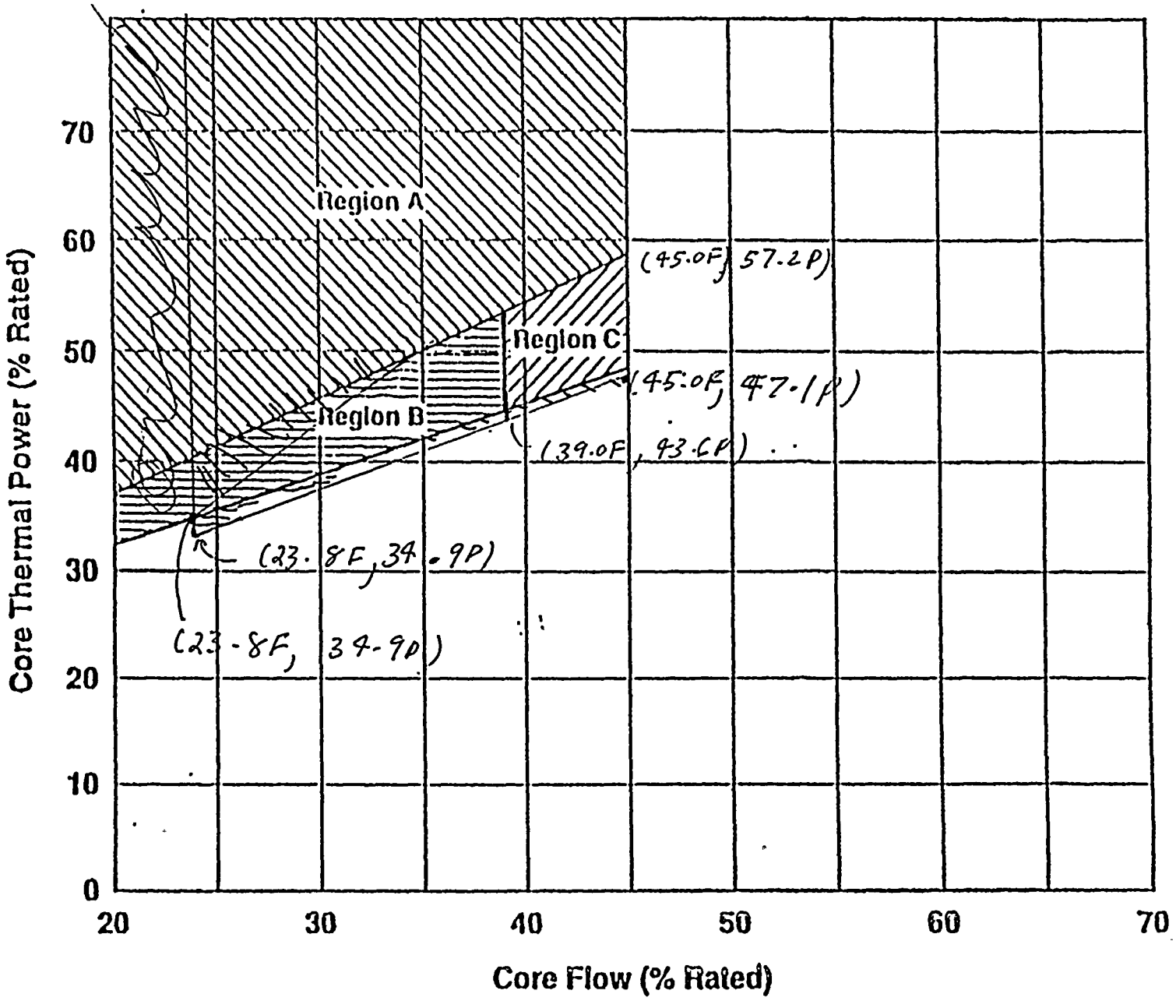
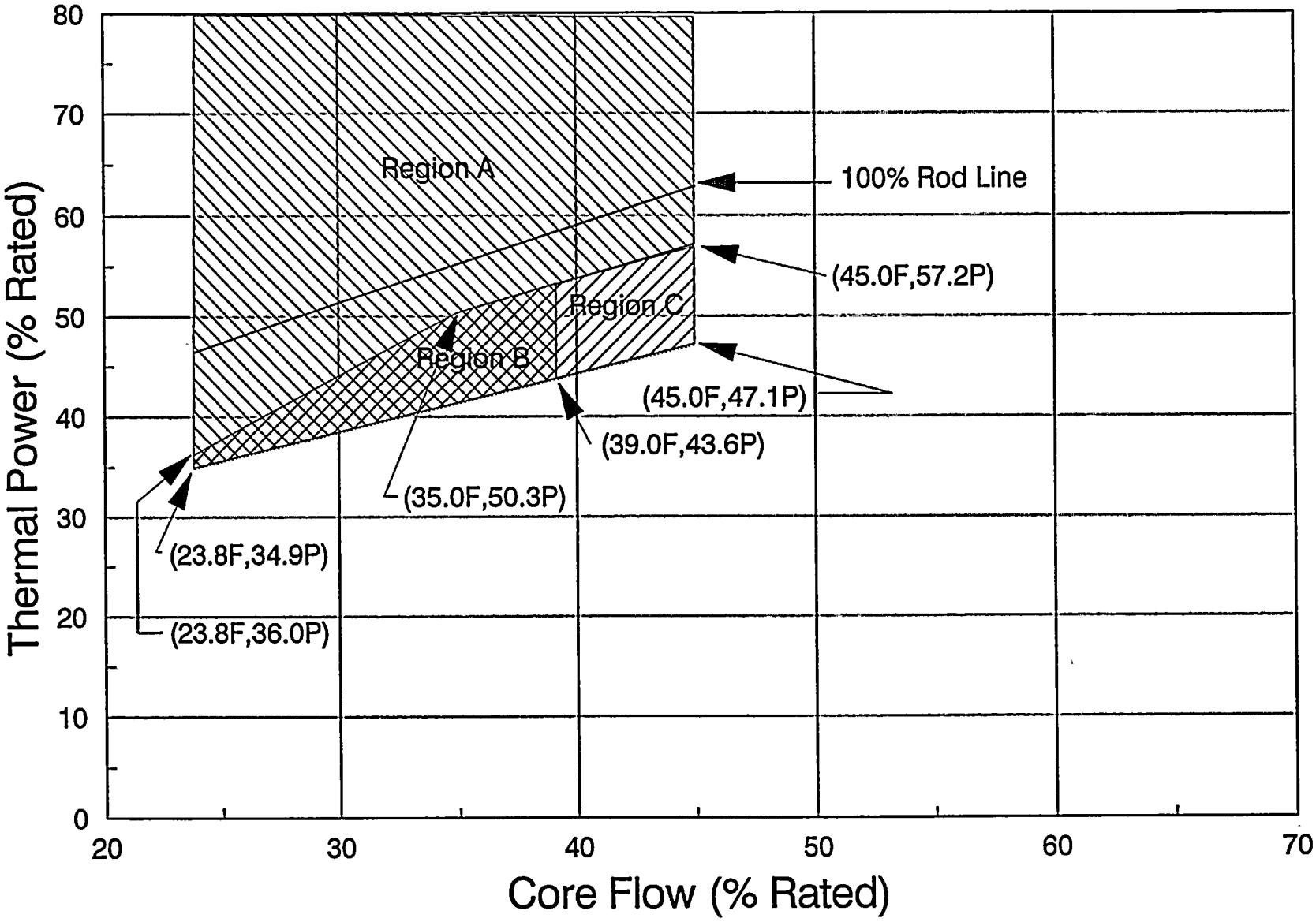


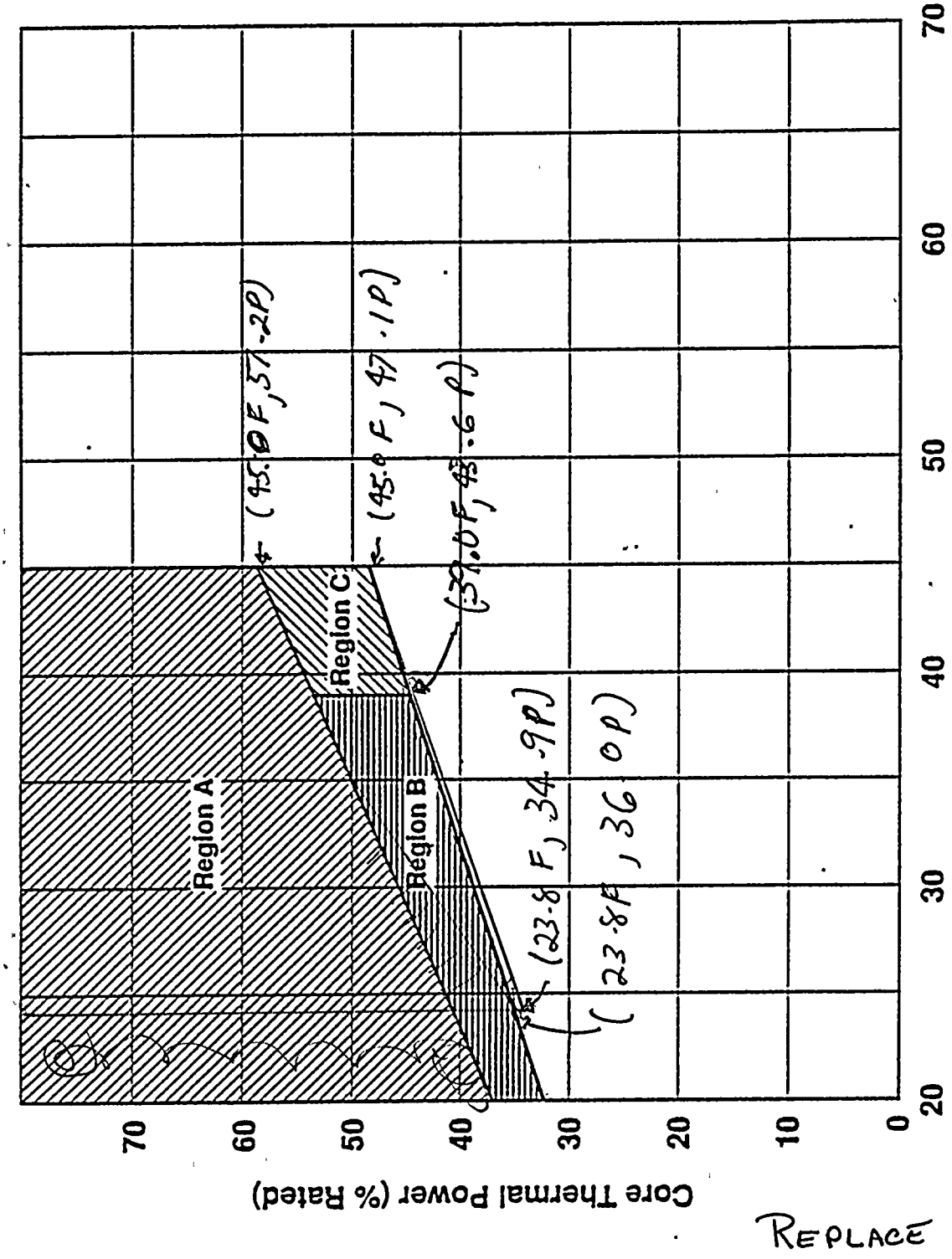
Operating Region Limits of Specification 3.2.8
Figure 3.2.8-1



Operating Region Limits of Specification 3.2.8

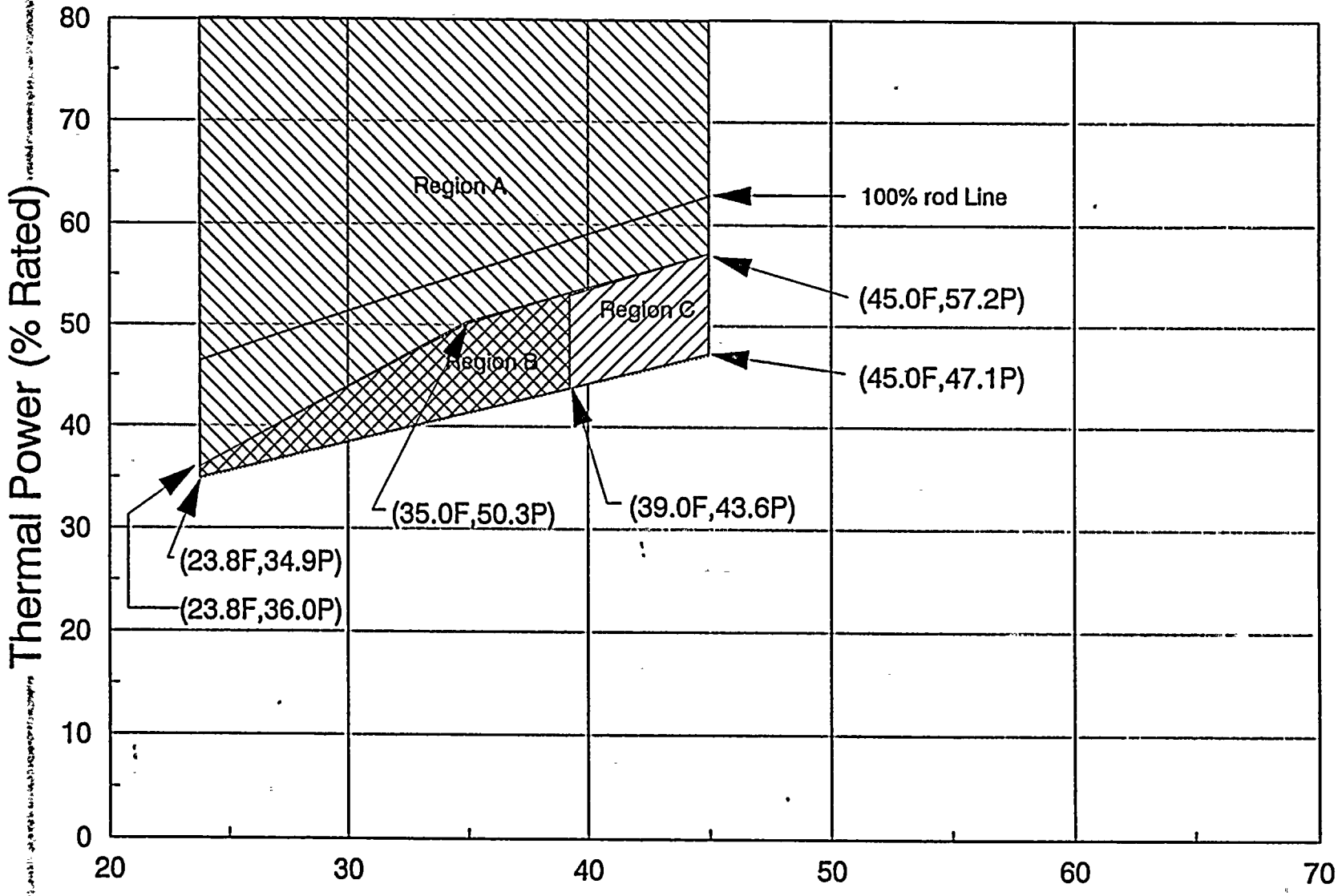
Figure 3.2.8-1

CONTROLLED COPY



REPLACE

Operating Region Limits of Specification 3.4.1.1
Figure 3.4.1.1-1



Operating Region Limits of Specification 3.4.1.1

Figure 3.4.1.1-1

slightly increasing the time required for the normal scram to suppress the flux.

3/4.2.4 LINEAR HEAT GENERATION RATE

This specification assures that the Linear Heat Generation Rate (LHGR) in any rod is less than the design linear heat generation even if fuel pellet densification is postulated.

3/4.2.6 POWER/FLOW INSTABILITY

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., power shape, bundle power, and bundle flow).

In February, 1984, GE issued SIL 380 addressing boiling instability and supplying several recommendations. In this SIL, the power/flow map was divided into several regions of varying concern. It also discussed the objectives and philosophy of "detect and suppress," coining the phrase.

The ~~ANF~~ Siemens topical report for COTRAN (XN-NF-691P) discusses boiling instability. The SER written on this topical (dated May 10, 1984) interprets the topical to require that the detect-and-suppress surveillance be used in regions which have code calculated decay ratios 0.75 or greater and that operation is forbidden in regions having calculated decay ratios of 0.9 and greater. ← Insert A

The NRC Generic Letter 86-02 addressed both GE and ~~ANF~~ Siemens (then EXXON) stability calculation methodology and stated that due to uncertainties, General Design Criteria 10 and 12 could not be met using analytic procedures on a BWR 5 design. The letter espoused GE SIL 380 and stated that General Design Criteria 10 and 12 could be met by imposing the SIL 380 recommendations in operating regions of potential instability. The NRC concluded that regions of potential instability constituted calculated decay ratios of 0.8 and greater by the GE methodology and 0.75 and greater by the EXXON methodology.

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. 100% rod line
4. Natural Circulation flow line
5. Minimum Forced Circulation for normal recirculation lineup.

← Replace with Insert B

This division conforms to the SIL 380 recommendations. For LCO 3.2.6, the region of concern (Region A) is bounded by the more conservative of either the 100% rodline or a line defining a calculated decay ratio of 0.9, the natural circulation flow line, and the 45% core flow line. Calculated decay ratios outside Region A must be less than 0.9. Operation in the region between the two

flow lines and above the more conservative of either the 100% rodline or a line defining a calculated decay ratio of 0.9 is forbidden due to the potential for boiling instabilities.

3/4.2.7 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 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 corresponding to the ~~80%~~ 75% rodline.

Stability monitoring is performed utilizing the ANNA system. The system shall be used to monitor APRM and LPRM signal decay ratio and peak-to-peak noise values when operating in the region of concern. A minimum number of LPRM and APRM signals are required to be monitored in order to assure that both global (in-phase) and regional (out-of-phase) oscillations are detectable. Decay ratios are calculated from 30 seconds worth of data at a sample rate of 10 samples/second. This sample interval results in some inaccuracy in the decay ratio calculation, but provides rapid update in decay ratio data. A decay ratio of 0.75 is selected as a decay ratio limit for operator response such that sufficient margin to an instability occurrence is maintained. When operating in the region of applicability, decay ratio and peak-to-peak information shall be continuously calculated and displayed. A surveillance requirement to continuously monitor decay ratio and peak-to-peak noise values ensures rapid response such that changes in core conditions do not result in approaching a point of instability.

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 smaller size of the region of allowable operation, Region C, is due to a limit on the allowed flow above the ~~80%~~ 75% rodline. When operating above the ~~80%~~ 75% rodline in single loop operation, the core flow is required to be greater than 39%.

INSERT A

The Siemens stability code STAIF (a frequency domain code) is also used to provide confirmation of the regions. Siemens has committed to use the STAIF code in addition to COTRAN and used the more conservative of the two results in a letter to the NRC (RAC:92:145, RA Copeland (SPC) to LE Phillips (NRC), "SPC Stability Evaluations," dated December 2, 1992).

INSERT B

Predicated on the SIL 380 endorsement and Siemens calculations with both COTRAN and STAIF, WNP-2 has divided the power/flow map on the following boundary lines

1. 75% rod line
2. 45% core flow
3. 77% rod line from natural circulation to 91% rod line at 35% core flow
4. 100% rod line
5. Natural Circulation flow line
6. Minimum Forced Circulation for normal recirculation lineup

This division conforms to the SIL 380 recommendations except that Region A has been expanded between natural circulation and 35% core flow. For LCO 3.2.6, the region of concern (Region A) is bounded by the more conservative of either the 100% rod line or a line defining a calculated decay ratio of 0.9, the natural circulation flow line, and the 45% core flow line. Operation between the two flow lines and the more conservative of either the 100% rod line or a line defining a calculated decay ratio of 0.9 is forbidden due to the potential for boiling instabilities.

Recent calculations by Siemens show that although COTRAN calculates the 0.9 decay ratio line to be above the 100% rod line, the STAIF stability code calculates the 0.9 decay ratio as below the 100% rod line at core flows less than 30%. Therefore, Region A has been expanded. Region A is above the line between a point at 36% power and 23.8% flow and a point at 50.3% power and 35% flow and for core flows greater than 35% the region is bounded by the 91% rod line. Region C is bounded by the 75% rod line.

SIEMENS

File 26.9.3
M.G. Eades – original
D L. Whitcomb 4o
D E Bush 4o
R A Vopalensky

April 20, 1993
RAC:93:049

Mr. David Whitcomb
Washington Public Power Supply System
P. O. Box 968
Richland, Washington 99352

Dear Mr. Whitcomb:

Affidavit for SPC Proprietary Letter

Reference: Letter, U. Fresk (SPC) to R. A. Vopalensky (WPPSS), "Summary of Stability Licensing Calculations in Support of WNP-2 Cycle 9," April 2, 1993, SPCWP-93-046.

In our telephone conversation yesterday, you requested an affidavit to support the submittal of the referenced proprietary letter to the NRC. This affidavit is needed to allow the NRC to withhold the letter from public distribution. When transmitting the letter and affidavit, please include the following paragraph.

> Siemens Power Corporation considers the information contained in the letter of U. Fresk to R. A. Vopalensky, dated April 2, 1993, SPCWP-93-046, to be proprietary. In accordance with the requirements of 10 CFR 2.790(b), an affidavit is enclosed to support withholding this letter from public disclosure.

If you have any questions, or if I can be of additional help, please contact me.

Very truly yours,

R. A. Copeland, Manager
Product Licensing

/smg

Attachment

cc: Ms. Y. U. Fresk (SPC)
Mr. R. A. Vopalensky (WPPSS)

Siemens Power Corporation
Nuclear Division - Engineering and Manufacturing Facility
2101 Horn Rapids Road, PO Box 130 Richland, WA 99352-0130 Tel: (509) 375-8100 Fax: (509) 375-8402

AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON)

I, R. A. Copeland being duly sworn, hereby say and depose:

1. I am Manager, Product Licensing, for Siemens Power Corporation ("SPC"), and as such I am authorized to execute this Affidavit.

2. I am familiar with SPC's detailed document control system and policies which govern the protection and control of information.

3. I am familiar with the letter from Y. U. Fresk (SPC) to R. A. Vopalensky dated April 2, 1993, SPCWP-93-046 entitled "Summary of Stability Licensing Calculations in Support of WNP-2 Cycle 9," referred to as "Document." Information contained in this Document has been classified by SPC as proprietary in accordance with the control system and policies established by SPC for the control and protection of information.

4. The Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by SPC and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in the Document as proprietary and confidential.

5. The Document has been made available to the U.S. Nuclear Regulatory Commission in confidence, with the request that the information contained in the Document will not be disclosed or divulged.

6. The Document contains information which is vital to a competitive advantage of SPC and would be helpful to competitors of SPC when competing with SPC.

7. The information contained in the Document is considered to be proprietary by SPC because it reveals certain distinguishing aspects of SPC licensing methodology which secure competitive advantage to SPC for fuel design optimization and marketability, and includes information utilized by SPC in its business which affords SPC an opportunity to obtain a competitive advantage over its competitors who do not or may not know or use the information contained in the Document.

8. The disclosure of the proprietary information contained in the Document to a competitor would permit the competitor to reduce its expenditure of money and manpower and to improve its competitive position by giving it valuable insights into SPC licensing methodology and would result in substantial harm to the competitive position of SPC.

9. The Document contains proprietary information which is held in confidence by SPC and is not available in public sources.

10. In accordance with SPC's policies governing the protection and control of information, proprietary information contained in the Document has been made available, on a limited basis, to others outside SPC only as required and under suitable agreement providing for nondisclosure and limited use of the information.

11. SPC policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

12. Information in this Document provides insight into SPC licensing methodology developed by SPC. SPC has invested significant resources in developing the methodology as well as the strategy for this application. Assuming a competitor had available the same background data and incentives as SPC, the competitor might, at a minimum, develop the information for the same expenditure of manpower and money as SPC.

THAT the statements made hereinabove are, to the best of my knowledge, information, and belief, truthful and complete.

FURTHER AFFIANT SAYETH NOT.

SUBSCRIBED before me this 20th day of April, 1993.

Susan K. McCoy
NOTARY PUBLIC, STATE OF WASHINGTON
MY COMMISSION EXPIRES: 1/10/96