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THREE MILE ISLAND NUCLEAR STATION
UNIT #2 OPERATING PROCEDURE 2102-3.1
UNIT SHUTDOWN

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Approval N/A Date —
Cognizant Dept. Head

Unit 2 Staff Recommends Approval

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Unit 2 PORC Recommends Approval

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Unit 1 Superintendent Approval

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Unit 2 Superintendent Approval

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THREE MILE ISLAND NUCLEAR STATION

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UNIT SHUTDOWN

1.0 REFERENCES

1.1 Drawings Applicable for Operation

Main & Reheat Steam-B&R Drawing No. 2002

Bleed Steam-B&R Drawing No. 2003

Auxiliary Steam-B&R Drawing No. 2004

Feedwater & Condensate-B&R Drawing No. 2005

Makeup Water Treatment & Condensate-B&R Drawing No. 2006

Feedwater Heater Drains-B&R Drawing No. 2009

Secondary Services Closed Cooling Water-B&R Drawing No. 2018

Circulating Water & River Water Chemical Treatment-B&R Drawing No. 2021

Circulating & Secondary Services Water-B&R Drawing No. 2023

Reactor Coolant Makeup & Purification-B&R Drawing No. 2024

Intermediate Closed Cooling Water-B&R Drawing No. 2029

Nuclear Services Closed Cooling Water-B&R Drawing No. 2030

Sampling Nuclear System-B&R Drawing No. 2031

Nuclear Services River Water-B&R Drawing No. 2033

Reactor Building Ventilation & Purge-B&R Drawing No. 2041

Reactor Building Normal Cooling-B&R Drawing No. 2046

Reactor Coolant Pump Seal Recirculating & Cooling Water-B&R Drawing No. 2601

1.2 Operating Procedures Applicable for Operation

1.2.1 2102-3.2, Unit Cooldown

1.2.2 2103-1.9, Reactivity Balance Calculations

1.2.3 2103-1.3, Pressurizer Operation

1.2.4 2104-1.2, Makeup and Purification System

1.2.5 2105-1.4, Integrated Control System

1.2.6 2105-1.1, Nuclear Instrumentation

1.2.7 2106-3.1, Turbine Generator

1.2.8 2106-3.3, Hydrogen Seal Oil System

1.2.9 2106-1.1, Main Steam

1.2.10 2106-2.4, Feed System

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1.2.12 2104-3.6, Circulating Water

1.2.13 2104-1.6, Intermediate Cooling System

1.2.14 2106-2.1, Condensate System

1.2.15 2103-1.5, Hydrogen Addition and Degasification

1.3 Manufacturer Instruction Manuals

1.3.1 Diamond Power "Control Rod Drive Mechanism Control System" instruction manual Volume I and II 01-0115-02 and 01-0116-01.

1.3.2 Bailey Meter Company "Integrated Control and Non-Nuclear Instrumentation System" instruction manual Volume 1A, Volume 1B and Volume 2.

1.3.3 Babcock & Wilcox, "Physics Test Manual," TMI-2. TG 06-000-23.

1.3.4 Westinghouse, "Steam Turbine for Jersey Central Power & Light Unit 2" Instruction Book Volume I (I.B. No. 1250-C734).

1.3.5 Westinghouse "Hydro Inner Cooled Turbine Generator for Jersey Central Power & Light Unit 2" Instruction Book (I.B. No. 20742).

1.4 Applicable System Descriptions

1.4.1 Not Applicable

1.5 Curves, Figures, Tables, etc.

1.5.1 Curves.

Figure 1 - Core Pressure/Temperature Safety Limits.

Figure 2 - Operational Power Imbalance Envelope (0-200 EFPD)

Figure 3 - Control Rod Group Withdrawal Limits for 4 Pump Operation (0-200 EFPD).

Figure 4 - Control Rod Group Withdrawal Limits for 3 Pump Operation (0-200 EFPD).

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Figure 6 - Control Rod Group Designation and Core Position.

Figure 7 - Reactor Coolant System Pressure/Temperature Limits for Heatup and Cooldown and Core Criticality.

Figure 8 - Minimum Boric Acid Tank Contained Volume/Concentration.

Figure 9A - Core Power Vs Rod Position Bands 4 Pump Operation (0-200 EFPD)

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Figure 11 - RC Boron Change Needed to Reposition Rods in Bands.

Figure 12 - Minimum Feed and Bleed Flow Rate per Load Change vs. RCS Boron Concentration.

Figure 13 - Pressurizer Level vs. T-ave.

Figure 14 - Shutdown Boron Concentration vs. EFPD.

2.0 LIMITS AND PRECAUTIONS

2.1 Equipment

2.1.1 Maintain gland sealing after turbine is taken off line.

2.1.2 Maintain pressurizer level within the limits of Figure 13.

2.1.3 The pressurizer spray valve minimum bypass flow must be maintained $\sim$ 1 gpm.

2.1.4 Do not feed steam generators via auxiliary feed nozzles except during emergency conditions or unless feedwater temperature is within 50°F of both RC System and OTSG shell; however, the auxiliary feed nozzles must be used for filling an empty OTSG ($\leq$ 10 inches startup level) when RC temperature is above 200°F.

2.1.5 For normal plant heatup and cooldown conditions the maximum delta T between the feedwater line temperature and steam generator lower downcomer temperature is 440°F when using the main feedwater nozzles.

2.1.6 When operating letdown coolers, intermediate cooling pumps and intermediate coolers must be in operation.

2.1.7 When turbine load is less than 75 MWE (15% reactor power) verify that the turbine bypass valves operate to maintain header pressure setpoint.

2.1.8 Maximum allowable OTSG fill rate is 500 gpm per steam generator.

2.1.9 Maximum allowable ΔT between RCS and OTSG average shell temperature is 60°F.

2.1.10 During startup and shutdown, when Groups 1&2 are withdrawn, OTSG water level shall be maintained between 97 and 99 percent on operating level instrumentation. If OTSG water level exceeds 390" (i.e. > 100% in the operate range), invoke action statement b of T.S. 3.4.5.

2.1.11 Maintain Makeup and Purification System boron concentration equal to or greater than the boron concentration of the RC System during the process of reducing power and cooldown of the RC System.

2.1.12 Do not attempt to start a Reactor Coolant Pump when power is greater then 30%.

2.1.13 With a filled and vented RC System, do not fill, drain, or blow an OTSG dry without flow in the RC System. Flow may be through Decay Heat or RC Pumps. Rate of fill, drain, or blowdown shall not decrease RC System temperature (T-cold) or OTSG downcomer temperature by more than 50°F below initial temperature.

2.1.14 The Nuclear Instrumentation will be continuously monitored during any reactivity addition. During withdrawal of control rods, subcritical source multiplication will be confirmed according to the following equation or the startup will be terminated until an appropriate evaluation is made.

$$M = \frac{SDM1\ (100 - SDM2)}{SDM2\ (100 - DSM1)}$$

where M = Multiplication factor

SDM1 = Shutdown Margin Prior to reactivity (% $\Delta k/k$)

SDM2 = Shutdown Margin after reactivity (% $\Delta k/k$)

NOTE: SDM1 and SDM2 are negative valves.

2.1.15 When operating from 50 to 100% rated power with 4 RC pumps running, maintain cold leg differential temperatures less than 5°F. During load transient near rated power maintain cold leg differential less than 10°F.

NOTE: With less than 4 RC pumps running the cold leg temperature may exceed these limits but not over 20°F.

2.1.16 Monitor core power distribution with in-core detectors and the on-line computer as follows:
During steady-state operating, a 3-D Power Map (Group 34) and a worst case Thermal Condition (Group 20) data dump should be taken every EFPD. The reactor power level, boron concentration, and core burnup should also be recorded. This data should be collected each day at midnight along with the Station Daily Log Sheet. Heat Balance (Group 32), Reactivity Balance (Group 22) and Periodic Typewriter Log Daily Summary for delivery to the Station Nuclear Engineer.

2.1.17 Following a significant one-step load change (>10% rated power) above 50% rated power or significant control rod motion (>10% insertion or withdrawal) a Worst Case Thermal Condition should be taken within one hour after the change and then every 4 to 8 hours for a period of 24 to 36 hours, or longer if evidence of a power distribution transient exists. A 3-D Power Map should be taken about 1 hour after reaching steady-state conditions. These data printouts are not necessary on the way up to full power if the mechanical maneuvering recommendations are followed. However, the data from Goups 20 and 34 should be called out one hour after the power hold level is reached.

2.1.18 Obtain a 3-D power may whenever a large imbalance or any other core flux abnormality exists.

2.1.19 Maintain all control rods and axial power shaping rods within ± 6.5% (indicated position) of their group average height (T.S. 3.1.3.1).

2.1.20 Except for physics tests or exercising control rods, the control rod insertion/withdrawal limits are specified on Figure 3, Figure 4 and Figure 5 of 2102-2.1 for various RC pump combinations. If control rod position LOCA limits are exceeded, proceed with T.S. Action Statement 3.1.3.7. If control rod position Shutdown Margin Limits are exceeded, proceed with T.S.
Action Statement 3.1.1.1.

2.1.21 Conduct surveillance testing as listed on the surveillance test schedule in accordance with Administrative Procedure 1010. Maintain shift logs in accordance with Administrative Procedure 1012.

2.2 Administrative

2.2.1 During boration verify boron concentration every estimated 30 ppm.

2.2.2 Maintain makeup tank level above the low level alarm.

2.2.3 Cooldown rate shall be no greater than 100°F/hr.

2.2.4 Cooldown of the R.C. System without degassing may result in excess hydrogen and airborne radioactivity when reactor coolant system is opened to atmosphere.

2.2.5 If any Safety Limit (defined in Technical Specification 2.1 and 2.2) is exceeded, the Shift Supervisor shall notify the Station/ Unit Superintendent. The reactor shall be placed in HOT standby within one hour. The licensee shall notify the

Commission, review the matter and record the results of the review, including the cause of the condition and the basis for corrective action taken to preclude reoccurrence. Operation shall not be resumed until authorized by the Commission.

2.2.6 If, during operation, the automatic safety system does not function as required, the Station/Unit Superintendent shall be notified. The Shift Supervisor shall take appropriate action as outlined in the Tech. Specs. The reporting requirements of T.S. 6.9 shall be followed. Note that this appropriate action may include shutting down the reactor.

2.2.7 When a Limiting Condition for Operation (LCO) (defined in Section 3 of the Technical Specifications) is not met, the shift supervisor shall notify the Station/Unit Superintendent. The reactor shall be placed in at least HOT STANDBY within 1 hour and in COLD SHUTDOWN within the following 30 hours unless corrective measures are completed that permit operation under the permissible ACTION statements for the specified time interval as measured from initial discovery. The reporting requirements of T.S. 6.9 shall be followed.

2.2.8 Quadrant tilt shall be monitored on a minimum frequency of once every twelve (12) hours during power operation above 15% of rated power. The QUADRANT POWER TILT shall not exceed the limits listed in Table 3.2-1 of Tech. Spec. (Tech Spec. 3.2.4).

2.2.9 When reactor power is less than 10% FP, do not request a printout of the following computer groups:

Gp. #

20 Worst Case Thermal Condition

31 Fluid Condition

38 Core Average Thermal Condition

39 Core Map Thermal Condition

40 All Thermal Output

53 Selected Assembly Thermal Condition

2.2.10 AXIAL POWER IMBALANCE shall be maintained within the limits shown on Figures 3.2-1, 3.2-2 and 3.2-3 of Tech Spec (TS 3.2.1) when above 40 percent of the Rated Thermal Power except for Physics Test (TS 3.2.1).

2.2.11 The reactor control rod position and boron concentration shall be maintained such that an available shutdown margin of at least ($\geq$ 2% ΔK/K when Keff $\geq$ 1.0) ($\geq$ 1% ΔK/K when Keff $<$ 1.0) exists with the single most reactive rod stuck out (TS.3.1.1.1.)

.2.12 On annunciation of an Asymmetric Fault on Control Rod Drive, verify the status of the rods in the group. All control rods should be operable and positioned within 9 inches ($\pm$ 6.5% indicated position) of their group average height. The misaligned rod is declared inoperable and power operation of the reactor would be restricted per T.S. 3.1.3.1.

2.2.13 AXIAL POWER IMBALANCE shall be maintained within the limits shown on Figures 3.2-1, 3.2-2 and 3.2-3 of Tech Spec 3.2.1 (Figure 2 attached). The AXIAL POWER IMBALANCE shall be determined to be within limits at least once every 12 hours when above 40% of RATED THERMAL POWER except when an AXIAL POWER IMBALANCE (computer alarm package) monitor is inoperable,

then calculate the AXIAL POWER IMBALANCE at least once per hour.

2.2.14 If axial power imbalance exceeds the limits specified, restore the axial imbalance within limits in 15 minutes or be in HOT STANDBY condition within 2 hours.

2.2.15 The Regulating Rod groups shall be limited in physical insertion as shown on Figures 3.1-2, 3.1-4, and 3.1-6, of Tech Specs, with a rod group overlap of 25 ± 5% between sequential withdrawn groups 5 and 6/7 (T.S. 3.1.3.7). With the regulating rod groups inserted beyond the LOCA limits proceed with T.S. Action Statement 3.1.3.7. With the regulating rod group inserted beyond the Shutdown Margin limit proceed with T.S. Action Statement 3.1.1.1.

2.2.16 The approval of the Shift Supervisor, Radiation Protection Supervisor, and Unit/Station Superintendent, must be obtained if maintenance or extended inspections must be performed within the secondary shield, on top of the "D" Rings, or in the reactor head area when the reactor power is greater than 1%. Reactor power must not be increased until such work is completed or the situation is re-evaluated and further approval is obtained from the Radiation Protection Supervisor, Shift Supervisor, and Unit/Station Superintendent.

2.2.17 Following a Refueling Period, Startup, or similar operational occurrence which could alter the mixture of radionuclides in the reactor coolant, an analysis for individual gamma emitters should be performed at the condenser vacuum pump discharge.

2.2.18 Power operation with at least one idle reactor coolant pump or one idle RC pump in each loop is restricted to 4 hours without having changed the RPS Setpoints. If the reactor is not

returned to an acceptable RC pump operating combination at the end of the 4 hour period, the reactor may be operated at restricted power level defined in Tech Spec 3.4.1.

3.0 INITIAL CONDITIONS

Indicate satisfactory completion by initialing each step.

_____3.1 Unit is at power.

_____3.2 Unit Tave is being controlled at 582°F and Reactor Coolant pressure is at ≃ 2155 psig.

_____3.3 Two main feedwater pumps, two condensate pumps and condensate booster pumps are operating, if power is greater than 40 percent of RTP.

_____3.4 Circulating Water System in operation per 2104-3.6.

_____3.5 Auxiliary Steam is available.

_____3.6 RCS shutdown Boron concentration for various first cycle temperature ranges have been determined and are shown in Figure 14. Boron concentration in excess of the applicable boron concentration in Figure 14, will ensure >1 percent Δk/k S.D. margin, is available.

_____3.7 Pressurizer level control in "Auto" and controlling at the set point in accordance with Fig. 13.

_____3.8 Verify that make up water at the required boron concentration is available to be added to the Make Up Tank when required as per 2103-1.2.

4.0 PROCEDURE

4.1 Normal Unit Shutdown

NOTE: Indicate satisfactory completion of below steps by initialing each step and sign name at end of applicable section.

____4.1.1 If the RCS is to be cooled down, RCS degassification is in progress per 2103-1.5.

____4.1.2 From plant computer demand performance data output and log the following in the Control Room Operator's Log Book:

a) Date and Time

b) Reactivity Balance from the computer (Operators Group 22)

c) Rod Position

d) Boron Concentration

e) Reactor Coolant Average Temperature

f) Effective Full Power Days (EFPD)

g) Notify Unit 1 of Shutdown.

NOTE: Following any thermal power change of more than 15% of rated thermal power within a one (1) hour period, notify HP/Chem that primary coolant must be sampled and analyzed for Iodine (including I-131, I-133 and I-135) between 2 and 6 hours following the change per 2304-SA4. This isotopic analysis of the primary coolant shall continue at 4 hour intervals until the specific activity drops below 1.0 μCi/gm dose equivalent I-131 or $100/\bar{E}$ μCi/gm. (T.S. 4.4.8).

CAUTION 1: While reducing load do not exceed a load reduction rate of 2% per minute until 40% load.

CAUTION 2: Maintain control rods in the transient rod position band (Figure 9) per 2102-2.1.

____4.1.3 Notify the load dispatcher and with his concurrence reduce unit load to approximately 40%, by establishing unit load demand of 38.4% at the Unit Master.

CAUTION: If load is to be held at less than 50% power for longer than 48 hours, remove the second stage MSR tube bundle from service by closing MS-V31A/B, MS-V32 A/B, MS-V36A/B, and MS-V37A/B.

____4.1.4 At approximately 384 MWE (40% reactor power), when the required Feed Water flow is within the capability of one Feed Water pump place one Feed Pump Turbine in Hand by the following procedure:

NOTE: Either Feed Pump Turbine may be placed in Hand.

____ a. Place the MV-Pos switch to "MV" and read the difference between Auto and Manual demand. It should read 50% (zero error). If not, use the Bailey Raise-Lower switch and adjust the manual demand until the error is zero.

____ b. Place the selected Feed Pump Turbine Bailey H/A Station to Hand by depressing the Hand pushbutton until the "Hand" light is lit.

____ c. Using the Raise-Lower switch on the Feed Pump Turbine Bailey H/A Station that has been placed in Hand, decrease the speed of the "Hand" Feed Pump to minimum and check that the Auto Feed Pump Turbine is assuming the Feed Water Load. (The speed of the Feed Pump Turbine on "Hand" should decrease and the speed of the Feed Pump Turbine on "Auto" should increase).

_____ d. Reduce the speed of Feed Pump Turbine on "Hand" to minimum with the SU/Load Limit Switch and shut the Feed Pump Turbine down as per 2106-2.4.

_____4.1.5 Stop one of the operating Heater Drain Pumps in accordance with 2106-1.2, thereby leaving one Heater Drain Pump operating and another in Standby Mode.

NOTE: Monitor moisture separator-reheater drain tanks, feedwater heaters, and the heater drain tank to ensure proper water levels are being maintained.

_____4.1.6 At ~ 40% unit load, open the deaerating steam valves EX-V71A and EX-V71B.

CAUTION 1: While reducing load below 40% load (384 MWE) do not exceed a load reduction rate of 1/2 per cent per minute.

CAUTION 2: Maintain control rods in the transient rod position band (Figure 9A, 9B, or 9C) per 2102-2.1.

_____4.1.7 Reduce unit load to approximately 35% by establishing the Unit Load Demand of 33.6% on the Unit Master.

4.1.8 After the load is stablized at 35% RTP, place the Feed Pump Turbine Speed Changer the for operating Feed Pump in "Hand" as follows:

_____ a. Place the MV-Pos switch to "MV" and read the difference between Auto and Manual demand. It should read 50% (zero error). If not, use the Raise-Lower switch and adjust the manual demand until the error is zero.

____ b. Place the selected Feed Pump Turbine speed changer to Hand by depressing the Hand pushbutton until the "Hand" light is lit.

CAUTION: Ensure Feedwater Control Valve ΔP is maintained at ≥ 35 PSID.

____ c. Lower Feed Pump Turbine speed using Bailey H/A Station to 3000 RPM.

____ d. Continue to lower Feed Pump speed using the Feed Pump turbine SU/Load Limit Switch as necessary to maintain ≥ 35 PSID across Feedwater Control valves.

____4.1.9 Reduce power to 20%, by establishing the Unit Load Demand at approximately 19.2%.

NOTE 1: Do not exceed the power reduction rate of 1/2 percent per minute. (Rate applicable below 40% power).

NOTE 2: Maintain Control Rods in the Transient Rod Position Band (Figure 9A, 9B, or 9C) per 2102-2.1.

____4.1.10 When plant load has decreased to 20%, stop all heater drain pumps by placing their Panel 5 control switches in PULL-TO-LOCK.

____4.1.11 Verify MS-FHS-4374 at Panel 17 is in Auto and when the load has decreased to about 20%, ascertain from Panel 17, that the turbine drain valves, MS-V281 A and B, MS-V283, MS-V284, and MS-V286 A and B, have opened. If not, use MS-FHS-4374 Panel 17 to attempt to open them.

____4.1.12 a. Place the condensate/condensate booster pump set selector switch to manual on Panel 5.

b. Stop one condensate booster pump by placing control switch to stop position on Panel 5.

c. Stop one condensate pump by placing control switch to stop position on Panel 5.

d. Place condensate/condensate booster pump set selector switch to Auto.

____4.1.13 Commence increasing RC System Boron concentration to the value determined in Section 3.6.

NOTE 1: Do not exceed the power reduction rate of 1/2 per cent per minute. (Rate applicable below 40% RP).

NOTE 2: Maintain the control rods in the transient rod position band (Figure 9A, 9B, or 9C) per 2102-2.1.

____4.1.14 Reduce power to 15% by establishing the Unit Load Demand to 14.4%.

____4.1.15 Place the SG/Rx Demand H/A station in Hand and decrease SG/Rx demand to zero by the following procedure:

a. Place the MV-Pos switch to "Pos" and place the SG/Rx Master in Hand by depressing the Hand pushbutton until the "Hand" light is lit. The "SG/Rx Master on Manual" alarm will sound. ICS is now in track.

b. Using the Raise-Lower switch, decrease SG/Rx demand to zero.

NOTE: If OTSG low level limit was not reached during 4.1.14, some power reduction may be associated with this step.

4.1.16 Before either Steam Generator goes on low level limit, place the Steam Generator Load Ratio ΔTc H/A station in Hand by the following procedure:

NOTE: If either Steam Generartor is on low level limit, go to step 4.1.16.b.

a. Place the MV-Pos switch to "MV" and read ΔTc error. It should read 50% (zero error), if not, use the ΔTc setpoint and adjust ΔTc error to 50% (zero error).

b. Place the Steam Generator Load Ratio ΔTc H/A station to Hand by depressing the Hand pushbutton until the "Hand" light is lit.

c. Use the Raise-Lower switch and adjust ΔTc demand to zero as read in "Pos."

4.1.17 Resume Feedwater heating by Aux steam and secure Feedwater heating by extraction steam in accordance with 2106-1.2.

4.1.18 Depress the "OPER AUTO" pushbutton. The "OPER ICS" pushbutton lamp will go off, and the "OPER AUTO" lamp should come on. Verify main turbine on manual alarm annunciates.

4.1.19 Reduce the Turbine Load to approximately 50 MWE as follows:

a. With the Turbine in "OPER AUTO," set the setter to 50MW by pressing lower button.

b. Set the load rate per 2106-3.1 (later) MW per minute.

c. Press IMP OUT button.

d. Press "GO" button.

NOTE: For operation at or below 10% load for more than 15 minutes, the 2nd stage reheater control valve should be positioned to maintain the LP Steam inlet temperature to 400F. Depress the "400F" pushbutton on the MRS controller, panel 16.

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4.1.20 Observe the Turbine Bypass valves (MS-V25A, MS-V25B, MS-V26A, and MS-V26B) open gradually as Turbine Generator load is reduced. Verify that Turbine Bypass Valves maintain the Turbine header pressure between 895 and 885 PSIG.

4.1.21 Start the AC Turning Gear Oil Pump, and the Seal Oil Backup Pump (TGP-SOP) from panel 5.

4.1.22 Place the bearing lift pump (BL) control switch on Panel 5 to AUTO. The BL pump should start when the turbine speed decreases below 500 RPM.

4.1.23 Insure the DC Emergency oil pump (EOP) is in the Normal-After-Stop position, and the turning gear control switch is in "Auto".

4.1.24 When load has decreased to approximately 50 MWE notify the Load Dispatcher and with his concurrence trip the Turbine by depressing the Panel 5 Trip pushbutton.

4.1.24.1 Insure turbine throttle valves, governor valves, reheat stop valves, and interceptor valves fully close.

4.1.25 Verify the generator breakers B2-02 and B2-2602 have opened, or open them manually by:

a. Verify turbine inlet valves are all closed.

b. Depress the Trip select for B2-02 (B2-2602).

c. VERIFY that the Green backlight and the Yellow Point Selected lights are lit.

d. PLACE the control switch for B2-02 (B2-2602) to trip and release.

e. Verify Green trip indication for the breaker.

f. TRIP the other Generator Breaker as per steps a thru d above.

g. If the unit is not going to resynchronize within one hour, align the 500 KV substation for generator shutdown per 2107-1.3, section 4.6.1.

4.1.26 Trip the Field Breaker.

NOTE: When the field breaker is tripped the Regulator is shut off, the base adjuster is positioned to the no load preposition point and the ground detection system is shutdown.

4.1.26.1 Reduce the number of operating CW pumps to a maximum of 4 pumps.

4.1.27 Ensure all Turbine Extraction Steam Drain Valves are opened.

4.1.28 Place the Voltage Regulator/Cutoff Switch in the OFF position to match indicate status.

4.1.28.1 It is important to manually regulate cooling water to the hydrogen seal oil coolers to maintain the oil temperature between 95°F and 110°F. Colder oil may damage the H_2 seal rings, and result in a hydrogen leak.

4.1.29 Regulate water to the oil coolers, by the controller on panel 5, to maintain an oil temperature leaving the coolers, between 95 and 100F.

NOTE: Turbine should take ≈ 75 minutes to slowdown to turning gear engage speed.

4.1.30 Insure turning gear operation per 2106-3.2.

4.1.31 The cooling water to the generator coolers may be shut off when the hot gas temperature (pt 13 YM-TR-1926) is less than 95°F.

4.1.32 At the Reactor Demand H/A station, place the MV-Pos switch to "Pos" and read the Reactor demand. It should be the same as neutron power as indicated on Panel 4. Place the Reactor Demand H/A station in Hand by depressing the Hand pushbutton until the "Hand" light is lit.

CAUTION: DECREASE REACTOR DEMAND AT A RATE WHICH DOES NOT EXCEED A MAXIMUM COOLDOWN RATE OF 100°F/hr.

4.1.33 Verify the Reactor demand MV-Pos switch is in "Pos" reading Manual Reactor demand. Use the Raise-Lower switch decrease Reactor Demand to 10%.

4.1.34 Close Letdown Isolation Valve MUV-376 and add water to MU tank per 2104-1.2 as required.

4.1.35 At 10% power, place the Loop A & B Feed Water demand H/A stations in Hand by the following procedure:

a. Place the MV-Pos switch to "Pos" both stations should read 0%, if not, balance Feed Water demand stations at 0% demand.

b. Place the Feed Water demand "A" H/A stations in Hand by depressing the Hand pushbutton until the "Hand" light is lit.

c. Using the Raise-Lower switch insure Feed Water demand A is at 0%.

d. Repeat steps b & c above for Feed Water demand "B" station.

4.1.36 Place the main Feed Water valve H/A stations in Hand by the following procedure:

a. Place the MV-Pos switch to "Pos" and verify Auto demand is 0%.

b. Place the Main Feed Water valve in Hand by depressing the Hand pushbutton until the "Hand" light is lit. Check "Pos" indication to insure manual demand is zero.

4.1.37 Place the Start-up Feed Water valves to "Hand" by the following procedure:

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a. Place the MV-Pos switch to "Pos" and note Auto demand.

b. Place the Start-up Feed Water valve in Hand by depressing the Hand pushbutton until the "Hand" light is lit. Check "Pos" indication to insure manual demand is approximately what it was in Auto.

c. Mode 1 to Mode 2 checklist (Appendix A) should be completed before proceeding with next step.

CAUTION 1: Maintain Tave within limits of 2101-1.1, Figure 1.0-07.1.

CAUTION 2: Do not exceed cooldown rate of 100°F per hour.

4.1.38 Maintain the OTSG levels at the LLL and lower power to 5%.

CAUTION 1: Maintain Tave within limits of 2101-1.1 Figure 1.0-07.1.

CAUTION 2: If Tave drops below 530°F complete SP2311-2 (TS 3.1.1.4)

CAUTION 3: If return to power is anticipated place the pressurizer level controller to manual and maintain the pressurizer level within the limits of Figure 13. Finally reducing the level to 100 inches. (25%)

CAUTION 4: Establish flow through the OTSG drain cooler per 2106-2.5 and open FW-V66A/B to maintain level at the LLL.

4.1.39 At 5 percent reactor power, place the Diamond Rod Control Station to manual and gradually reduce reactor power to 10^{-8} amps on the Intermediate Range instrumentation.

4.1.40 When the reactor is stable at 10^{-8} amps with zero startup rate, record critical data in the Control Room Logbook: boron

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ppm, RCS temperature, rod position, and time/date. Mode 2 to 3 (Appendix B) checklist should be completed before proceeding with the next step.

4.1.41 Insert regulating groups 7/6 & 5and 4 and 3 to In-Limit and leave group 8 at previous operating position.

4.1.42 With the Reactor Coolant Average Temperature between 532 and 525°F, the Safety Rod Groups (1-2) withdrawn, and the reactor greater than 1 percent shutdown the plant is in Hot Standby condition (Mode 3).

NOTE: If unit is in Hot Standby greater than 24 hours, verify boron is greater than Tav <300°F curve on Figure 14 prior to flooding nozzles.

4.1.42.a Place the SU FW RV's in "Hand" and maintain OTSG levels between 97 and 99% on the Operating Range. Ensure boron concentration is greater than Figure 14 curve "Tave <300°F". If water level exceeds 390" (i.e. > 100% in the operate range) invoke action statement b of Tech Spec Paragraph 3.4.5.

4.1.43 If cooldown is intended, reduce the number of operating RC Pumps to one pump per loop in accordance with 2103-1.4. Maintain RCS pressure/temperature within the single pump in a loop operation curve.

4.1.44 Open the Generator Disconnect Switches as directed by Load Dispatcher per 2107-1.3.

4.1.45 Complete the Reactor Building inspection, if required.

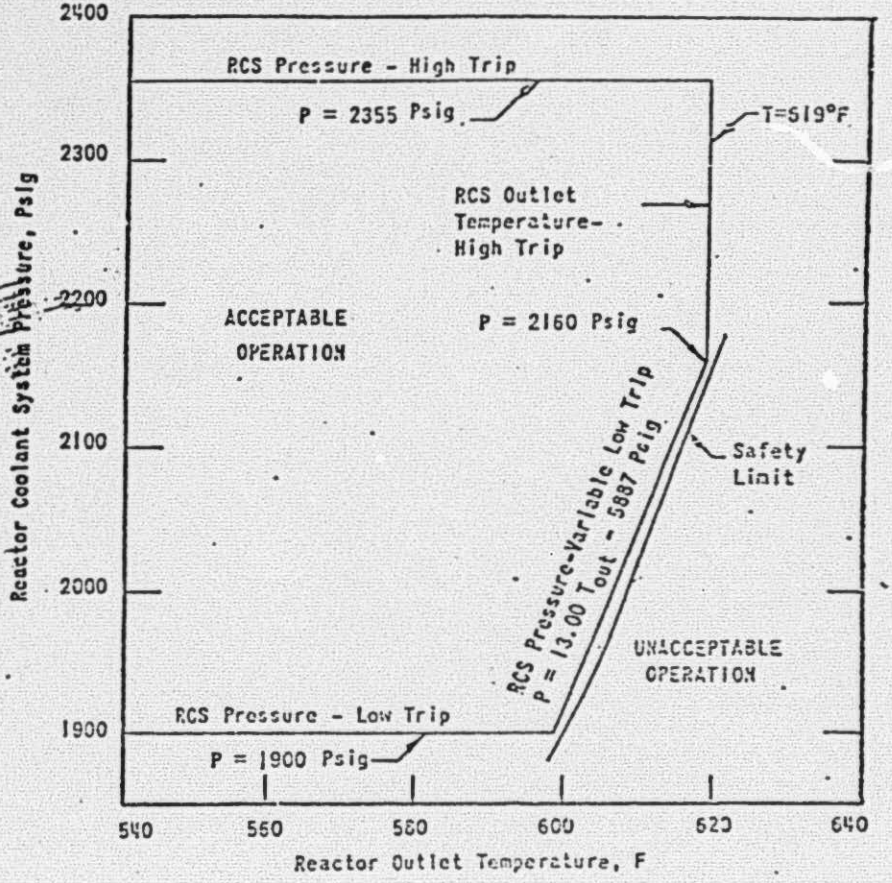

Figure 1

THI - UNIT 2

REACTOR CORE SAFETY LIMIT

(Tech. Spec. Figure 2.1-1)

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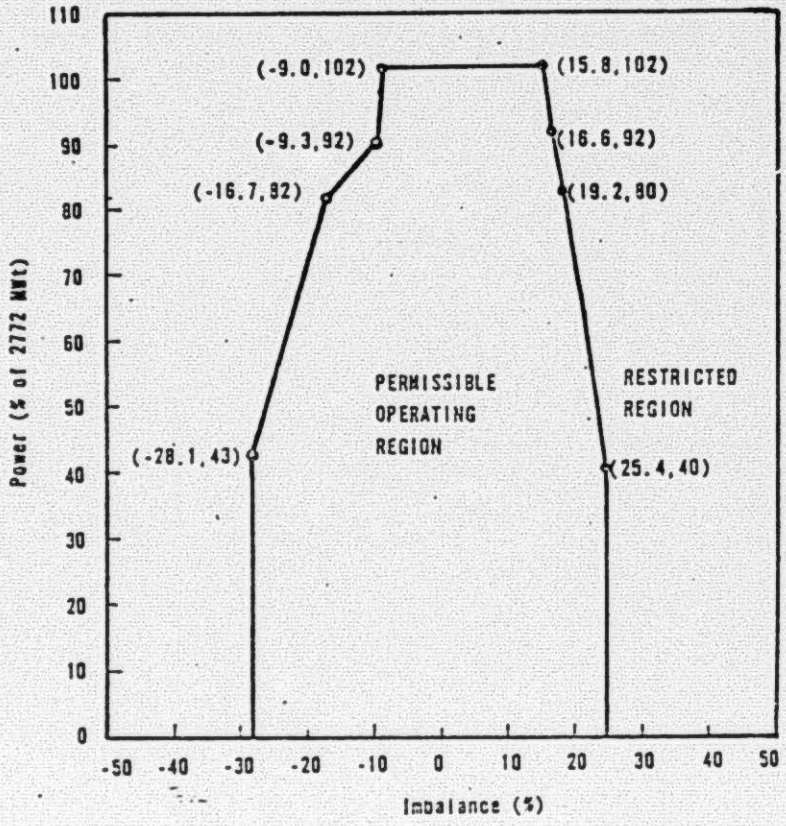

CORE IMBALANCE VS POWER LEVEL
(0-200 ± 10 EFPD'S)

Figure 3.2-3

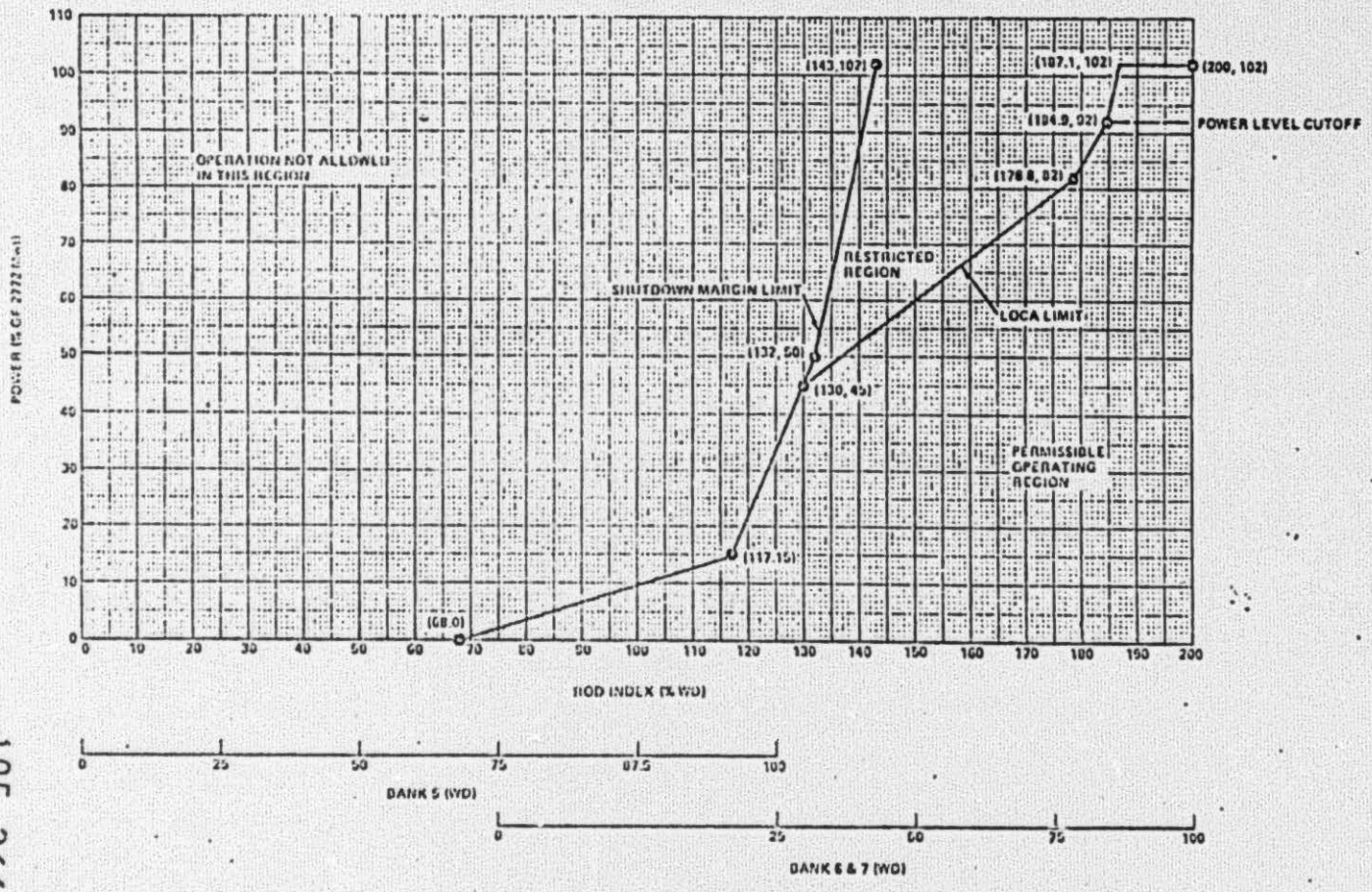

Figure 3 ____ Regulating Rod Group Insertion Limits
(0–200 ± 10 EFPD's) 4 Pump Operation

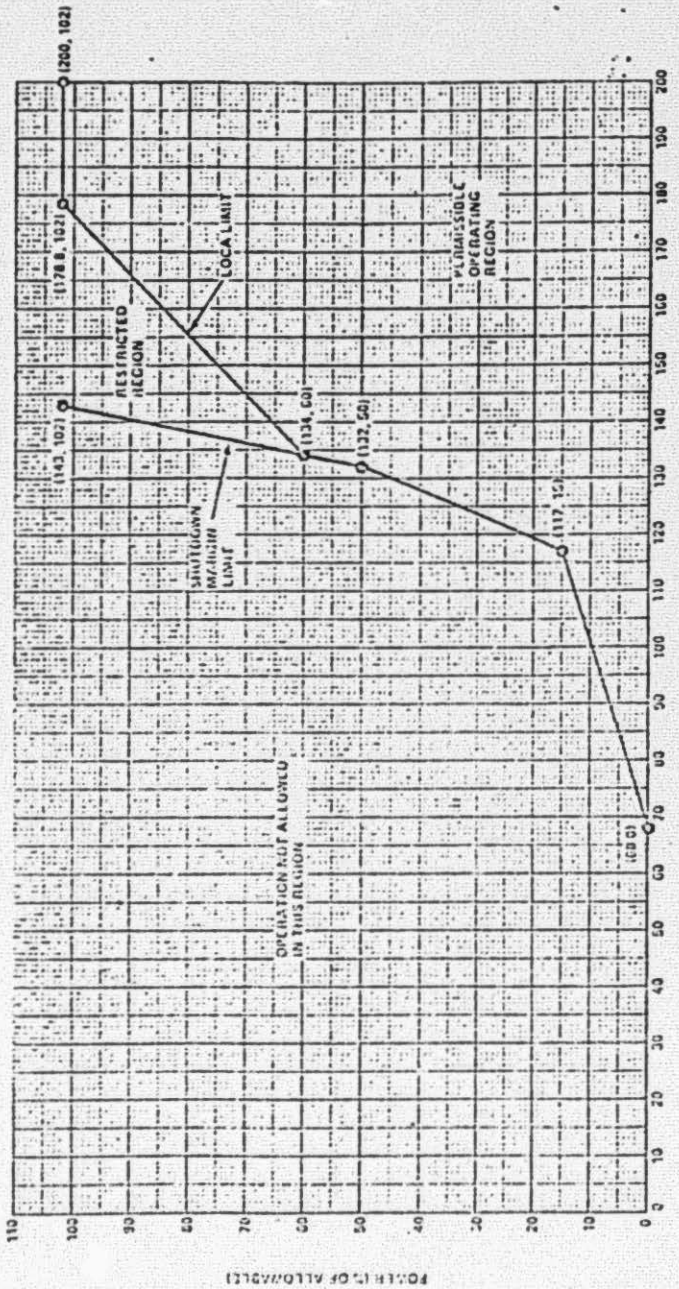

Figure 4 Regulating Rod Group Insertion Limits
(0–200 ± 10 EFPD's) 3 Pump Operation

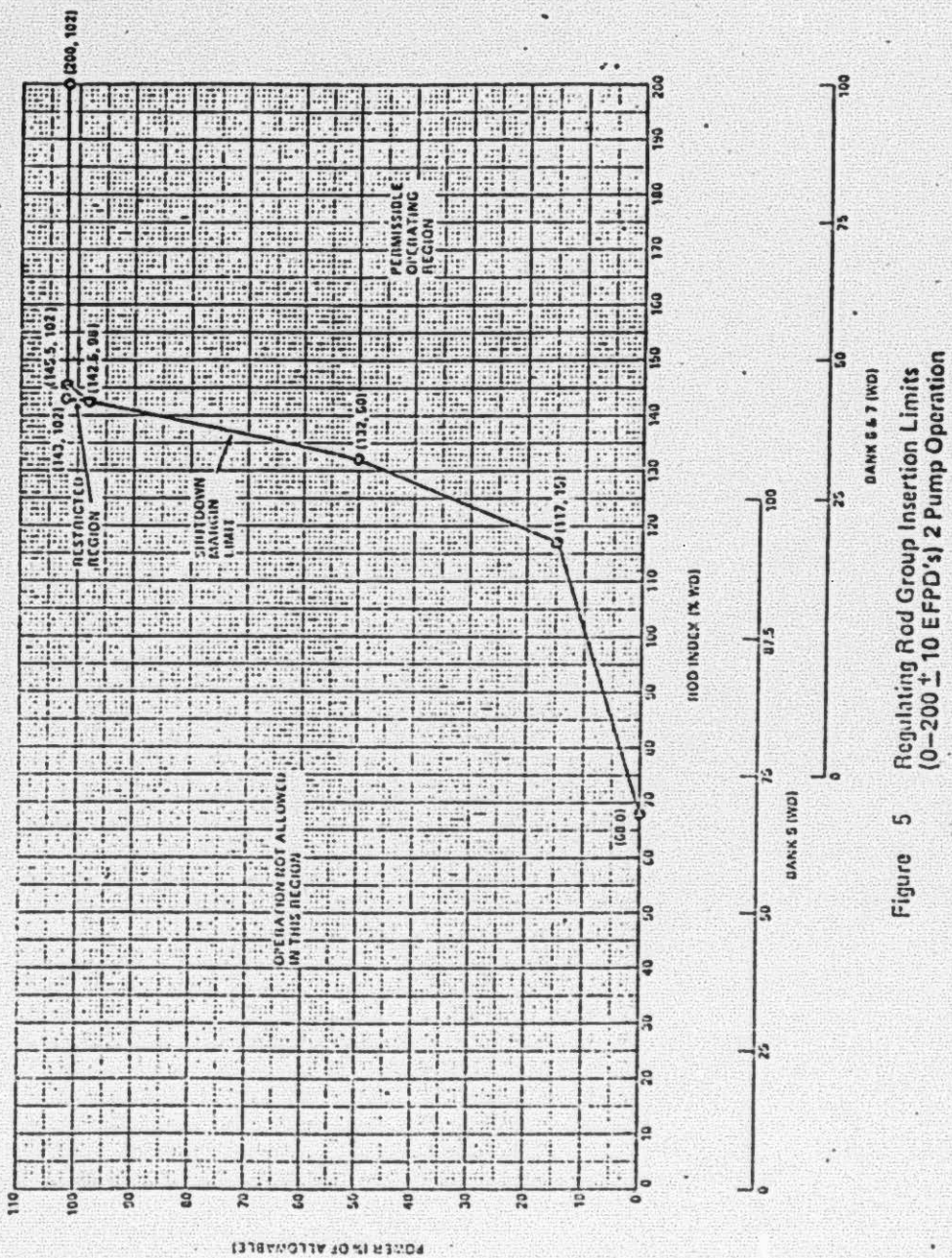

Figure 5 Regulating Rod Group Insertion Limits (0–200 ± 10 EFPD's) 2 Pump Operation

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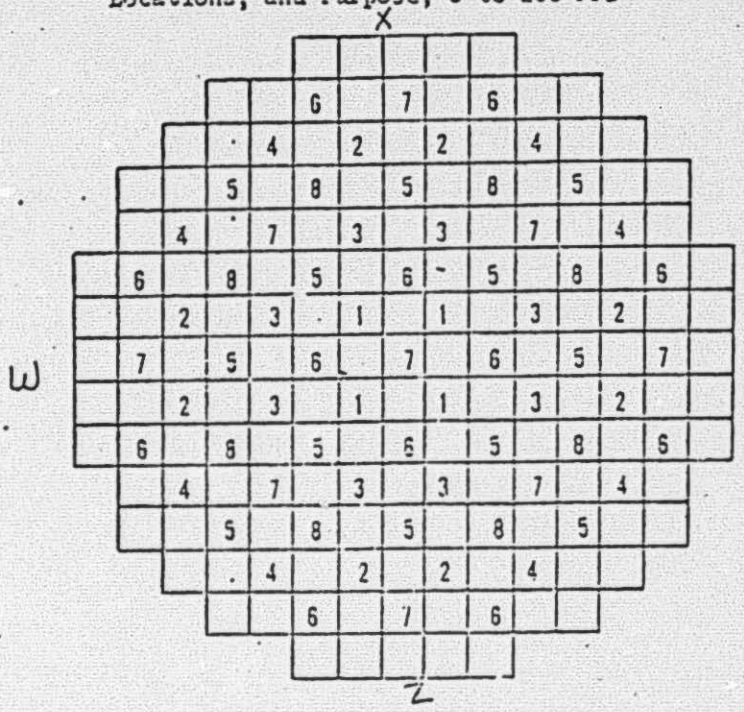
Control Rod Group Designations, Locations, and Purpose, 0 to 200 FPD



Rod Group	No. CRAs	Purpose
1	4	Safety
2	8	Safety
3	8	Safety
4	8	Safety
5	12	Regulating
6	12	Regulating
7	9	Regulating
8	8	APSR
	69	

FIGURE 7
HEAT UP/COOLDOWN CURVE

Revision 4
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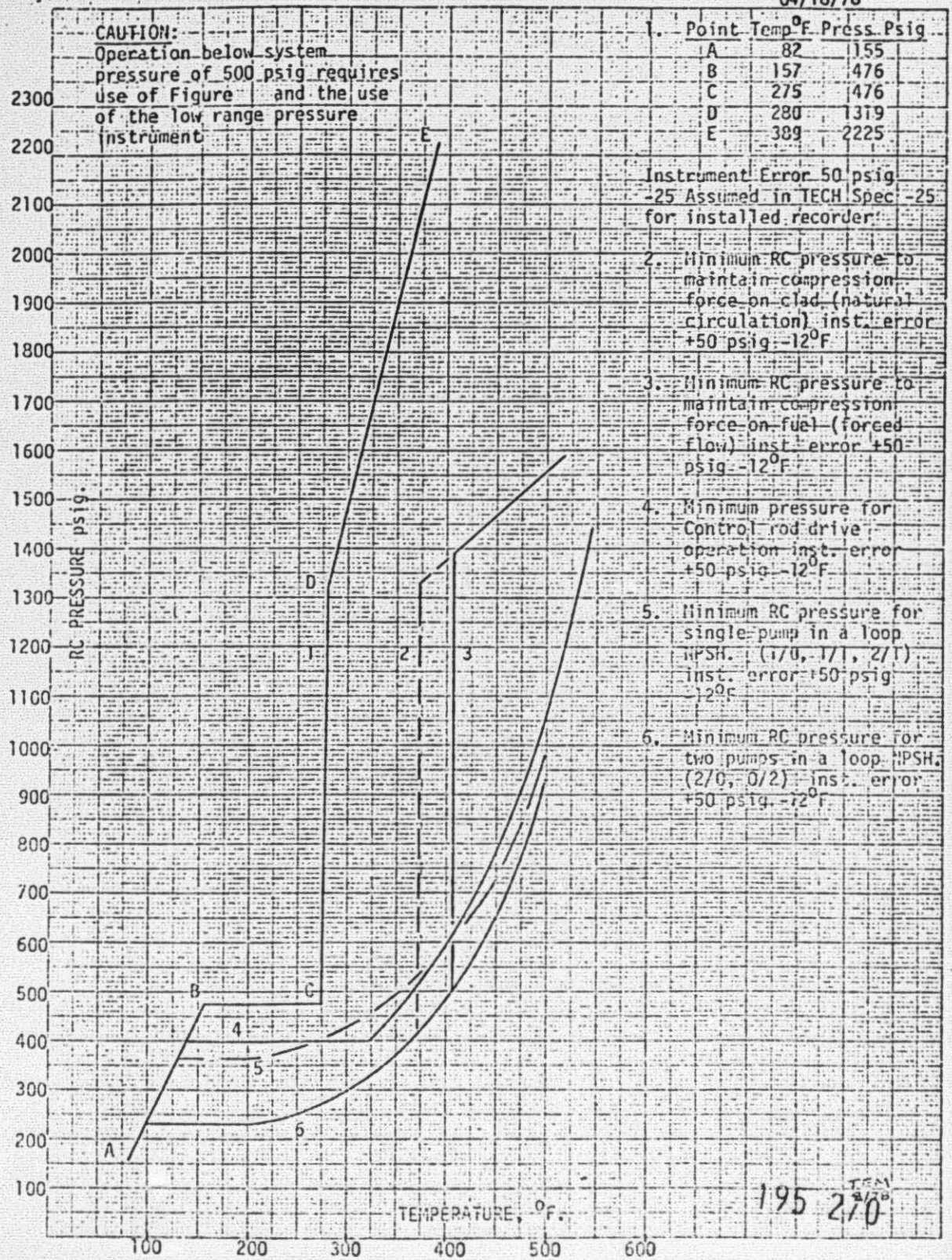

1. Point | Temp °F | Press Psig
   - A | 82 | 155
   - B | 157 | 476
   - C | 275 | 476
   - D | 280 | 1319
   - E | 389 | 2225

   Instrument Error 50 psig -25 Assumed in TECH Spec -25 for installed recorder

2. Minimum RC pressure to maintain compression force on clad (natural circulation) inst. error +50 psig -12°F

3. Minimum RC pressure to maintain compression force on fuel (forced flow) inst. error +50 psig -12°F

4. Minimum pressure for Control rod drive operation inst. error +50 psig -12°F

5. Minimum RC pressure for single pump in a loop NPSH. (1/0, 1/1, 2/1) inst. error +50 psig -12°F

6. Minimum RC pressure for two pumps in a loop NPSH. (2/0, 0/2) inst. error +50 psig -12°F

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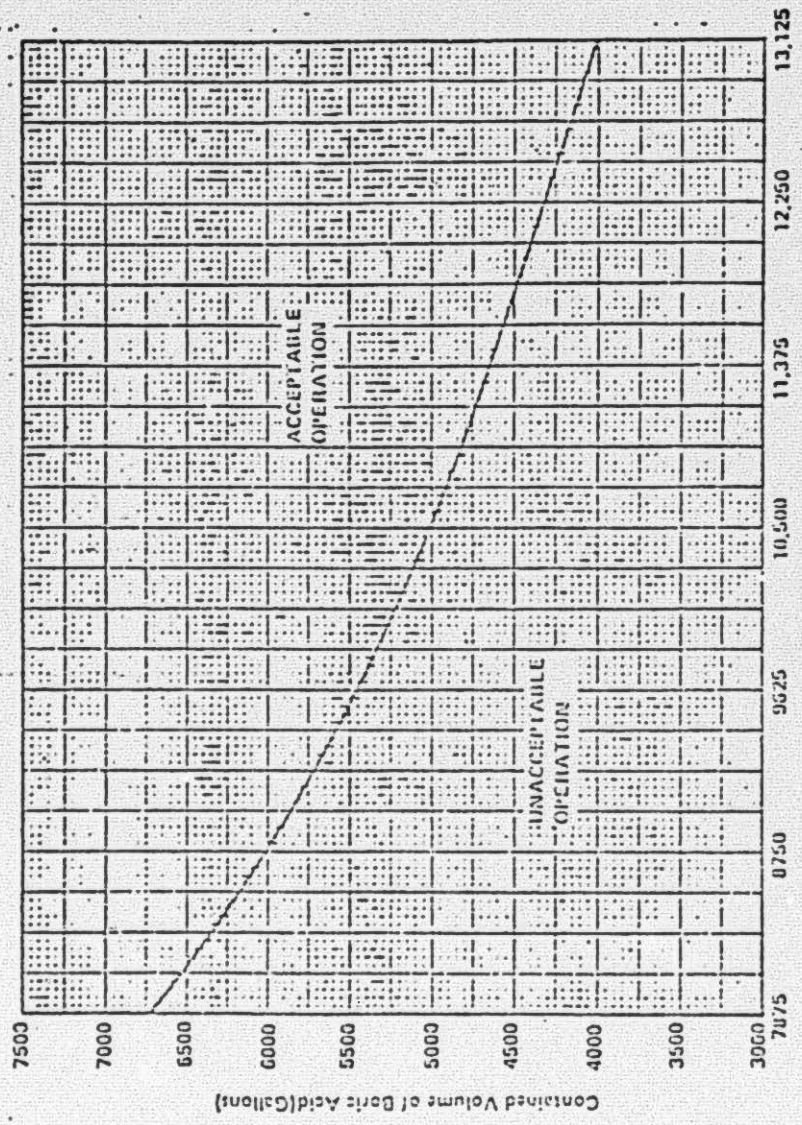


Figure 8 Minimum Boric Acid Tank Contained Volume as a Function of Stored Boric Acid Concentration

CORE POWER

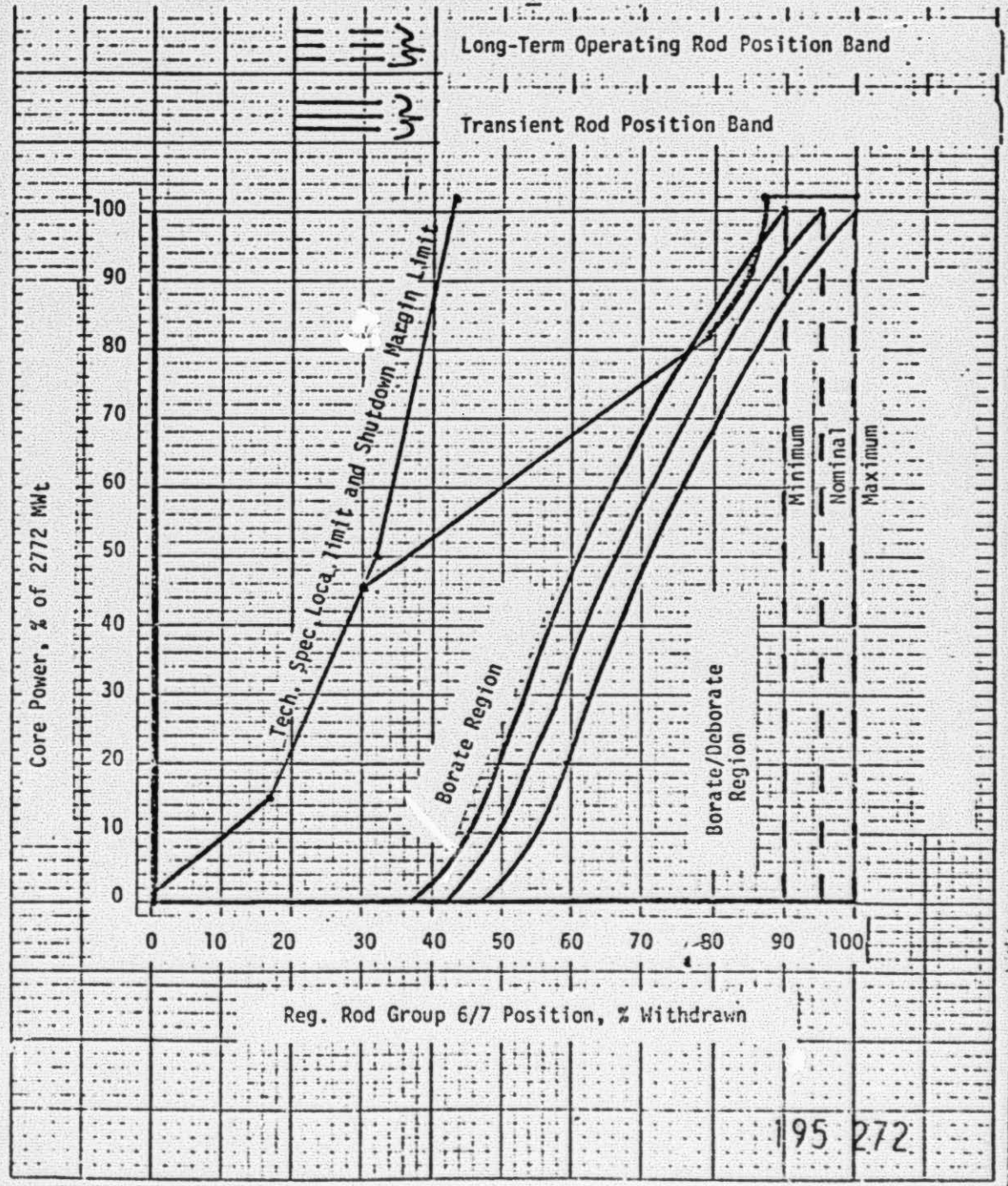
VS.

2102-3.1
Revision 4
04/18/78

LONG-TERM OPERATING AND TRANSIENT ROD POSITION BANDS

TMI 2 CYCLE 1 (0-200 ± 10 EFPD's) 4 PUMP OPERATION

FIGURE 9A



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CORE POWER

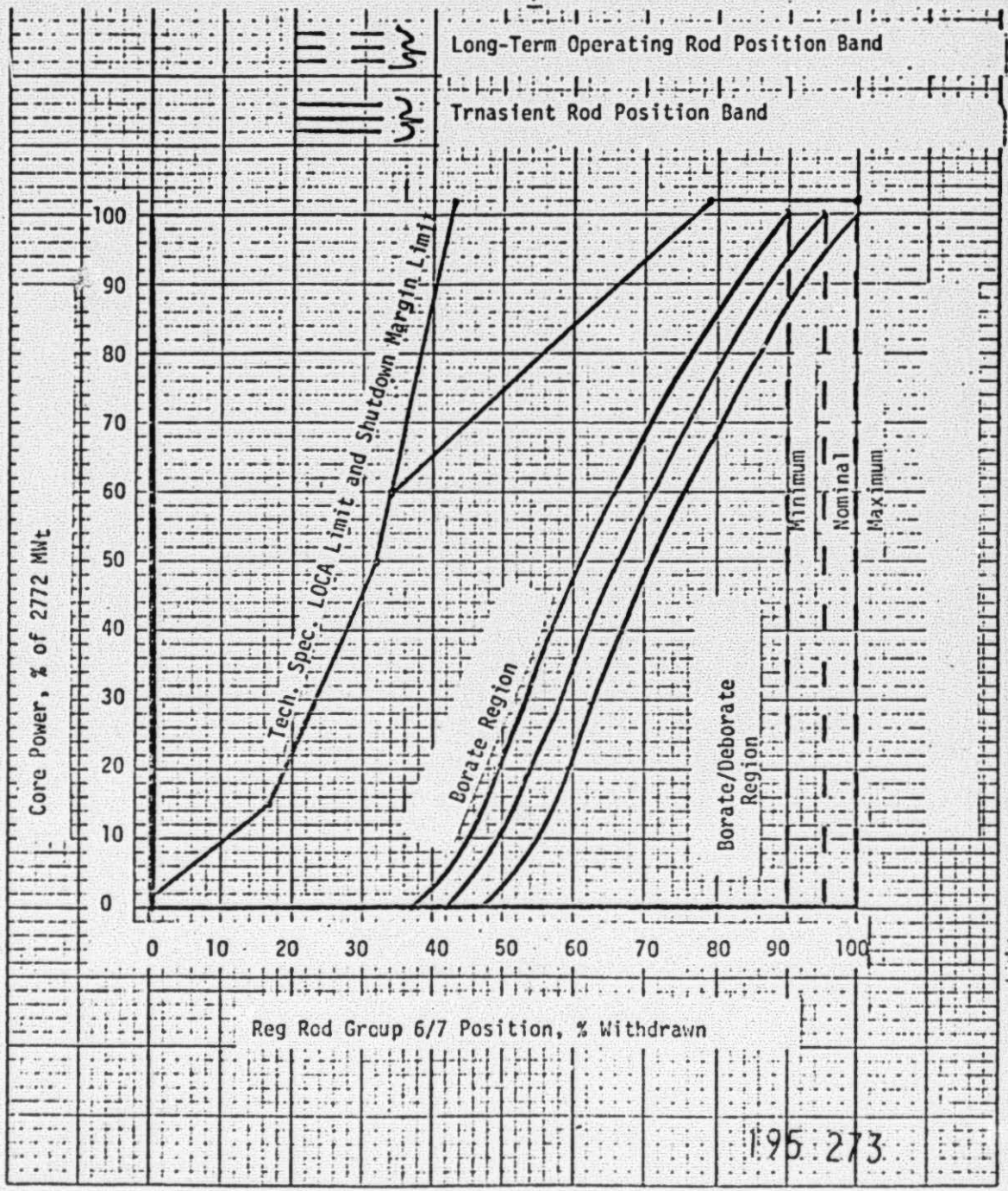
VS.

2102-3.1
Revision 4
04/18/78

LONG-TERM OPERATING AND TRANSIENT ROD POSITION BANDS

TMI 2 CYCLE 1 (0-200 ± 10 EFPD's) 3 PUMP OPERATION

FIGURE 9B



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CORE POWER

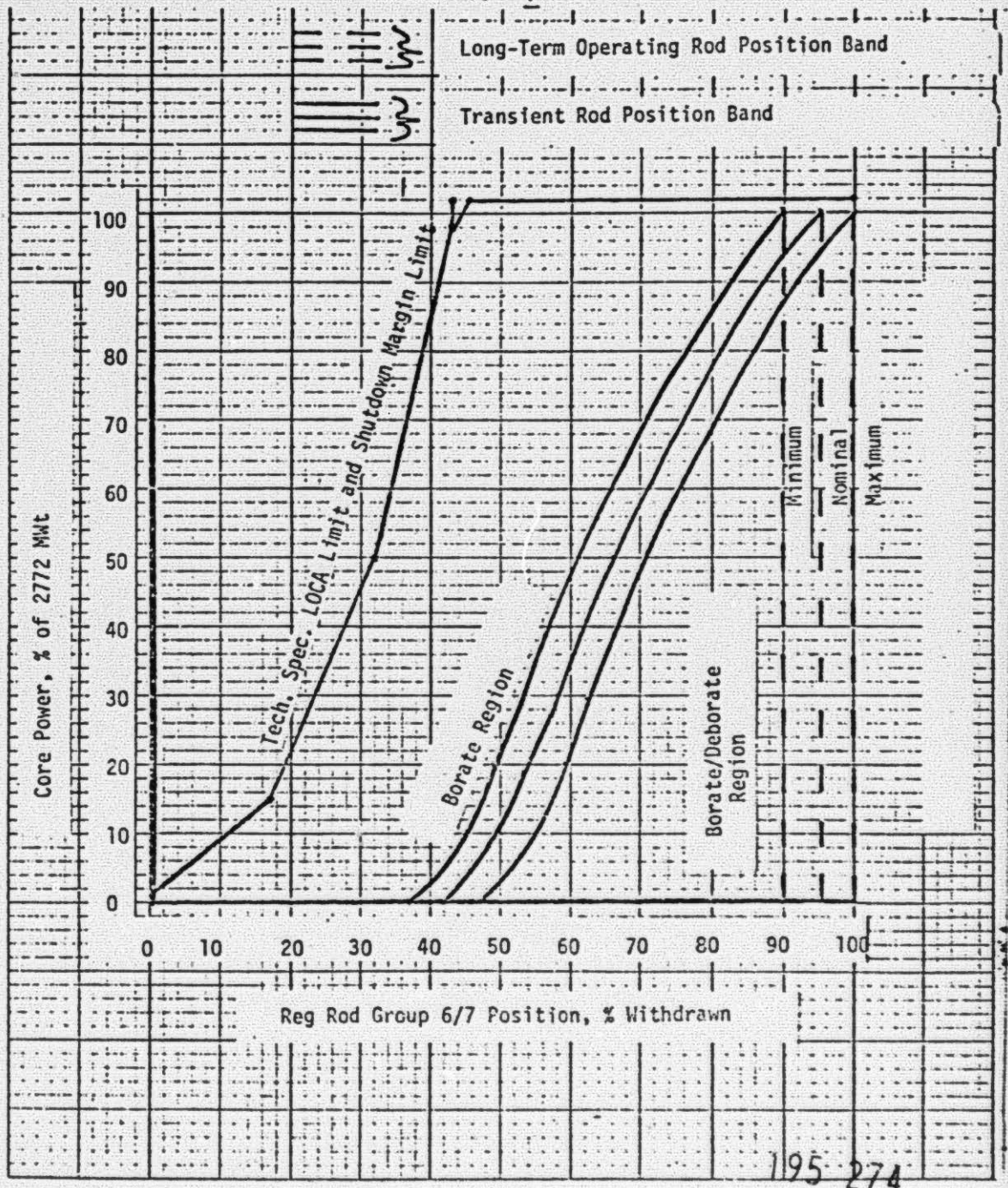
VS.

LONG-TERM OPERATING AND TRANSIENT ROD POSITION BANDS

TMI 2 CYCLE 1 (0-200 ± 10 EFPD'S) 2 PUMP OPERATION

FIGURE 9C

2102-3.1
Revision 4
04/18/78



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APPENDIX A

MODE 1 to MODE 2

DATE SP SATISFIED	INITIALS	SURV. FREQ	RESPONSIBILITY	SP NO.	TS NO.	DESCRIPTION
		7 da		2303-W1	4.3.1.1.1 Tab 4.3-1(11)	S.R. Chan Funct

NAME_____

DATE_____

TIME_____

APPENDIX B

MODE 2 to MODE 3

DATE SP SATISFIED	INITIALS	SURV. FREQ	RESPONSIBILITY	SP NO.	TS NO.	DESCRIPTION
		18 mo		2303-R20	4.1.3.4	RPI Chan Funct

NAME_____

DATE_____

TIME_____

TMI DOCUMENTS

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Wilda R. Mullinix, NRC