REFERENCE: SO123-VI-1.0.1

9510000147

Submittal No. AA001BFS (if applicable)

TEMPORARY CHANGE NOTICE

NOTES: 1) If the Document is QA Program Affecting, then a Technical Specification Violation will occur if CFDM final approval is not obtained within 14 days from TCN date of issuance.
2) If only Editorial Corrections are required, then form PF(123) 111 should be used (refer to SO123-VI-1.0.1).

Part A — For CDM Use Only: Issuance Date OCT 13 1995 Single Use TCN Cancels On PERFORMED BY: C. Fields TCN No. 6-36 Date OCT 13 1995

Copy forwarded to the Nuclear Safety Group.

Part B

1. Document No. SO23-5-1.7 Revision No. 6 Single Use TCN. Yes ☐ No ☑

Document Title POWER OPERATIONS

Document Author/Originator Frank Grovich (PRINT OR TYPE NAME) 87387 (PAX) 9/05/95 (DATE) OPG 2/3 (ORGANIZATION)

2. If required, TCN Deviation Approval: APPROVED BY: CFDM (or designee) ______ SIGNATURE / IF BY TELECON, PRINT NAME AND SO STATE DATE/TIME

3. Check appropriate box: ☑ Entire Document Attached ☐ Affected Page(s) Attached

Superseded/Incorporated TCN(s)/EC(s) 6-35 NUMBER (IF NONE, SO STATE) (Not applicable for Single Use TCNs)

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4. This change cannot wait until the next revision of the Document and is required:

a. ☑ To implement facility design change (DCP, MMP, TFM, etc.)

Facility design change identifier DCP NCR (INDICATE DCP, MMP, PFC, TFM, ETC.) 2&3-6851.00SJ, 95100006 (IDENTIFIER)

Implementation of the facility design change has been determined. (If No, then a TCN cannot be approved until the facility design change has been implemented.) Yes ☑ No ☐

b. ☑ Other (e.g., CAR, NRC Commitments) Specific Reason: OPERATIONAL NECESSITY

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Description of Change(s) (Use Reverse Side If Required) SEE PAGE 2 OF 3

5. Could implementation of this change pose adverse environmental effects of any type directly or indirectly? (If Yes, then a TCN is not authorized until a review from Environmental Protection is obtained. Refer to SO123-VI-1.3) Yes ☐ No ☑

6. Review requested from other organizations/disciplines? (If Yes PF(123) 110A, or equivalent documentation, may be attached.) Yes ☐ No ☑

Part C

7. Is the document being TCN'd QA Program Affecting or Level 1 QA Program Affecting? Yes ☑ No ☐

Answer No only if document is classified as Not QA Program Affecting. This is indicated on the Table of Contents page of the document. If Yes, complete this section; then proceed to Part D. If No, then proceed to Part D. (See * below for initial approval. If time permits, obtain initial and final approvals.)

a. Is the document to be changed an Emergency Operating Instruction? Yes ☐ No ☑

b. Is the intent of the original document altered? Yes ☐ No ☑

(If the answer to a or b is Yes, then a TCN is not authorized. A revision is required; see SO123-VI-0.9 and SO123-VI-1.)

10 CFR 50.59 Consideration:

c. Has the proposed change already been evaluated for 50.59 consideration or a 7 question Safety Evaluation prepared using an approved process? (Examples of approved processes are: DCP/MMP/TFM/NCR/Technical Specification change, associated procedure Safety Evaluation [7 questions], etc.)

Yes ☑ Enter identifier and associated no. NOTE: If YES, the proposed change must be addressed in the 50.59 documentation already generated.

No ☑ Attach PF(123) 109-1 or 50.59 Safety Evaluation (7 questions). (Refer to SO123-VI-1.3.)

DCP 2&3-6851.00SJ, NCR 95100006 (INDICATE DCP, MMP, TFM, NCR, TECH. SPEC., PROCEDURE AND NO.)

NOTE: Both YES and NO may be checked, if applicable.

Part D — INITIAL APPROVAL — REVIEWED and APPROVED BY: **

1. N/A — PLANT MANAGEMENT STAFF—UNIT 1 — DATE — TIME
Could this TCN affect or does it represent a change to a plant operation in progress? Yes*** ☐ No ☐

2. [signature] — PLANT MANAGEMENT STAFF—UNITS 2&3 — 9-20-95 (DATE) — 0842 (TIME)
Could this TCN affect or does it represent a change to a plant operation in progress? Yes*** ☐ No ☑

3. N/A — CFH—UNIT 1 — DATE — TIME

4. [signature] — SRO—UNITS 2&3 — 10-4-95 (DATE) — 1539 (TIME)

Part E — FINAL APPROVAL — REVIEWED and APPROVED BY: **

5. [signature] — COGNIZANT FUNCTIONAL DIVISION MANAGER — 10/17/95 (DATE)

6. N/A — QUALITY ASSURANCE—UNITS 1, 2 AND 3 — DATE

* If Level 1 QA Program Affecting or Not QA Program Affecting, then obtain approval from the Cognizant Supervisor(s) on the affected Unit(s) [signs Plant Management Staff line(s)] and enter N/A on SRO/CFH lines prior to submittal to CDM. QA approval may be required for Level 1 QA Program Affecting TCNs.

** If QA Program Affecting, then approval shall be by one member of the Plant Management Staff, and one SRO/CFH Licensed on the unit or units affected. (For TCN approval, members of the Plant Management Staff are defined as the supervisor in charge of the shift, or as designated in writing by the CFDM, exercising responsibility in the specific area and unit(s) addressed by the change.)

*** If Yes, then the Shift Superintendent/Shift Supervisor shall provide the required SRO/CFH approval.

Part F — (Optional) The entire document was reviewed in conjunction with this TCN and found to be acceptable as written. This constitutes an annual/biennial review disposition of Acceptable As Written-Extend (SO123-VI-1.0.2).

REVIEWED and APPROVED BY: N/A — COGNIZANT FUNCTIONAL DIVISION MANAGER OR DESIGNEE — DATE

Part G — For NPG Use Only: NPG

Is QA/QC Review/Approval Required? NOTE: Use the computer system or QA/QC Review Not Required Report (Waiver List) to respond. Yes ☐ No* ☒
* If No, enter N/A on the Quality Assurance Review/Approval line in Part E.

Has a 50.59 Safety Evaluation (7 questions) been attached? If Yes, forward a copy of the PF(123) 109-1 and 50.59 Safety Evaluation to Nuclear Licensing, as applicable (Refer to SO123-VI-1.3) Yes ☐ No ☒

PERFORMED BY: [signature] — NUCLEAR PROCEDURES GROUP (NPG) — 10/16/95 (DATE)

1) Modified procedure to allow throttling open S2(3)1301MU120, First Point Heaters Bypass to maximize Unit Megawatt Output, per SO23-9-1.

2) Deleted reference to use of Shift Superintendent's PC for Reactivity Calculations due to the program being available on other Control Room computers.

3) Added Secondary Plant Guidelines to Section for Guidelines for Steady State Power Operation.

4) Deleted Note instructing SRO Ops. Supv. to ensure system is in the correct configuration, or all comments have been resolved. Action is covered in SO123-0-20.

5) Deleted Note to consider removing Unit 3 V&LPM Recorder from service if many spurious alarms are expected, since this is no longer a problem with new V&LPM system installed per DCP 2&3-6851.00SJ

6) Corrected called out VCT pressure band to be consistent with current operating philosophy.

7) Changed the called out BSCAL value to CV9005AVG, which is an average value and the only ABB/CE approved BSCAL value.

UNREVIEWED SAFETY QUESTION (10 CFR 50.59) SCREENING CRITERIA

DOCUMENT NO. S023-5-1.7 REV. NO. 6 TCN. NO. 6-36 (if applicable)

PART I) 10 CFR 50.59 REVIEW (Refer to SO123-VI-1.3)

1. *Does this new procedure/procedure change alter system/component performance or the design configuration of a system important to safety?* Yes___ No X
2. *Does this new procedure/procedure change alter the calibration of a system important to safety?* Yes___ No X
3. *Does this new procedure/procedure change alter the required actions as a result of not meeting the acceptance criteria or alter Technical Specification numerical data of a system important to safety?* Yes___ No X
4. *Does this new procedure/procedure change reduce the level of approval required for a plant activity?* Yes___ No X
5. *Does this new procedure/procedure change alter processes for handling, processing, monitoring, or releasing licensed radioactive material not contained in plant systems?* Yes___ No X
6. *Does this new procedure/procedure change violate the provisions of the Technical Specifications?* Yes___ No X

Remarks: ____________________

(If required, use reverse side or attach additional sheets.)

PREPARED BY: [signature] DATE 9/18/95
Cognizant Individual

APPROVED BY: [signature] DATE 9-20-95
Cognizant Supervisor

If "Yes" is the answer to any question in Part I), then **STOP** document processing. Coordinate Part II) completion with Cognizant Supervisor, or contact Nuclear Procedures Group (NPG) to coordinate Part II) completion with Supervisor, Technical Support, or contact Supervisor, Technical Support directly; during off-hours contact the on-duty Station Technical Advisor (STA).

PART II) 50.59 SAFETY EVALUATION DETERMINATION (Required when YES checked in PART I)

Area/Individual Assigned: ____________________ DATE ______
(Please Print)

Is a 50.59 Safety Evaluation required based on the new procedure/procedure change? (Refer to SO123-VI-1.3, Attachment 1) Yes*___ No**___

* If YES, complete 50.59 Safety Evaluation per established procedures and attach. **STOP** document processing if YES answer indicated on 50.59 Safety Evaluation.

** If NO, provide justification (indicate resources consulted, as applicable):

____

(If required, use reverse side or attach additional sheets.)

PREPARED BY: ____________________ DATE ______
Cognizant Individual/STA

APPROVED BY: ____________________ DATE ______
CFDM or Designee

NPG: 1) If YES in Part II), then notify NPG supervision; forward a copy of this form and associated 50.59 Safety Evaluation (7 questions) to Nuclear Licensing.

2) If YES answer is indicated on 50.59 Safety Evaluation (7 questions), then **STOP** document processing and notify NPG supervision; forward a copy of this form, 50.59 Safety Evaluation, and document to Nuclear Licensing and Nuclear Safety Group.

POWER OPERATIONS

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POWER OPERATIONS

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ATTACHMENT PAGE

POWER OPERATIONS

1.0 OBJECTIVE

1.1 This procedure is intended to provide procedural guidelines and strategies for conducting overall plant operations above 15% power.

2.0 REFERENCES

2.1 Licensing Commitments

2.1.1 Technical Specifications

2.1.2 National Pollutant Discharge Elimination System (NPDES) Permit contained in the Facility Operating License

.1 Unit 2 NPDES Permit No. CA0108073

.2 Unit 3 NPDES Permit No. CA0108181

2.2 Procedures

2.2.1 SO123-VI-0.9, "Documents-Author's Guide to the Preparation of Orders, Procedures and Instructions"

2.2.2 SO123-III-2.1.23, "Units 2/3 Steam Generator and Condensate/Feedwater Chemistry Control and Sampling Frequencies"

2.2.3 SO23-V-13, " Modifications to the Nuclear Design Data Book (NDDB) and the Operations Physics Summary (OPS)

2.2.4 SO23-V-2, "Power Ascension Testing"

2.3 Operating Instructions

2.3.1 SO123-0-25, "Trip/Transient Review"

2.3.2 SO123-0-32, "Operations Records and Transmittal"

2.3.3 SO123-0-42, "Cumulative Equipment Hours, Inoperability, and Design Cycles"

2.3.4 SO23-2-1, "Main Feedwater Pump and Turbine Operation"

2.3.5 SO23-2-2, "Condensate Pump Operation"

2.3.6 SO23-2-3, "Heater Drain Pump Operation"

2.3.7 SO23-3-1.3, "Operation of Part-Length CEAs"

2.3.8 SO23-3-2.1, "CVCS Charging and Letdown"

2.0 REFERENCES (Continued)

2.3.9 SO23-3-2.2, "Makeup Operations"

2.3.10 SO23-3-2.4, "RCS Purification and Deborating Ion Exchange Operation"

2.3.11 SO23-3-2.13, "Core Protection/Control Element Assembly Calculator Operation"

2.3.12 SO23-3-2.17, "Vibration and Loose Parts Monitoring System"

2.3.13 SO23-3-2.21, "Core Operating Limits Supervisory System (COLSS)"

2.3.14 SO23-3-3.5, "CEA Monthly Operability Test"

2.3.15 SO23-3-3.25, "Once-A-Shift Surveillance (Modes 1-4)"

2.3.16 SO23-5-1.1, "Heat Treating the Circulating Water System"

2.3.17 SO23-5-1.3.1, "Plant Startup from Hot Standby to Minimum Load"

2.3.18 SO23-5-1.4, "Plant Shutdown to Hot Standby"

2.3.19 SO23-9-2, "Testing Bleeder Trip Valves and Blowdown of Heater Level Alarms"

2.3.20 SO23-9-4, "Steam Generator Blowdown Processing System Operation"

2.3.21 SO23-9-9, "Condenser Overboard Operations"

2.3.22 SO23-10-1, "Turbine Startup and Normal Operation"

2.3.23 SO23-10-2, "Turbine Shutdown"

2.4 Other

2.4.1 Operations Physics Summary

2.4.2 Letters and Memorandums

.1 CE to SCE Letter S-CE-3973, Fuel Preconditioning Guidelines

.2 CE to SCE Letter S-CE-8250, Core Operating Guidelines for SONGS 2 and 3

.3 Letter from W. Marsh to J. D. Dyer, dated August 14, 1983; Subject: San Onofre Unit Load Limitations (AC-056)

2.0 REFERENCES (Continued)

2.4.2.4 Letter from J. F. Hirsch to V. B. Fisher, dated January 7, 1988; Subject: MSR Live Steam Venting, Unit 2 (MT-173)

.5 Letter from R. Waldo to W. Marsh, dated June 16, 1985; Subject: Unit 2 ASI Control (RP-046)

.6 CE to SCE Letter S-CE-9113, CPC Thermal Power Decalibration - Unit 2

.7 Memorandum for File from R. Waldo, dated July 25, 1985; Subject: CPC Responses to SONGS 2 Power Reduction on July 23, 1985 (PPS-044)

.8 Letter from J. T. Reilly to R. W. Krieger, dated September 13, 1985; Subject: Full Flow Condensate Polisher Demineralizer (FFCPD) Technical Guidance. (COND-119)

.9 Letter to J. T. Reilly from I. C. Rickard (C-E), dated December 6, 1985; Subject: Overlap of CEA Banks for SONGS 2/3 Operation (RP-052)

.10 Memorandum to File from W. G. Zintl, dated December 11, 1985; Subject: Regulating CEA Insertion Limits Clarification (RP-052)

.11 Letter from P. H. Penseyres to V. B. Fisher, dated July 23, 1986; Subject: Temperature Effects on Purification Ion Exchanger Resin (CVCS-121)

.12 Letter from M. McDevitt to W. Zintl, dated September 18, 1986; Subject: ASI Control Using CEA Group 5 (IOI-095)

.13 Memorandum For File from N. J. Quigley, dated August 18, 1986; Subject: MSR Relief Valves (IOI-094)

.14 Letter from J. A. Mundis to W. C. Marsh, dated December 17, 1986; Subject: Circulating Water Delta T (IOI-111)

.15 Memo from D. Niebrugge to D. Lokker, dated 04/30/87; Subject: Recommended Power Levels When Operating With 3 Circulating Water Pumps (IOI-128)

.16 Letter from J. F. Hirsch to W. C. Marsh, dated 7 May 1987; Subject: Operation of Narrow Range Governor During Load Reduction (MT-156)

2.0 REFERENCES (Continued)

2.4.2.17 Letter from R. W. Waldo to W. C. Marsh, dated 29 May 1987; Subject: CEA Motion Restrictions (RP-080)

.18 Memorandum for File from R. W. Waldo, dated September 11, 1987; Subject: Evaluation of LPD Changes Due to CEA Motion (RP-082)

.19 Letter from M. J. McDevitt to W. C. Marsh, dated June 15, 1987; Subject: Recommended Limits for Power Ramp Rates (IOI-131)

.20 Memorandum for File from V. B. Fisher, dated November 30, 1987; Subject: Positive ITC on Unit 2 Reactor Startup (RP-085)

.21 Special Order 88-01, issued by V.B. Fisher, dated April 19, 1988; Subject: Forecast Operation of Unit 3 (SO-8801)

.22 SONGS LER 2-88-028 (SOI-894)

.23 Letter from David J. Ramendick, dated January 25, 1989; Subject: Updated ASI Control Guidance San Onofre Nuclear Generating Station, Units 2 and 3. (IOI-239)

.24 Letter from J.F Hirsch, dated April 18, 1989; Subject: Power Operations with One Main Feedwater Pump, San Onofre Nuclear Generating Station, Units 2 & 3. (IOI-257)

.25 Memorandum for File from R. Waldo, dated September 6, 1989; Subject: Axial Shape Index Control on SONGS 2 End of Cycle 4 Shutdown (IOI-279)

.26 Letter from Ray Waldo to V. Fisher, dated December 27, 1989; subject: Rod Insertion Versus Power Level for ASI Control. (IOI-292)

.27 Letter from J. T. Reilly to R. W. Krieger, dated January 12, 1990; Subject: Units 2 and 3 Main Steam Safety Valve Flow Capacity (IOI-296)

.28 Letter to USNRC from H. E. Morgan, dated October 6, 1989; Subject: Unit 3 Emergency Chilled Water System LER 89-009 (IOI-281)

.29 E-Mail from Walter Marsh to Chuck Elliott, dated August 28, 1991; Subject: Ramp Rates after Refueling. (IOI-378)

.30 E-Mail to T. Vogt from D. Ramendick, dated July 28, 1993; Subject: Azimuthal Tilt Guidance (RP-140)

2.0 REFERENCES (Continued)

2.4.2.31 E-Mail to V. Fisher from R. Waldo, dated August 11, 1993; Subject: Operation at 80% Power with 1 MFW Pump (IOI-482)

.32 Letter from W. Strom to J. Hirsch, dated April 1, 1993; Subject: INPO SER 91-18, Main Generator Failure due to Hydrogen Cooler Failure (GEN-196)

.33 E-Mail to D. Hansford from M. McDevitt dated August 14, 1994; Subject: High Tcold During Physics Testing (RP-143)

.34 E-Mail to D. Hansford from Oscar Flores dated May 10, 1993; Subject: Deboration for U2C7 (Ion Exchanger boron removal at EOC). (CVCS-301)

.35 E-Mail to M. Jones from M. McDevitt dated June 6, 1995; Subject: Revised Power Ramp Limitations (IOI-569)

.36 E-Mail to D. Hansford from R. Clark dated Feb. 17, 1995; Subject: U3 Cycle 7 First Point Heater Bypass Operation and Special Test: SO3-XXVI-11.3, Unit 3 First Point Heater Extraction Reduction Test. (IOI-576)

3.0 PREREQUISITES

3.1 Verify this document is current by checking a controlled copy or by using the method described in SO123-VI-0.9.

3.2 On-shift SRO Ops. Supv. approval has been obtained.

3.3 Reactor Power is greater than or equal to 15%.

3.4 SO23-5-1.3.1 has been completed to the point where power escalation may continue.

3.5 CEDMCS is in MANUAL SEQUENTIAL or OFF, except during ASI control when Reg. Group 5 insertion is performed in the Manual Group Mode.

4.0 PRECAUTIONS

4.1 Reactor Coolant Cold Leg Temperature shall be maintained within the following limits: (Tech. Spec. 3.2.6)

4.1.1 At 535-558°F when RX power is 30-70% Rated Thermal Power.

4.1.2 At 544-558°F when RX power is greater than 70% Rated Thermal Power.

4.1.3 RCS Cold Leg Temperature may be allowed to drift above 558°F (NOT to exceed two hours) when performing the rapid/accelerated downpower requirements of Attachment 20.

4.0 PRECAUTIONS (Continued)

4.2 The Daily Average Differential Temperature (24-hour period, midnight to midnight) of the Circulating Water Discharge and Intake shall not exceed 20.4°F ΔT. [1] (Ref. 2.1.2)

4.3 The Instantaneous Differential Temperature of the Circulating Water Discharge and Intake shall not exceed 21°F. The Instantaneous Differential Temperature is an average taken over one minute.

4.4 Operating the FFCPD with only four beds (4 Cps or 4 MBPs) should be minimized when the Unit is at full power, because increased flow demands on the Condensate Pumps (such as loss of a Heater Drain Pump) could result in an increased pressure drop across the FFCPD.

4.5 Starting the 4th Condensate Pump arms the Condenser Overboard Control System. If controls are set for AUTO with Hotwell cation conductivity 1.5 μmhos or higher on CR-6700/6701 and/or CR 6702/6703, then automatic overboarding will be initiated.

4.6 The chemistry limitations of SO123-III-2.1.23 must be observed at all times.

4.7 The average Pressurizer pressure shall be maintained between 2025 psia and 2275 psia while in Mode 1. (Tech. Spec. 3.2.8)

4.8 If during operation with CEAs beyond the Long Term Steady State Insertion Limit for ASI control a failure occurs of 1) COLSS, 2) Both CEACs, or 3) one CEAC inoperable for more than 7 days, then CEA Group 5 shall be fully withdrawn and CEA Group 6 shall be withdrawn per the requirements of the Tech. Spec. 3.1.3.6.b, and/or Tech. Spec. Table 3.3-1, Item 15, Action 6.

4.9 A decrease in letdown temperature will cause a decrease in RCS Boron concentration. Conversely, an increase in letdown temperature will cause an increase in RCS Boron concentration. [The Purification Ion Exchanger resin has a greater affinity to absorb boron at lower temperatures and releases boron at higher temperatures.] (Ref. 2.4.2.11)

4.10 If the Narrow Range Governor (NRG) and Control Valve Open Limit (CVOL) are not set in close proximity of each other (especially during a Turbine load reduction), then the unlikely event of CVOL failure high could result in a primary plant transient. (Ref. 2.4.2.16)

[1] The Daily Average ΔT limit ensures the NPDES ΔT limit of 20°F will not be exceeded. Insignificant figures are rounded in accordance with the NPDES Permit and Standard Methods (i.e., values up to 20.499°F are rounded down to 20°F by Environmental for the monthly NPDES report). ΔT may rise to 21°F instantaneously, but must be below an average of ≤20.4°F over the 24 hour period of midnight to midnight.

4.0 PRECAUTIONS (Continued)

4.11 **Axial Shape Index**

4.11.1 If Hot Pin ASI value (CPC PID 187 or PID 266) is greater than + 0.50 or less than - 0.50, then a CPC auxiliary trip will be initiated at power levels above 17%.

4.11.2 When greater than 20% RX power, then Average ASI shall be maintained within ± 0.27 with COLSS in service (PID-CV9198), or ± 0.20 with COLSS out of service (CPC PID-268). [Tech. Spec. 3.2.7]

4.11.3 Failure to maintain Average ASI close to the full power ESI value during power descension can result in a RX trip due to the Xenon redistribution effect. (Ref. 2.4.2.25)

4.11.4 Inserting Group 6 CEAs below 80 inches for control of a strongly negative ASI will worsen the problem.

4.11.5 To prevent a CPC generated Trip while using CEA Reg. Group 5 for ASI control, a minimum separation of at least 15 inches should be maintained between Group 5 and 6. (Ref. 2.4.2.9 and 2.4.2.10).

4.11.6 On a fast re-start after a RX Trip, if ASI is allowed to remain negative to the ESI value at low power, then Xenon redistribution effect can cause ASI control problems. (Ref. 2.4.2.25)

4.12 An unused Deborating Ion Exchanger has the capacity to lower RCS boron concentration by approximately 60 ppm at any time of core life. Following this, no further boron reduction is possible using the Deborating Ion Exchanger. (Ref. 2.4.2.34)

4.13 Power shall be maintained below the COLSS Alarm (50A02) setpoint. With Annunciator 50A02 alarming, Reactor Power shall be reduced to clear the alarm, or the reason for the alarm shall be clearly understood as a proper response to plant conditions/transients (e.g., Turbine Stop and Governor Testing, RSMI Surv.).

4.14 With the COLSS Alarm annunciated, monitor Linear Heat Rate (JI-0011), DNBR (JI-0012), Reactor Power (CPC), and Azimuthal Tilt (CPC and PMS) to ensure the LCOs for Tech. Specs. 3.2.1 (LPD), 3.2.3 (AZ Tilt), and 3.2.4 (DNBR) are met.

4.15 Do not place systems in "MANUAL" unless misoperation in "AUTOMATIC" is apparent. Systems placed in "MANUAL" must be checked frequently to ensure proper operation.

5.0 CHECKLIST(S)

5.1 None

6.0 PROCEDURE

6.1 Preparations for Power Ascension

NOTE: All Power Ascension preparations may be performed concurrently or in any order.

6.1.1 Ensure that COLSS or the COLSS Backup Computer System is in service, or that the applicable surveillances are being performed as directed by SO23-3-2.21.

6.1.2 Estimate pre-planned power maneuvering boration/dilution requirements based on desired load and equipment availability per Attachment 15, Power Maneuvering Boration/Dilution Guidelines.

.1 If the power maneuvering evolution has not been pre-planned, then review Attachment 15, Steps 2.1.1 through 2.1.3.

6.1.3 Notify the Chemistry Department Foreman of the planned power increase.

6.1.4 Determine if S/G and Feedwater/Condensate Chemistry parameters are within the Normal Range per SO123-III-2.1.23.

.1 If Chemistry is not within the Normal Range then follow the Chemistry Guidelines of Section 6.2.1.

CONTINUED ON NEXT PAGE

6.0 PROCEDURE (Continued)

NOTE: The Equilibrium Shape Index (ESI) is the value of the Axial Shape Index (ASI) of the unrodded core in equilibrium condition at the Power level the core will be brought to for continued operation.

6.1.5 Determine ESI for the next projected Power Plateau [1] from the Operations Physics Summary (OPS), Figure 6-1, or from a memorandum approved in accordance with SO23-V-13. (Ref. 2.2.3)

6.1.6 Initiate ASI monitoring, as follows: (Ref. 2.4.2.25)

ASI PARAMETER	MONITOR AT RX POWER LEVEL %	MONITORING POINT
Average ASI	20 - 100 17 - 100	COLSS CV-9198 CPC PID-268
Hot Pin ASI	17 - 100	CPC PID-187
Pseudo Hot Pin	17 - 100	CPC PID-266

.1 Initiate the monitoring of Average ASI using the PMS strip chart.

.2 If the strip chart is not available, then initiate hourly plotting of Average ASI using Attachment 13.

6.1.7 Initiate monitoring of RCS T_{cold} using the following instruments (listed in the preferred order of use):

.1 PMS - Loop 1, select T112CA (CB, CC, CD); Loop 2, select T122CA (CB, CC, CD).

.2 CPCs - Loop 1, Point ID 160; Loop 2, Point ID 161.

.3 TIs - Loop 1, TI-9178-1 or 3; Loop 2, TI-9179-2 or 4.

.4 TRs - Loop 1, TR-0115; Loop 2, TR-0125.

6.1.8 If plant conditions permit, then maximize CVCS Purification flow to anticipate a change in RCS Iodine concentration caused by the power increase.

6.1.9 Commence power ascension per Section 6.3 while following the guidelines of Section 6.2.

[1] Planned hold at a given power level of at least 6 hours; normally 100%.

6.0 PROCEDURE (Continued)

6.2 Guidelines During Power Ascension

6.2.1 **Chemistry Guidelines (Power Ascension)**

.1 Ensure S/G and Feedwater/Condensate Chemistry parameters are maintained within the Normal Range per SO123-III-2.1.23.

.2 If S/G or Feedwater/Condensate Chemistry parameters are outside the Normal Range, then take action per the following guidelines:

.2.1 With Chemistry parameters in the Abnormal Range, power ascension may continue; however, after 100 hours outside the Normal Range, a plant shutdown should be considered.

.2.2 If Chemistry parameters exceed the Abnormal Range, then notify the Chemistry Supervisor and Unit Superintendent. A power reduction to less than 25% should be initiated within 4 hours.

NOTE: Operation at greater than 25% may continue when parameters are returned to within the Abnormal or Normal Range.

.2.3 If S/G sodium concentration exceeds 500 ppb or cation conductivity exceeds 7.0 μs/cm, then inform the Chemistry Supervisor and obtain approval of the Plant Superintendent or his designee and commence a Unit Shutdown.

.3 If Reactor Power change exceeds 15% in a one-hour period, then record the time of the change in the Control Operator's log book, and notify the Chemistry Department to perform RCS Iodine sample analysis and gaseous release path samples at the required frequencies. (Tech. Spec. Table 4.4-4, Table 4.11-2)

.4 Based on RCS gaseous activity, operate the Pressurizer Degas System per SO23-3-2.1.

.5 If RCS boron concentration is changed by 50 ppm or greater, then force Pressurizer Normal Spray flow until PZR and RCS boron concentrations are within 10 ppm.

6.0 PROCEDURE (Continued)

6.2.2 **ASI Guidelines (Power Ascension)**

NOTES: 1. Normally ASI will be less positive in relation to ESI prior to increasing power. Initially, as power is increased, power generation shifts to the bottom of the RX core which results in ESI being reached. As the power increase continues, CEA withdrawal (in Section 6.3) is required to hold ASI at ESI.

2. ASI is more difficult to control at EOC.

.1 During power changes, the preferred CEA sequence for transient ASI control is: PLCEAs (per SO23-3.1.3), Reg. Group 6, and if necessary, Reg. Group 5.

NOTE: Normally Reg. Group 5 CEAs should be fully withdrawn (per SO23-3-3.5, Attachment 2, CEA Position vs. EFPD) when above 50% RX power.

.2 Reg. Group 5 may be used for ASI control under the following conditions: (Ref. 2.4.2.25)

- RX power is less than 70% (preferably less than 50%).
- Insertion of PLCEAs and Reg Group 6 was insufficient to maintain ASI within ± 0.05 of the ESI value.
- COLSS or CBCS is in service. (Tech. Spec. 3.1.3.6)
- Approval has been granted by the SRO Ops. Supv.

NOTE: When Reg. Group 5 to 6 overlap is increased for ASI control, then PMS alarms for CEA deviation will annunciate. This is an acceptable condition; however, a CPC trip will be generated without further warning if CEA Group sequencing is violated.

.3 <u>If</u> Reg. Group 5 is used for ASI control, <u>then</u> a minimum 15 inch separation between Group 5 and 6 shall be maintained to eliminate the risk of an out-of-sequence trip from CPCs. (Ref. 2.4.2.9, 2.4.2.10, and 2.4.2.12)

6.0 PROCEDURE (Continued)

6.2.2.4 CEA adjustments for ASI control should be accomplished by small (less than 3 in/min.), smooth, and frequent movements. Whenever possible, the CEA withdrawal guidelines of Step 6.2.2.14 should be followed.

.5 Ensure CEAs and PLCEAs remain above the Transient Insertion Limitations of Tech. Spec. 3.1.3.6 and 3.1.3.7, as applicable.

.6 Operation of any CEA or PLCEA group below the Long Term Insertion Limit shall adhere to the associated time limitations. Since Regulating Group 5 does not have a Short Term Insertion Limit, any Group 5 insertion is limited to 4 hours per 24 hours. (Tech. Spec. 3.1.3.6)

.7 Log CEA insertions below the Long Term Insertion Limits per SO123-0-42, Attachment 25 and/or 26.

.8 When greater than 20% RX power, then Average ASI Value shall be within ± 0.27 with COLSS in service (PID-CV9198), or ± 0.20 with COLSS out-of-service (CPC PID-268). [Tech. Spec. 3.2.7]

.9 Control Average ASI as tightly as CEA insertion limits allow. If possible, then ASI should be maintained within ± 0.05 of the ESI value. When above 40% power and prior to reaching a steady state power plateau, ASI should be maintained within ± 0.01 of the ESI value.

.10 If Average ASI cannot be maintained within ± 0.10 of the ESI value, and within the limits of Step 6.2.2.8, then immediately contact Reactor Engineering for support.

.11 If Average ASI cannot be maintained within ± 0.20 of the ESI value, and within the limits of Step 6.2.2.8, then consider holding RX power constant until ASI is controlled to within ± 0.10 (or alternate control value approved by Reactor Engineering).

.12 Discuss with Reactor Engineering any decision to allow uncontrolled ASI swings. Failure to maintain tight control of ASI will have delayed consequences and may result in a RX trip.

.13 When above 40% power, then all CEAs should be positioned in accordance with SO23-3-3.5, Attachment 2, CEA Position vs. EFPD, except as necessary for ASI control or emergency power reduction. However, if CEAs are inserted for Power/Temperature control during a load change, then as soon as possible, borate and withdraw the CEAs to minimize the adverse effect on ASI control.

6.0 PROCEDURE (Continued)

6.2.2.14 When above 60% power, then the following guidelines apply for CEA withdrawal: (Ref. 2.4.2.17 and 2.4.2.18)

NOTES: 1. When below 60% power or above 140 inches these guidelines do not apply.

2. The need to control plant stability takes precedence over these guidelines.

.14.1 Limit CEA withdrawals to no more than 10 inches per hour.

.14.2 If full fuel preconditioning has not been achieved (i.e; restart after a refueling), then limit CEA withdrawals to 1 inch per hour.

.14.3 These guidelines may be superseded by approved station procedures during Physics testing.

.15 Continue monitoring or plotting ASI for a minimum of 30 hours after completing the power change.

6.2.3 **RCS Temperature Guidelines (Power Ascension)**

CAUTION Reactor Coolant Cold Leg temperature shall be maintained within the following limits: (Tech. Spec. 3.2.6)

- At 535-558°F when RX power is 30-70% Rated Thermal Power.
- At 544-558°F when RX power is greater than 70% Rated Thermal Power.
- RCS Cold Leg temperature may be allowed to drift above 558°F (NOT to exceed two hours) when performing the rapid/accelerated downpower requirements of Attachment 20.

.1 Maintain Tc within the normal operating band of Attachment 8, Tcold vs. Reactor Power.

6.0 PROCEDURE (Continued)

NOTE: For example, a dilution to 100% power results in 98% power with Tc at the programmed level. By picking up slightly more Turbine Load, Tc will decrease and Reactor Power will increase to 100%. Then as Xenon burns out or builds in, allow Tc to move to the limits of its normal operating band.

6.2.3.2 If Tc leaves the normal operating band, then borate or dilute as necessary to return Tc within its normal operating band while taking into account the affect on ASI control.

.3 If Tc drops below 544°F when >70% Rx Power or below 535°F when between 30% and 70% Rx Power, then take action, such as reducing turbine load, to recover Tc. Use CEAs and boration or dilution as necessary to match Rx Power with Turbine load, and restore Tc to within the operating band. (Tech. Spec. 3.2.6)

6.2.4 **Power Level Guidelines (Power Ascension)**

NOTE: Shiftly Excore Instrumentation surveillances should be performed either before or after a scheduled Reactor power maneuver due to the effects on channel comparisons when not in a steady state condition.

.1 The applicable Maximum Core Power Escalation Rate of Attachment 1 should not be exceeded.

.1.1 If the Maximum Core Power Escalation Rate is exceeded for any two (2) consecutive hours, then stop the power increase until the overall average rate is within the guidelines of Attachment 1, and notify Reactor Engineering.

.2 During Power changes the Secondary Calorimetric Power indication (CV9005AVG) may be inaccurate, therefore, use the COLSS Plant Power indication (CV9000) or COLSS Backup Computer Plant Power indication. TCN

.2.1 If COLSS and the COLSS Backup Computer are out of service, then use the highest PID-217 of the Operable CPC channels. PID-217 auctioneers the higher value of ΔT Power (PID-177) and CPC Neutron Power (PID-171).

6.0 PROCEDURE (Continued)

6.2.4.3 If a positive ITC is known to exist, then the following guidelines apply: (Ref. 2.4.2.20)

.3.1 Assign a dedicated Reactor Operator to monitor Reactor power and control CEA position until a stable load on the Turbine is reached or a negative ITC is known to exist.

.3.2 Closely monitor RCS temperature and adjust CEA position to maintain a stable power level. An increase in RCS temperature will tend to increase RX Power. Conversely, a decrease in RCS temperature will tend to lower RX power.

.3.3 Ensure CEAs are maintained in a good "Bite" position (good reactivity position with room to move in both directions).

.3.4 During any inadvertent steam transients power should be controlled by the Operator without waiting for the final effects of doppler.

.3.5 Make all changes slowly and in a controlled manner; be prepared to respond if sudden changes occur.

.4 If this Startup is after a refueling outage, then power calibrations may be suspended at the request of Reactor Engineering during power ascension testing provided power calibration is performed upon reaching a major test plateau and again before continuing to the next plateau. (Tech. Spec. 3.3.1)

.5 During RCS boration/dilution, periodically adjust the blended makeup setpoint.

.6 When the desired power level is reached, then perform the following:

.6.1 Verify the Turbine Load is blocked by CVOL.

.6.2 Maintain Reactor Power constant by adjustment of load and/or boration/dilution as required.

.6.3 Follow Section 6.4, Guidelines for Steady State Power Operation.

TCN

6.0 PROCEDURE (Continued)

6.3 Power Ascension

6.3.1 Throughout the power increase, follow the guidelines of Section 6.2.

6.3.2 Increase RCS temperature by dilution per SO23-3-2.2, Section for Dilution Mode, following hourly flowrates and volumes established in Attachment 15, Power Maneuvering Boration/Dilution Guidelines and/or Attachment 18, Boration/ Dilution Schedule. Concurrently increase Turbine load as necessary to maintain Tc within the normal operating band of Attachment 8.

.1 Power increase may require boration per SO23-3-2.2, Section for Borate Mode, to maintain desired rate of power increase due to Xenon burnup.

6.3.3 **20% Reactor Power**

.1 If not already in service, then initiate placing the remaining Main Feedwater Pump (SO23-2-1), two Heater Drain Pumps (SO23-2-3), and at least three Condensate Pumps (SO23-2-2) in service (must be in service by 50% power).

.2 As power is increased from 20% to 40% power, establish ASI at ESI ± 0.01 Shape Index Units in accordance with Section 6.2.2, ASI Guidelines (Power Ascension).

.3 After the Main Turbine has been loaded and the SBCS valves Closed with no Open signal, then restore the SBCS to normal, as follows:

CAUTION The SBCS Master Controller, PIC-8431, should be placed in MANUAL prior to changing the setpoint selector switch.

.3.1 Return SBCS Master Controller, PIC-8431, to normal (usually 1000 psi).

.3.2 Place SBCS Master Controller, PIC-8431, setpoint selector in REMOTE.

.3.3 Verify/place SBCS Master Controller, PIC-8431, in AUTO.

.3.4 Verify/place all operable SBCS Valve Controllers in AUTO.

.3.5 Return the SBCS Valve Permissive Switches for all operable SBCS Valves to AUTO.

6.3.4 **220-250 Mwe Generator Load**

.1 Perform the applicable steps of SO23-10-1, to close steam drains and apply live steam to the MSRs.

6.0 PROCEDURE (Continued)

6.3.5 **30-50% Reactor Power**

.1 When Unit reaches 330 MWe gross, if permissible, then increase the Turbine loading rate to 11 MWe/min. Do not exceed the maximum allowable Core Power escalation rate per Attachment 1.

.2 At approximately 330 MWe, shift the Blowdown Flash Tank Vent to the Third Point heaters per SO23-9-4, Section for Operation of the Blowdown Flash Tank Vent.

.3 Between 35% and 50% RX Power start two Heater Drain Pumps per SO23-2-3.

.4 Prior to exceeding 40% Reactor power, verify the CEAs are either positioned per SO23-3-3.5, Attachment 2, CEA Position vs. EFPD, or maintaining ASI at ESI ± 0.01 Shape Index Units.

6.3.6 **450-550 MWe Generator Load**

.1 If not required for cascade draining, then Close the first through sixth point Feedwater Heaters Startup vents. (Ref. SO23-9-1) These vents may be left throttled open if necessary to facilitate cascade draining of Feedwater Heaters.

.2 When Unit Load reaches 500 MWe, then contact the SCE Switching Center, for the proper System Separation switch selection.

6.3.7 **45-50% Reactor Power**

.1 Prior to increasing above 50% power, ensure the PLCEAs are above the Long Term Insertion Limit of 112.5 inches. (Tech. Spec. Fig. 3.1-3)

CONTINUED ON NEXT PAGE

6.0 PROCEDURE (Continued)

CAUTION Starting the 4th Condensate Pump arms the Condenser Overboard Control System. If controls are set for AUTO with Hotwell cation conductivity 1.5 μmhos or higher on CR-6700/6701 and/or CR-6702/6703, then automatic overboarding will be initiated.

6.3.7.2 Prior to increasing above 50% power, ensure two Main Feedwater Pumps (S023-2-1), two Heater Drain Pumps (S023-2-3) and at least three Condensate Pumps (S023-2-2) are in service, otherwise limit power per Attachment 6.

NOTE: The Condensate Overboard Control System (COCS) should be operated per Section 6.4.2.

.3 When 50% power is reached, then ensure the Circulating Water Temperature Data Logger, 2(3)L-168, is in service, and ensure 2(3)64A14, Circ. Wtr. Temp. Monitor System Trouble, alarm is clear. If the data logger is not in service or if 64A14 is alarming, then follow the guidelines of Section 6.4.4.)

.4 If the Turbine has been shutdown for greater than 72 hours, then after reaching 50% power, blowdown the Feedwater Heater instrument bridles per S023-9-2, Section for Blowdown of FW Heaters and Drain Tank Level Columns.

6.3.8 **50-70% Reactor Power**

.1 Adjust CPC Azimuthal Tilt (Tq) Limit Constant (PID 063) to 1.03 per S023-3-2.13. TCN

CONTINUED ON NEXT PAGE

6.0 PROCEDURE (Continued)

6.3.9 **60-75% Reactor Power**

NOTE: Main Steam Drain Tanks T-098 and T-101 vent to the opposite First Point Heater than they drain to.

.1 At approximately 60% power, if not required to facilitate cascade draining and the associated 1st Point Heater is not out of service, then Close the Main Steam Drain Tank Startup Vents.

- S2(3)1301MU528 T-098 Startup Vent (to E-037)
- S2(3)1301MU546 T-101 Startup Vent (to E-036)

NOTE: If flow instabilities return during operation, then MSR Live Steam Vents to Cold Reheat may be reopened. Continued operation with excessive flow oscillation will likely result in a large amount of premature tube failure.

.2 When power exceeds 60%, then Close the 13% MSR Live Steam Vents to Cold Reheat and monitor for main steam flow instabilities to the MSRs (E-112 at DPI-2284 & 2285; E-113 at DPI-2290 & 2291). If instabilities are noted, then re-open the 13% Live Steam Vents and notify Station Technical. (Ref. 2.4.2.4)

- S2(3)1301MU1044 MSR E-112 13% Live Steam Vent
- S2(3)1301MU1045 MSR E-112 13% Live Steam Vent
- S2(3)1301MU1048 MSR E-113 13% Live Steam Vent
- S2(3)1301MU1051 MSR E-113 13% Live Steam Vent

.3 When power exceeds 60%, then to place Feedwater Pump Mini-flow Valves FV-3433 and FV-3432 in MODULATE, perform the following:

- To ensure Mini-flow valves will stay closed when placed in MODULATE, verify locally on Mini-flow Controllers FIC-3433 and/or FIC-3432, flow indicating greater than 10,000 gpm.
- Place the valve handswitches (one valve at a time) in MODULATE.
- Monitor the system response and adjust as necessary.

6.0 PROCEDURE (Continued)

6.3.9.4 When both Heater Drain Pumps are in service, then (at the discretion of the SRO Ops. Supv.) place Condensate Pump P-053 in AUTOMATIC per SO23-2-2.

.5 Prior to exceeding 70% power: if Reg. Group 5 CEAs were used for ASI control, then ensure Reg. Group 5 CEAs are fully withdrawn per SO23-3-3.5 Attachment for CEA Position vs. EFPD. (Tech. Spec. Figure 3.1-2)

.6 After reaching 70% power, and while continuing to 100% steady state, then closely monitor by group trend E-036 and E-037, First Point Feedwater Heaters, shell side water level and drain temperature. Use PMS Points TE3957 for E-036 and TE3941 for E-037. Adhere to the following guidelines:

NOTE: FW Heater shell side blow-by will cause drain temperatures to increase significantly (10°F or more) above 100% power steady state values.

.6.1 To prevent shell side blow-by, maintain shell side water level at approximately the 100% power steady state level.

.6.2 If shell side level falls out of the normal range, or if drain temperature exceeds 386°F, then request the I&C Department to readjust level.

.7 When power is ≥75%, then position 2(3)HS-2808, Vacuum Trip Setpoint Select Switch, to **6.5 INCHES HG**.

6.3.10 **90-95% Reactor Power**

.1 Prior to exceeding 95% Power, verify CPC Nuclear Power and ΔT Power indications agree with COLSS (or COLSS Backup Computer) calculated Power per SO23-3-3.25, Attachment for Power Distribution and Burnup Log.

.2 Monitor Condenser Circ. Water ΔT to ensure that the daily average ΔT does not exceed 20.4°F when 100% Power is reached.

.2.1 If it is projected that the unit will exceed a Circ. Water daily average ΔT of 20.4°F, then hold Power at a level that will maintain the daily average ΔT at less than 20.4°F, and notify the Unit Superintendent and the Station NPDES Engineer. (Ref. 2.1.2)

6.0 PROCEDURE (Continued)

6.3.11 **100% Reactor Power**

.1 Final adjustment to Power level should be made in small incremental reactivity changes using dilution or boration per SO23-3-2.2, as applicable.

.2 Following a plant restart and return to full power, do not exceed 100.5% Reactor Power as indicated by the highest PID-217 of the Operable CPC channels until an excore calibration has been completed per SO23-3-3.2.

CAUTION If the Narrow Range Governor and Control Valve Open Limit (CVOL) are not set in close proximity of each other, then the unlikely event of CVOL failure high could result in a primary plant transient.

.3 During normal operation, the CVOL and Narrow Range Governors should be maintained within close adjustment of each other. This can be accomplished by adjusting the non-controlling Governor down until it becomes in control, then re-adjust up slightly until the desired Governor resumes control.

.4 Maintain Generator MVARs within the limits of Attachment 22.

NOTE: Throttling Open TV-2579, Generator Cooler Bypass Valve, ensures that a failure of TV-2579 will not result in total loss of Hydrogen Gas Cooling flow. (Ref. 2.4.2.32)

.5 Position the Generator Hydrogen Cooler Bypass Valve per SO23-6-18, attachment for Generator Hydrogen Cooler Flow Configuration.

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6.0 PROCEDURE (Continued)

6.4 Guidelines for Steady State Power Operation

6.4.1 **First Point Heater Bypass Guidelines**

.1 When Full Load is reached, then Open/Throttle S2(3)1305MU120, per SO23-9-1, Attachment for Opening/Throttling First Point Heaters Bypass Valve. Maximize Megawatt output by Throttling S2(3)1305MU120, as required throughout core life. (Ref. 2.4.2.36) TCN

6.4.2 **Chemistry Guidelines (Steady State)**

.1 When the Secondary Chemistry parameters of SO123-III-2.1.23 are within the Normal Range, then Steam Generator Blowdown may be reduced to 200 gpm total.

.2 After a change in S/G blowdown rates, then K9008 and K9009, COLSS Blowdown Constants, should be updated per SO23-3-2.21.

NOTE: 1. Secondary Chemistry Limits are divided into three groups:
- Normal Range
- Abnormal Range
- Immediate Shutdown Limits

2. The following are basic Guidelines and Recommendations from SO123-III-2.1.23. Compliance with these actions will provide a more reliable overall secondary system with fewer repairs due to long-term corrosion problems.

.3 If the Normal Range is exceeded, then immediate investigation of the problem will be initiated. If the parameter(s) is (are) not returned to within Normal Range within one week, then a recommendation to reduce Power to <30% will be issued.

6.0 PROCEDURE (Continued)

6.4.2.4 If the Abnormal Range is exceeded, then Chemistry Dept. will request a power reduction to <30% Power. This power reduction should begin within four hours of exceeding the Abnormal Range.

.5 If an Immediate Shutdown Limit is exceeded regardless of duration, then the Unit should be shutdown to at least Mode 2 within 4 hours.

CAUTION A decrease in letdown temperature will cause a decrease in RCS boron concentration. Conversely, an increase in letdown temperature will cause an increase in RCS boron concentration. [The Purification Ion Exchanger resin has a greater affinity to absorb boron at lower temperatures and releases boron at higher temperatures.] (Ref. 2.4.2.11)

.6 After PZR and RCS boron concentration are within 10 ppm, then ensure PZR Backup Heaters are energized as required to maintain PZR Proportional Heater capacity at approximately 50% (indicated by PIC-0100, Pressurizer Pressure Controller, output signal of approximately 33%).

CAUTION Operating the FFCPD with only four beds (4 Cps or 4 MBPs) should be minimized when the Unit is at full power, because increased flow demands on the Condensate Pumps (such as loss of a Heater Drain Pump) could result in an increased pressure drop across the FFCPD.

.7 With the FFCPD in service (bypass valves closed), operate the Condensate Overboard Control System (COCS) in Manual to prevent unnecessary overboarding/power reduction during the final flush of a FFCPD polisher. This poor quality final flush water will be cleaned up as it passes through the in-service polisher vessels without the need for overboarding. Operation of the COCS in Manual is addressed in SO23-9-9. (Ref. 2.4.2.8)

.8 When all of the following conditions are met, then the COCS should be operated in Automatic:

- The FFCPD bypass valves are open;
- Four Condensate Pumps are operating, or three Condensate Pumps are operating with Condensate Pump P-053 selected to AUTO/OFF;
- Two Heater Drain Pumps are operating.

6.0 PROCEDURE (Continued)

6.4.3 Circulating Water Guidelines

.1 When above 50% power, then monitor Condenser Circulating Water temperature ΔT using the Circ. Water Temperature Data Logger, 2(3) L-168.

.2 If the Circ. Water Temperature Data Logger, 2(3)L-168, is out of service or if 2(3)64A14, CIRC. WTR. TEMP. MONITOR SYSTEM TROUBLE, is in the alarm condition, then initiate monitoring per Attachment 11. (Ref. 2.1.2)

.2.1 Monitoring per Attachment 11 shall remain in effect until the data logger is returned to service and 2(3)64A14 has cleared.

.3 If Circulating Water Conduit reverse flow exists for greater than 4 hours during heat treat, then initiate monitoring per Attachment 11.

6.4.4 Power Level Guidelines (Steady State)

.1 Monitor power based on Secondary Calorimetric Power, PMS PID CV9005AVG. R TCN

.2 Maximize Unit generation. If at full power plateau, then when conditions allow, average Reactor Power over the entire shift.

.3 Power shall be maintained such that the COLSS Alarm (50A02) is not annunciated. If the alarm is annunciated, then determine the cause for the alarm and complete the following:

.3.1 If Annunciator 50A02 is alarming due to exceeding a Power Operating Limit, then reduce power to clear the alarm.

.3.2 If Annunciator 50A02 is alarming due to an understood condition that affects COLSS power calculations (e.g. Turbine Stop/Governor valve test, RSMI Surv.), then commence monitoring Linear Heat Rate (JI-0011), DNBR (JI-0012), Reactor Power (CPC), and Azimuthal Tilt (CPC and PMS) to ensure compliance with Tech. Specs. 3.2.1 (LPD), 3.2.3 (AZ Tilt), 3.2.4 (DNBR).

.4 If Azimuthal Tilt exceeds 0.03 during *steady state* conditions, then initiate a Non-Conformance Report. (Ref. 2.4.2.30)

6.0 PROCEDURE (Continued)

6.4.4.5 If a transient (i.e., uncontrolled Power decrease, Pressure or Temperature change) occurs, then after conditions are stabilized, borate as necessary to restore CEAs to the desired axial shape control position.

.5.1 If required by the Shift Superintendent or Shift Technical Advisor after the transient, then implement the applicable portion of SO123-0-25 for transient review and documentation.

CAUTION An unused Deborating Ion Exchanger has the capacity to lower RCS boron concentration by approximately 60 ppm at any time of core life. Following this, no further boron reduction is possible using the Deborating Ion Exchanger.

.6 To minimize (dilution) radwaste volume at EOL, RCS boron concentration should be lowered by using ion exchangers. Refer per SO23-3-2.4, Section for Reducing Boron Concentration Using a Purification Ion Exchanger.

6.4.5 **Secondary Plant Guidelines**

.1 When Reactor Power is ≥ 80%, then maintain Secondary Plant conditions as follows:

- Steam Generator Pressure, based on the average readings of all available channels from Point IDs PT1013 (1-4) and PT1023 (1-4) or equivalent [1], is ≥ 825 psia
- Feedwater Temperature, based on the average readings from Point IDs TE3921 and TE3922 or equivalent [1], is ≥ 410°F
- Feedwater Flow on Point IDs PD1112 and PD1122, or PD1111 and PD1121 [1], is ≥ 165 inches of water

TCN

[1] Plant parameter may be monitored by any of the following available methods; PMS, Control Panel indication, or COLSS alarm (when software modification is completed).

6.0 PROCEDURE (Continued)

6.4.6 **RCS Temperature Guidelines (Steady State)**

NOTES: 1. To minimize Steam Generator corrosion over the duration of plant life, Tcold should be maintained as close as possible to 553°F during steady state conditions at 100% power.

2. When controlling RCS temperatures by Tcold, then programmed values for Thot and Tavg should follow per Attachment 9.

CAUTION Reactor Coolant Cold Leg temperature shall be maintained within the following limits: (Tech. Spec. 3.2.6)

- At 535-558°F when RX power is 30-70% Rated Thermal Power.
- At 544-558°F when RX power is greater than 70% Rated Thermal Power.
- RCS Cold Leg temperature may be allowed to drift above 558°F (NOT to exceed two hours) when performing the rapid/accelerated downpower requirements of Attachment 20.

.1 Maintain Tcold within the normal operating band of Attachment 8 and as close as possible to the program value during steady state (e.g., ±0.5°F).

.2 Monitor Tcold using the instrument indication that is most representative of the average Tcold. This value may be obtained from TCOLDAVG on CFMS (using PMARS) or by averaging all of the indications for one of the following instrument methods (listed in preferred order of use):

- **PMS Method**: Loop 1 T112CA, T112CB, T112CC, T112CD
  Loop 2 T122CA, T122CB, T122CC, T122CD
- **CPC Method**: Loop 1 PID-160
  Loop 2 PID-161
- **MCB Method**: Loop 1 TI-9178-1 or TI-9178-3
  Loop 2 TI-9179-2 or TI-9179-4
- **REC Method**: Loop 1 TR-0115
  Loop 2 TR-0125

.3 If space is available on PMS, then the most representative indication of average Tcold should be placed on the Alarming Trend Recorder with alarm setpoints as directed by the SRO Ops. Supv.

6.0 PROCEDURE (Continued)

6.4.7 **CEA Guidelines (Steady State)**

.1 When Part Length and Group 6 CEAs are not being used for ASI control, then position in accordance with EFPD (SO23-3-3.5, Attachment for CEA Position vs. EFPD).

.2 Borate or dilute as required to achieve CEA position per SO23-3-2.2.

6.4.8 **ASI Guidelines (Steady State)**

NOTE: ASI may be permitted to swing for determining ESI if directed by Reactor Engineering.

.1 Maintain ASI at the ESI ± 0.05 Shape Index Units per the Operations Physics Summary, Figure 6-1 or as directed by a memorandum approved in accordance with SO23-V-13. (Ref. 2.2.3)

.1.1 If the ESI per the Operations Physics Summary differs from the "observed ESI" (ASI average over an oscillation cycle), then the "observed ESI" may be used at the SRO Ops. Supv. discretion. (Ref. 2.4.2.22)

.2 Make adjustments to ASI per Attachment 14, ASI Control Strategy During Steady State Operation.

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6.0 PROCEDURE (Continued)

6.4.9 **Unexpected Plant Transient during Steady State Operation**

CAUTION Do not place systems in "MANUAL" unless misoperation in "AUTOMATIC" is apparent. Systems placed in "MANUAL" must be checked frequently to ensure proper operation.

.1 If a Primary to Secondary Power mismatch occurs (e.g., an HP Stop or Governor Valve fails closed or SBCS malfunction), then reduce Reactor Power and/or increase Secondary Power to restore plant balance as follows:

.2 Verify proper automatic SBCS response or manually operate the SBCS to balance Secondary Power with Primary Power.

.3 If necessary to lower Primary Power, then place CEDMCS in manual sequential and insert CEAs to match Tave to Tref.

.4 If a transient (i.e., uncontrolled Power decrease, Pressure or Temperature change) occurs, then after conditions are stabilized, borate as necessary to restore CEAs to the desired axial shape control position, and ensure Reactor Power and Turbine Load are matched.

.5 If desired to lock down a failed HP Stop or Governor Valve, then refer to SO23-10-3, Attachment for Procedure to Remove a Unitized Actuator from Service During on Load Operation.

.6 When the transient is stabilized, then ensure any control systems that have been place in Manual are returned to Automatic Operation per applicable Operating Instructions.

.7 If required by the Shift Superintendent or Shift Technical Advisor after the transient, then implement the applicable portion of SO123-0-25 for transient review and documentation.

6.0 PROCEDURE (Continued)

6.5 Preparations for Power Descension

NOTES:

1. This Section concerns decreasing plant load to a lower power plateau. All Power Descension preparations may be performed concurrently or in any order.

2. If the power descension is to be followed by a shutdown and cooldown, then Steps 6.5.2 and 6.5.3 should be initiated approximately 24 hours prior to starting the power descension in order to save time degassing the RCS.

6.5.1 Refer to unit outage schedule and outage package to determine the time to start load reduction, anticipated time Unit will be off-line, if Turbine tests will be conducted, and whether any special tests, procedures or observations will be made during load reduction.

6.5.2 If a cooldown is planned, then to assist with RCS Degassing, perform the following: (N/A if a cooldown is not planned.)

CAUTION When VCT Pressure is less than 25 psig, then the plant is in a moderate risk evolution due to the potential for Charging Pump gas binding. N TCN

.1 Lower the setpoint of PCV-9213, VCT Hydrogen Regulator, as follows:

- 15 to 25 psig as directed by the SRO Ops. Supv. R TCN
- 5 to 15 psig as directed by the Chemistry Division

.2 Log the new PCV-9213, VCT Hydrogen Regulator, setpoint in the C.O.'s Log.

NOTE: Burping the VCT pressure down to the new setpoint may waste Hydrogen by causing the VCT Hydrogen Regulator to open.

.3 Lower VCT pressure to just above the new setpoint by burping the VCT per SO23-3-2.1, Section for Burping the VCT.

.4 Notify the Chemistry Dept. that VCT Hydrogen pressure has been reduced.

6.0 PROCEDURE (Continued)

NOTES: 1. In order to avoid scheduling conflicts and possible entry into Technical Specification Actions, ESF components common to both Units should be supplied/powered from the Unit remaining in the higher Mode of operation if a shutdown to Mode 5 is planned. (Ref. 2.4.2.28)

2. If the ESF component transfers are 'initiated' in the next step, then they must be completed prior to removing the Turbine-Generator from service.

6.5.3 If the Unit shutdown will be to Mode 5, then initiate transferring the following ESF components to the Unit remaining in the higher Mode of operation: (N/A if a shutdown to Mode 5 is not planned.)

.1 Initiate transfer of Emergency Chiller E-335 power source per SO23-1-3.1 and CCW supply per SO23-2-17.

.2 Initiate transfer of Emergency Chiller E-336 power source per SO23-1-3.1 and CCW supply per SO23-2-17.

NOTE: In order to avoid additional TGIS and CRIS actuations, TGIS and CRIS power transfer should be coordinated with the transfer of MCC BS and BQ.

.3 Initiate transfer of MCC BS and BQ per SO23-6-3.2.

.4 Initiate transfer of TGIS per SO23-3-2.29, Attachment for Transferring Logic Power Supplies.

.5 Initiate transfer of CRIS per SO23-3-2.24.6, Attachment for Transferring Power Supplies.

6.5.4 If Power Descension will decrease power to < 75%, then determine pre-planned power maneuvering boration/dilution requirements based on desired load and equipment availability per Attachment 15, Power Maneuvering Boration/Dilution Guidelines.

.1 If the power maneuvering evolution has not been pre-planned, then review Attachment 15, Steps 2.1.1 through 2.2.5.

6.5.5 If Power Descension will decrease power to ≥ 75%, then Attachment 19, Rapid and Accelerated Downpower Boration/CEA Insertion Determination, may be used to calculate the volume of boric acid or Group 6 CEA position required to attain various target power levels.

6.0 PROCEDURE (Continued)

6.5.6 Notify the Chemistry Department Foreman of the planned power decrease.

6.5.7 For reduced power operations anticipated to last less than 48 hours, maintain ASI at the initial equilibrium (typically HFP) value.

.1 If the duration of the reduced power operation is anticipated to be greater than 48 hours, then contact Reactor Engineering for ASI control recommendations.

.2 If the duration of the reduced power operation is extended, and the change will extend past 48 hours, then contact Reactor Engineering for specific guidance. (Ref. 2.4.2.23)

6.5.8 Initiate ASI monitoring, as follows: (Ref. 2.4.2.25)

ASI PARAMETER	MONITOR AT RX POWER LEVEL %	MONITORING POINT
Average ASI	20 - 100 17 - 100	COLSS CV-9198 CPC PID-268
Hot Pin ASI	17 - 100	CPC PID-187
Pseudo Hot Pin	17 - 100	CPC PID-266

6.5.9 If the Power reduction is to a plateau above 40% power, then initiate monitoring of Average ASI using the PMS Strip Chart. (N/A if decreasing to less than 40%.)

.1 If the PMS Strip Chart is not available, then initiate hourly plotting of ASI using Attachment 13.

6.5.10 Initiate monitoring of RCS Tcold using the following instruments (listed in the preferred order of use):

.1 PMS - Loop 1, select T112CA (CB, CC, CD); Loop 2, select T122CA (CB, CC, CD).

.2 CPCs - Loop 1, Point ID 160; Loop 2, Point ID 161.

.3 TIs - Loop 1, TI-9178-1 or 3; Loop 2, TI-9179-2 or 4.

.4 TRs - Loop 1, TR-0115; Loop 2, TR-0125.

6.5.11 To enhance system response to plant transients, commence forcing Pressurizer Normal Spray flow as directed by the SRO Ops. Supv.

6.0 PROCEDURE (Continued)

6.5.12 If plant conditions permit, then maximize CVCS Purification flow to anticipate a change in RCS Iodine concentration caused by the power reduction.

6.5.13 If the power decrease is occurring at End Of Cycle (RCS boron concentration less than 50 ppm), then three Charging Pumps should be maintained available to provide maximum deboration capability. (Ref. 2.4.2.21)

6.5.14 If power is intentionally reduced to curtail plant output, for ≥ one week, ensure Closed S2(3)1305MU120, First Point Feedwater Heater Bypass Valve. TCN

6.5.15 Commence power descension per Section 6.7 while following the guidelines of Section 6.6.

6.6 Guidelines During Power Descension

POWER DESCENSION RATE GUIDELINES		
RATE	CLASSIFICATION	DEFINITION
3 TO 15 %/Hr	Normal	Power decrease within the guidelines of Attachment 5.
15 to 60 %/Hr	Accelerated	Rate of power decrease to be used when shutdown is occurring in response to a Tech. Spec. Action Statement or a power reduction is required by Tech. Spec. (e.g dropped CEA)
1 to 5 %/min	Rapid	Rate of power decrease to be used when power decrease must be accomplished rapidly to prevent a Rx Trip (loss of a MFWP or Circ Water Pump) or in response to actions from an AOI (SGTL)

6.0 PROCEDURE (Continued)

6.6.1 **Chemistry Guidelines (Power Descension)**

.1 If Reactor Power change exceeds 15 percent in a one-hour period, then record the time of the change in the Control Operator's log book, and notify the Chemistry Department to perform RCS Iodine sample analysis and gaseous release path samples per the required frequencies. (Tech. Spec. Table 4.4-4, Table 4.11-2)

.2 Based on RCS gaseous activity, operate the Pressurizer Degas System per SO23-3-2.1.

.3 If RCS boron concentration is changed by 50 ppm or greater, then force Pressurizer Normal Spray flow until PZR and RCS boron concentrations are within 10 ppm.

6.6.2 **ASI Guidelines (Power Descension)**

.1 During power changes, the preferred CEA sequence for transient ASI control is: PLCEAs (per SO23-3-1.3), Reg. Group 6, and if necessary, Reg. Group 5.

NOTE: Normally Reg. Group 5 CEAs should be fully withdrawn (per SO23-3-3.5, Attachment 2, CEA Position vs. EFPD) when above 50% RX power.

.2 Reg. Group 5 may be used for ASI control under the following conditions:

- RX power is less than 70% (preferably less than 50%).
- Insertion of PLCEAs and Reg Group 6 was insufficient to maintain ASI within ± 0.05 of the ESI value.
- COLSS or CBCS is in service. (Tech. Spec. 3.1.3.6)
- Approval has been granted by the SRO Ops. Supv.

6.0 PROCEDURE (Continued)

NOTE: When Reg. Group 5 to 6 overlap is increased for ASI control, then PMS alarms for CEA deviation will annunciate. This is an acceptable condition; however, a CPC Trip will be generated without further warning if CEA Group sequencing is violated.

6.6.2.3 If Reg. Group 5 is used for ASI control, then a minimum 15 inch separation between Group 5 and 6 shall be maintained to eliminate the risk of an out-of-sequence trip from CPCs.

.4 CEAs and PLCEAs shall remain within the Transient Insertion Limitations of Tech. Spec. 3.1.3.6 and 3.1.3.7.

.5 Operation of any CEA or PLCEA group below the Long Term Insertion Limit shall adhere to the associated time limitations. Since Regulating Group 5 does not have a Short Term Insertion Limit, any Group 5 insertion is limited to 4 hours per 24 hours. (Tech. Spec. 3.1.3.6)

.6 CEA insertions below the Long Term Insertion Limits shall be logged per SO123-0-42, Attachment(s) for Regulating CEA Insertion Limits and/or Part Length CEA Insertion Limits as applicable.

NOTE: The maximum dampening position of any CEA group is approximately 85-92 inches depending upon actual Average ASI value. Further insertion may help Average ASI, however the CPCs may calculate a worse Average ASI.

.7 CEA adjustments for ASI control should be accomplished by small (less than 3 in. per min.), smooth, and frequent movements.

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6.0 PROCEDURE (Continued)

6.6.2.8 The recommended CEA insertion strategy for maintaining Average ASI close to 0.0 at **EOC** is, as follows: (Ref. 2.4.2.25)

% RX POWER	PLCEAs INCHES	GROUP 6 INCHES	GROUP 5 INCHES
100	150	150	150
95	139	150	150
90	127	150	150
85	116	150	150
80	115 [2]	140	150
75	115	129	150
70	115	117	150 [1]
65	115	106	150
60	115	95	150
55	115	83	150
50	115	75	150
45	101	75	150
40	89	75	150
35	78	75	150
30	75	75	150
25	75	75	131
20	75	75	119

NOTE: The following strategy is designed to minimize Xenon redistribution in the Core and its adverse effect on ASI (especially at EOC) during power reduction.

.9 When greater than 20% RX power, then maintain Average ASI Value within ± 0.27 with COLSS in service (PID-CV9198), or ± 0.20 with COLSS out-of-service (CPC PID-268). [Tech. Spec. 3.2.7]

.10 Control Average ASI as tightly as CEA insertion limits allow. If possible, then ASI should be maintained within ± 0.05 of the full power ESI value (see Step 6.5.9).

.11 If Average ASI cannot be maintained within ± 0.10 of the full power ESI value, and within the limits of Step 6.6.2.8, then immediately contact Reactor Engineering for support.

[1] Group 5 may be used below 70% power; see Step 6.6.2.2.
[2] PLCEA Transient Insertion Limit

6.0 PROCEDURE (Continued)

6.6.2.12 If Average ASI cannot be maintained within ± 0.20 of the full power ESI value, and within the limits of Step 6.6.2.8, then consider holding RX power constant until ASI is controlled to within ± 0.10 (or alternate control value approved by Reactor Engineering).

.13 If Average ASI is greater than ± 0.20, then monitor Hot Pin ASI (CPC PID-187) closely.

.14 Discuss with Reactor Engineering any decision to allow uncontrolled ASI swings. Failure to maintain tight control of ASI (especially at EOC) will have delayed consequences and may result in a RX trip.

.15 When above 40% power, then all CEAs should be positioned per SO23-3-3.5, Attachment for CEA Position vs. EFPD, except as required for ASI control or emergency power reduction.

.16 If power reduction is to a plateau above 40% power, then continue monitoring/plotting ASI for a minimum of 30 hours after completing the power change.

6.6.3 **RCS Temperature/Pressure Guidelines (Power Descension)**

CAUTION Reactor Coolant Cold Leg temperature shall be maintained within the following limits: (Tech. Spec. 3.2.6)

1. At 535-558°F when RX power is 30-70% Rated Thermal Power.
2. At 544-558°F when RX power is greater than 70% Rated Thermal Power.
3. RCS Cold Leg temperature may be allowed to drift above 558°F (NOT to exceed two hours) when performing the rapid/accelerated downpower requirements of Attachment 20.

.1 Maintain Tc within the normal operating band of Attachment 8, Tcold vs. Reactor Power.

.2 If the power decrease is occurring at End Of Cycle (RCS boron concentration less than 50 ppm), then Turbine load should be used to maintain Tc in the high end of the normal operating band of Attachment 8, Tcold vs. Reactor Power. (This guideline will assist in recovering from any unanticipated Xenon transients.) (Ref. 2.4.2.21)

.3 If Tc drops below 544°F when >70% Rx Power or below 535°F when between 30% and 70% Rx Power, then take action, such as reducing turbine load, to recover Tc. Use CEAs and boration or dilution as necessary to match Rx Power with Turbine load, and restore Tc to within the operating band. (Tech. Spec. 3.2.6)

.4 After completing the power decrease and any matching of PZR/RCS boron, then terminate forcing PZR Spray flow.

6.0 PROCEDURE (Continued)

6.6.4 **Power Level Guidelines (Power Descension)**

NOTE: Shiftly Excore Instrumentation surveillances should be performed either before or after a scheduled Reactor power maneuver due to the effects on channel comparisons when not in a steady state condition.

NOTE: The licensed Power Limit is factored into the COLSS Power Limit Margin Display JI-0013 and COLSS Backup Computer Power Limit Margin Display.

.1 During Power changes the Secondary Calorimetric Power indication (CV9005AVG) may be inaccurate, therefore, use the COLSS Plant Power indication (CV9000) or COLSS Backup Computer Plant Power indication. **T & C N**

.1.1 If COLSS and the COLSS Backup Computer are out of service, then use the higher of CPC ΔT Power (PID-177) or CPC Neutron Power (PID-171).

.2 If Reactor Power is being decreased by boration, then slow down or stop boration prior to reaching the desired Reactor Power level. This will lessen an overshoot due to transit time for the Charging Pump discharge to reach the core and due to Xenon buildup.

.2.1 During RCS boration, periodically adjust the blended makeup setpoint.

CAUTION An unused Deborating Ion Exchanger has the capacity to lower RCS boron concentration by approximately 60 ppm at any time of core life. Following this, no further boron reduction is possible using the Deborating Ion Exchanger.

.2.2 If the power decrease is occurring at End Of Cycle (RCS boron concentration less than 50 ppm), then use the Deborating Ion Exchanger to limit overshoot and decrease the associated recovery time. (Ref. 2.4.2.21)

.3 If the power decrease is occurring at End Of Cycle (RCS boron concentration less than 50 ppm), and a sudden drop in power occurs (greater than 3% in less than 30 minutes), then power must be returned to near its original value within 15 minutes. Otherwise the resultant Xenon transient may be difficult to stop by dilution alone. (Ref. 2.4.2.21)

6.0 PROCEDURE (Continued)

6.6.4.3.1 To restore from the sudden power drop quickly; use moderator temperature to insert a large amount of reactivity. (A one degree change in temperature will result in approximately a one percent change in Reactor power.)

.3.2 To restore temperature to the high end of the normal operating band; deborate and/or dilute as required.

.4 When the desired power level is reached, then perform the following:

.4.1 Verify the Turbine Load is blocked by CVOL or NRG (Section 6.6.5).

.4.2 Maintain Reactor Power constant by boration/dilution.

.4.3 Follow Section 6.4, Guidelines for Steady State Power Operation.

6.6.5 **Turbine Control Guidelines (Power Descension)** D TCN

NOTE: The recommended method of reducing Turbine load is with the Narrow Range Governor (NRG) followed by lowering the Control Valve Open Limit (CVOL) accordingly. This arrangement protects against inadvertent throttle opening. If the NRG adjustment is too coarse, then the CVOL may be used provided the NRG is also lowered accordingly.

CAUTION If the Narrow Range Governor (NRG) and Control Valve Open Limit (CVOL) are not set in close proximity of each other (especially during Turbine load reduction), then the unlikely event of CVOL failure high could result in a primary plant transient. (Ref. 2.4.2.16)

.1 If turbine load is reduced using the NRG, then the CVOL should be lowered accordingly.

.2 If turbine load is reduced using CVOL, then the NRG should be lowered until the low value gate shows NRG in control, then raised slightly until NRG is no longer in control.

6.0 PROCEDURE (Continued)

6.7 Power Descension

6.7.1 Ensure Section 6.5, Preparations for Power Descension, has been completed.

6.7.2 Throughout the power decrease follow the guidelines of Section 6.6.

NOTE: 1. During an emergency situation, power may be decreased by either CEA insertion, boration or both. During normal maneuvering, power decrease should be accomplished by boration.

2. The rate for a normal power decrease is defined as 3-15 %/Hr. This is within the guidelines established in Attachment 5, Recommended Maximum Rates for Decreasing Load.

3. If this is an EOC Shutdown, then Attachment 21 may be used as an example for plant parameter expectations between 75% to 20% power decrease.

6.7.3 Obtain System Operating Supervisor and SRO Ops Supv approval to start the load reduction.

6.7.4 Decrease power by boration per SO23-3-2.2, Section for Borate Mode in accordance with the following:

- If power descension will decrease power to < 75%, then Attachment 15, Power Maneuvering Boration/Dilution Guidelines will establish the hourly flowrates and volumes and/or Attachment 18, Boration/Dilution Schedule.
- If power descension will decrease power to ≥ 75%, then Attachment 19, Rapid and Accelerated Downpower Boration/CEA Insertion Determination may be used to calculate the volume of boric acid <u>or</u> Group 6 CEA position required to attain various target power levels and/or Attachment 18, Boration/Dilution Schedule.

.1 Concurrently decrease Turbine load as necessary to maintain Tc within the operating band of Attachment 8.

.2 Power decrease may require dilution per SO23-3-2.2, Section for Dilution Mode, to maintain desired rate of power decrease due to Xenon buildup.

6.0 PROCEDURE (Continued)

6.7.5 **50-75% Reactor Power**

.1 When power is <75%, then after verifying Main Condenser backpressure is <3.5" Hg, position 2(3)HS-2808, Vacuum Trip Setpoint Select Switch, to **4.5 INCHES HG**.

.2 After power is <75%, then Close the Generator Hydrogen Cooler Bypass Valve per SO23-6-18, attachment for Generator Hydrogen Cooler Flow Configuration. (Ref. 2.4.2.32)

.3 After power is <70%, then Reg. Group 5 CEAs may be used to assist in transient ASI control per Section 6.6.2, ASI Guidelines (Power Descension).

.4 At approximately 60% power, Open the Main Steam Drain Tank Startup Vents (two valves):

- S2(3)1301MU528 T-098 Startup Vent
- S2(3)1301MU546 T-101 Startup Vent

.5 If power is being reduced to a plateau of less than 50%, then ensure Closed S2(3)1305MU120, First Point Feedwater Heater Bypass Valve. R **TCN**

.6 If power is being reduced to a plateau of less than 40%, then adjust the CPC Azimuthal Tilt (Tq) Limit Constant (PID 063) to 1.05 per SO23-3-2.13.

.7 At approximately 60% power, Open the 13% MSR Live Steam Vents to Cold Reheat (four valves): (Ref. 2.4.2.4)

- S2(3)1301MU1044 MSR E-112 13% Live Steam Vent
- S2(3)1301MU1045 MSR E-112 13% Live Steam Vent
- S2(3)1301MU1048 MSR E-113 13% Live Steam Vent
- S2(3)1301MU1051 MSR E-113 13% Live Steam Vent

NOTE: To minimize Feedwater Control System oscillations and prevent significant S/G level transients, the following Step should be performed in a controlled manner and with one Feedwater Pump Mini-flow Valve at a time.

.8 When power is between 60% and 50%, then perform the following with FV-3433 and FV-3432, Feedwater Pump Mini-flow Valves:

- When a Feedwater Pump Mini-flow Valve receives an AUTO OPEN signal, then place the valve handswitch (one valve at a time) in OPEN
- Monitor the system response and adjust as necessary

.9 When power is at 50%, then initiate SO23-5-1.4 up through and including the shift meeting while continuing with this procedure.

6.0 PROCEDURE (Continued)

6.7.6 **45-50% Reactor Power**

.1 When less than 50% power, then initiate and concurrently perform SO23-9-6, Section for Feedwater Regulating System Operation - Unit Shutdown.

NOTE: When removing a Condensate Pump or Heater Drain Pump from service, then Condensate Pump P-053 may auto-start unless selected to MANUAL.

.2 When less than 50% power, and at the SRO Ops. Supv. discretion, then Main Feedwater Pump, Condensate Pump and Heater Drain Pump combinations may be changed.

.3 When less than 50% power, then Circ. Water Temperature monitoring per Attachment 11 may be terminated, if previously initiated.

6.7.7 **35-45% Reactor Power**

.1 Transfer 6.9 kV busses A01 and A02 from the Unit Auxiliary Transformers to the Reserve Auxiliary Transformers per SO23-6-1.

.2 Transfer 4 kV busses A03, A07, A08, and A09 from the Unit Auxiliary Transformers to the Reserve Auxiliary Transformers per SO23-6-2.

6.7.8 If this is an **EOC** shutdown, and it is desired to trip the Turbine and Reactor at 35% Reactor Power due to Hot Pin ASI considerations, then perform Section 6.10.

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6.0 PROCEDURE (Continued)

6.7.9 **25-35% Reactor Power**

.1 Prior to reducing load below 330 MWe, shift the Blowdown Flash Tank Vent from the Third Point Heaters to the Condenser per SO23-9-4, Section for Operation of the Blowdown Flash Tank Vent.

.2 Reduce the ramp unloading rate to a maximum of 4 MWe/min. for loads less than 330 MWe.

.3 Remove the Heater Drain Pumps from service per SO23-2-3.

.4 Place the Auxiliary Steam System and Air Ejector Steam Supply in the configuration designated by the SRO Ops. Supv.

.5 If transfer of steam supplies is necessary, then perform the applicable steps of SO23-2-10, Section for Transfer of Auxiliary Steam Supplies.

.6 If Power is being reduced to a plateau of less than 25%, then notify the Chemistry Department Foreman.

6.7.10 **220 MWe Generator Load**

.1 If generator load is reduced to less than 220 MWe, and the Turbine is not to be immediately shut down, then reduce reheat temperature to the L.P. Turbine by closing HV-2702, Live Steam to Reheater Control Valve. Reheat temperatures are on indicated PMS Pt. ID. TE2079 through TE2084.

6.7.11 If the plant is to be shutdown, then continue the plant shutdown per SO23-5-1.4 and SO23-10-2.

6.8 Guidelines for Rapid Downpower Transients

6.8.1 Perform Attachment 19, Rapid And Accelerated Downpower Boration Volume Determination, once a week to calculate the volume of boric acid or Group 6 CEA position required to attain various target power levels.

6.8.2 Transfer the values calculated in Attachment 19 to the table in Attachment 20, Rapid And Accelerated Downpower Boration/CEA Insertion Guidelines, and post the attachment in the Unit Control Room or maintain in the "In-Use" procedures book.

6.0 PROCEDURE (Continued)

NOTES: 1. The rate for a rapid downpower is 1 to 5 %/min. This rate is established to reduce power to prevent a Reactor Trip (e.g. Loss of MFW Pump or Circ. Water Pump) or in response to actions specified in an AOI (e.g SGTL)

2. CEA insertion and turbine load reduction are expected to be the major factors in attaining the target power level.

6.8.3 If plant conditions warrant the need to rapidly decrease power due to a Technical Specification action requirement (e.g. SGTL, LOCA, large power reduction) or to prevent a Reactor Trip (e.g. loss of a MFWP or Circulating Water Pump), then initiate a rapid downpower using Attachment 20, Rapid or Accelerated Downpower Boration/CEA Insertion Guidelines, to determine the amount of Boration and CEAs to be used to achieve the target power level.

.1 IF greater than 50% power decrease is required, then strong consideration should be given to tripping the Reactor and Turbine-Generator.

.2 If time permits, then to enhance system response to the plant transient, commence forcing Pressurizer Normal Spray flow as directed by the SRO Ops. Supv.

NOTES: 1. A 30% power drop by both CEA insertion and boration would, for example, insert CEAs to the 10% power level decrease position and borate the 20% power level decrease volume.

2. A faster power decrease may be obtained by emergency boration via HV-9247, but this requires careful monitoring of time and charging flow to determine volume of boration.

.3 Determine whether the rapid downpower is to be performed by boration only, CEA insertion only, or a combination of the two methods.

.4 Initiate direct boration and/or CEA insertion per the guidelines of Attachment 20. Stop CEA insertion any time the PPDIL alarm is received.

.5 Review the additional guidelines provided by Attachment 20.

.6 Take all necessary actions to compensate for Xenon build-in after stabilizing the unit at the target power level.

6.0 PROCEDURE (Continued)

6.9 Guidelines for Accelerated Downpower Transients

NOTE: 1. The rate for an accelerated downpower is 15 to 60 %/Hr. This rate is established to shutdown in response to Tech. Spec. Action Statement or a Tech. Spec. required power reduction (e.g. dropped CEA)

2. CEA insertion and turbine load reduction are expected to be the major factors in attaining the target power level.

3. "Boration Only" is the preferred method for a dropped CEA event. A combination of the two methods is preferred for other events.

6.9.1 If plant conditions warrant the need to decrease power at an accelerated rate (15 to 60 %/Hr) due to Technical Specification action requirement (e.g. Reactor shutdown required, dropped CEA), then initiate an accelerated downpower using Attachment 20, Rapid or Accelerated Downpower Boration/CEA Insertion Guidelines, to determine the amount of Boration and CEAs to be used to achieve the target power level.

.1 Determine whether the accelerated downpower is to be performed by boration only, CEA insertion only, or a combination of the two methods.

.2 Initiate direct boration and/or CEA insertion per the guidelines of Attachment 20. Stop CEA insertion any time the PPDIL alarm is received.

.3 Take all necessary actions to compensate for Xenon build-in after stabilizing the unit at the target power level.

6.10 EOC Shutdown - Turbine and Reactor Trip from 35% Reactor Power

NOTE: This section is to be used during an EOC shutdown when Hot Pin ASI concerns require a Turbine and Reactor trip from 35% Reactor Power.

6.10.1 If time permits, then perform the following actions prior to tripping the Turbine and Reactor:

.1 Shift the Blowdown Flash Tank Vent from the Third Point Heaters to the Condenser per SO23-9-4, Section for Operation of the Blowdown Flash Tank Vent.

6.0 PROCEDURE (Continued)

6.10.1.2 Remove the Heater Drain Pumps from service per SO23-2-3.

.3 Place the Auxiliary Steam System and Air Ejector Steam Supply in the configuration designated by the SRO Ops. Supv.

.3.1 If transfer of steam supplies is necessary, then perform the applicable steps of SO23-2-10, Section for Transfer of Auxiliary Steam Supplies.

.4 To enhance system response to the plant transient, commence forcing Pressurizer Normal Spray flow as directed by the SRO Ops. Supv.

6.10.2 Ensure the ESF component transfers initiated in Section 6.5 have been completed.

NOTE: Unnecessary steam loads should be isolated prior to taking the Reactor subcritical.

6.10.3 Since a mode change may affect chemistry sampling frequencies, limits and parameters, notify the Chemistry Department Foreman that the Unit is about to enter Mode 3.

6.10.4 Remove the Turbine Generator from service, as follows:

NOTE: Before tripping the turbine, having the SBCS modulating with a Manual-Local setpoint at the present Steam Generator pressure will ensure smoother transfer to SBCS and reduce secondary plant transients.

CAUTION To prevent SBCS Valve oscillations, 2(3)PIC-8431 SBCS Master Controller, should be placed in MANUAL prior to changing the Remote/Local setpoint selector switch.

.1 Prior to tripping the Turbine Generator, Ensure the SBCS Functions to maintain steam flow constant as follows:

- Two SBCS Valves have permissives in Manual (normally HV-8423 and HV-8425)
- The Master Controller 2(3)PIC-8431 is in Local with its setpoint 2 psig to 3 psig below existing Steam Generator pressure.

6.0 PROCEDURE (Continued)

6.10.4.2 Depress the TURBINE EMERGENCY STOP pushbutton.

.3 Initiate SO23-10-2, Section for Actions on a Turbine Trip while continuing with this section.

6.10.5 Place Feedwater Pump Mini-flow Valves, FV-3433 and FV-3432, in NORMAL for proper response to an RTO due to a Reactor Trip,

OR

Leave the Feedwater Pump Mini-flow Valves, FV-3433 and FV-3432, OPEN if a dedicated Operator is stationed at the Feedwater controls ready to compensate for the higher Feedwater Pump discharge pressure resulting from a RTO due to RX Trip.

6.10.6 Ensure the Steam Bypass Control System is operating in automatic and maintaining 1000 psia.

.1 If the Condenser is not available or if the MSIVs are closed, then use the Main Steam Atmospheric Dump valves.

6.10.7 When the Secondary plant has stabilized following the Turbine trip, then manually trip the Reactor from between 35% to 15% power and initiate SO23-12-1, Standard Post Trip Actions.

.1 Continue Plant shutdown per SO23-5-1.4.

7.0 RECORDS

7.1 Transmit completed Attachment 11 to the NPDES Engineer.

7.2 File Attachment 13 as follows:

7.2.1 If associated with a startup or shutdown, then file per SO123-0-32.

7.2.2 If associated with Steady State load, then transmit to Equipment Control for filing.

7.3 File Attachments 15, 18, 19 and 20 per SO123-0-32.

MAXIMUM CORE POWER ESCALATION RATE
(References 2.4.2.2 and 2.4.2.29 and 2.4.2.35)

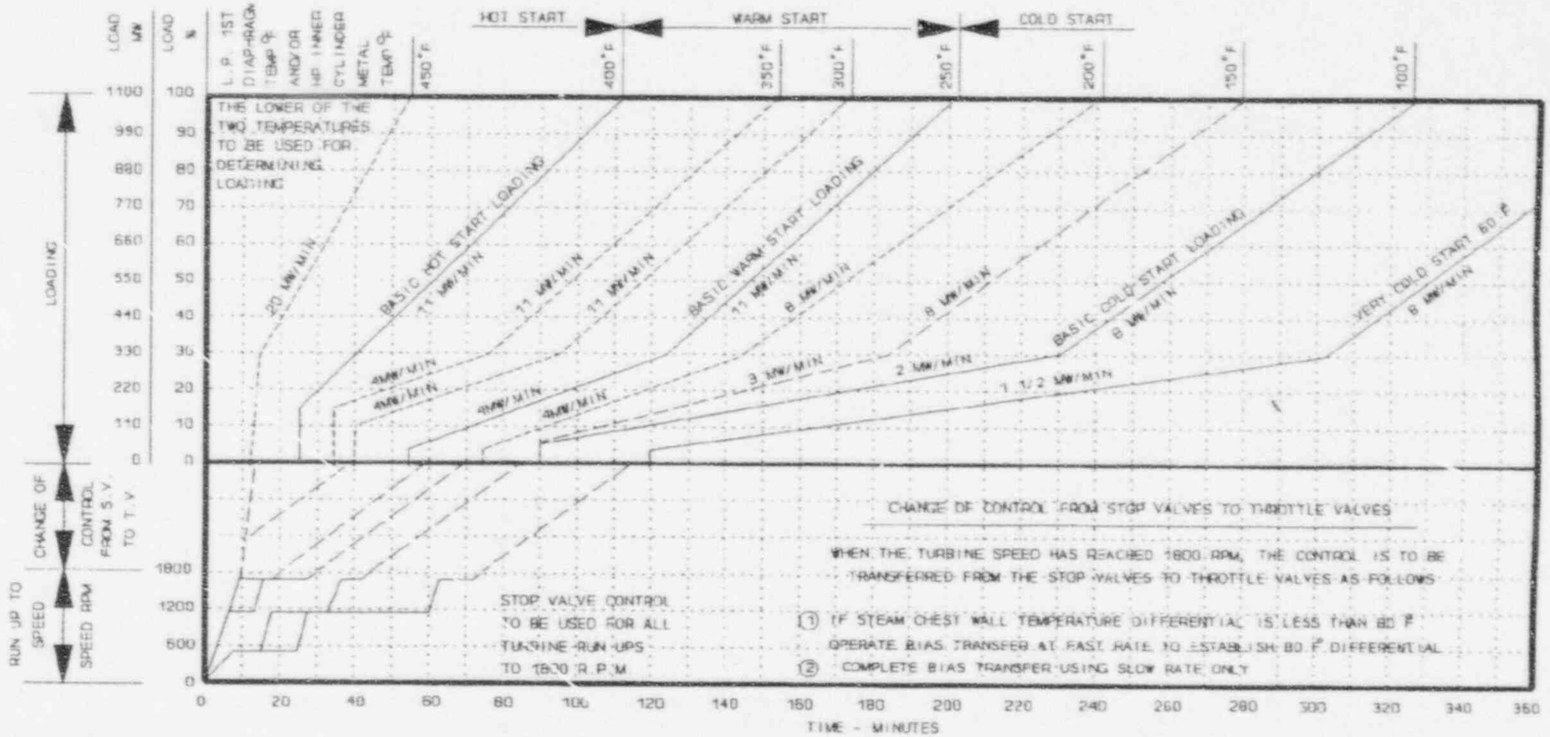
Fuel Condition Category	Applicable Power Range	Note	Maximum Core Power Escalation Rate
First power escalation after refueling.	20% to 100%	[1]	3% per hour
Increase in Reactor Power to a level which has not been previously sustained for more than 3 hours within the last 60 days.	Above 50%		3% per hour
When fuel cladding leaks are known to exist.	20% to 100%	[2]	5% per hour
All Other Times	0 - 100%	[3]	20% per hour

[1] Deviation from this ramp rate may be directed by Reactor Engineering per SO23-V-2.

[2] Refer to the Operations Physics Summary for current status of fuel failure per Reactor Engineering Transmittal.

[3] 10%/hr is the normal recommended power increase ramp rate.

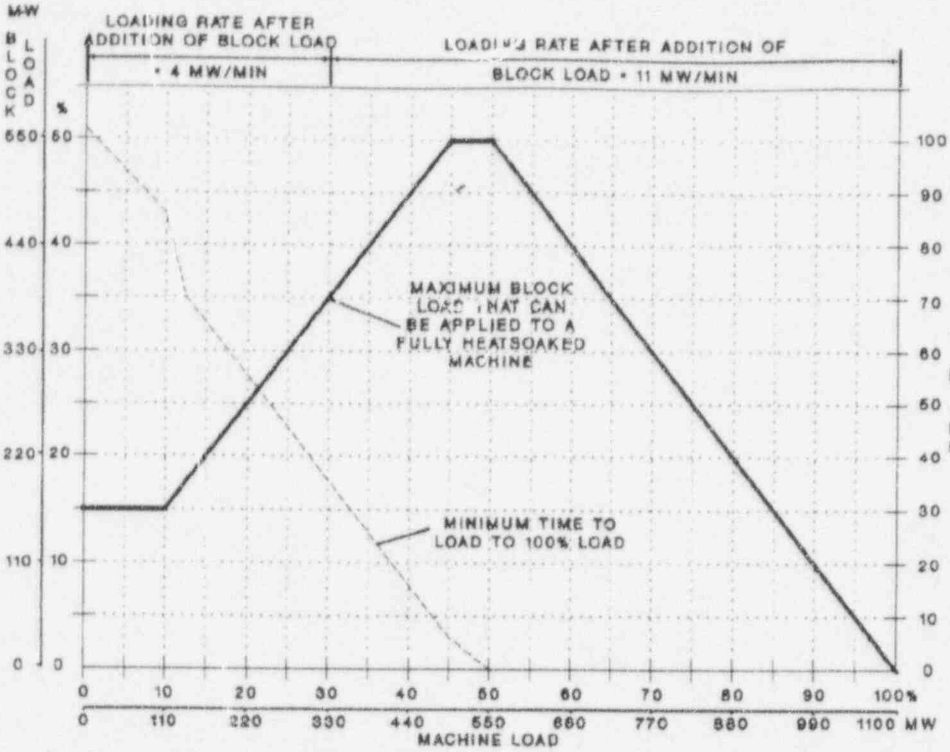
TURBINE RUN-UP AND LOADING RATES WITH REHEAT TEMPERATURE CONTROL



REHEAT STEAM TEMPERATURE-CONTROL - For all starts live steam should not be admitted to the live steam tube bundles prior to reaching 220 MWe gross.

LOADING RATES - For each type of start, hot, warm and cold, the limits provided can be for all H.P. and/or L.P. temperatures.

RECOMMENDED MAXIMUM RATES FOR INCREASING LOAD ON A HEATSOAKED MACHINE



1. The above rates are the recommended maximum loading rates for a fully heat soaked Turbine operating with the full reheat temperature.

2. These rates should not be used for frequent daily use but should be used as the limiting rate during the occasions when system demands rapid and large load increases.

3. If load changes are carried out on frequent basis, then the loading rates provided for a Turbine not fully heat soaked (Attachment 4) should be used as the limiting rates.

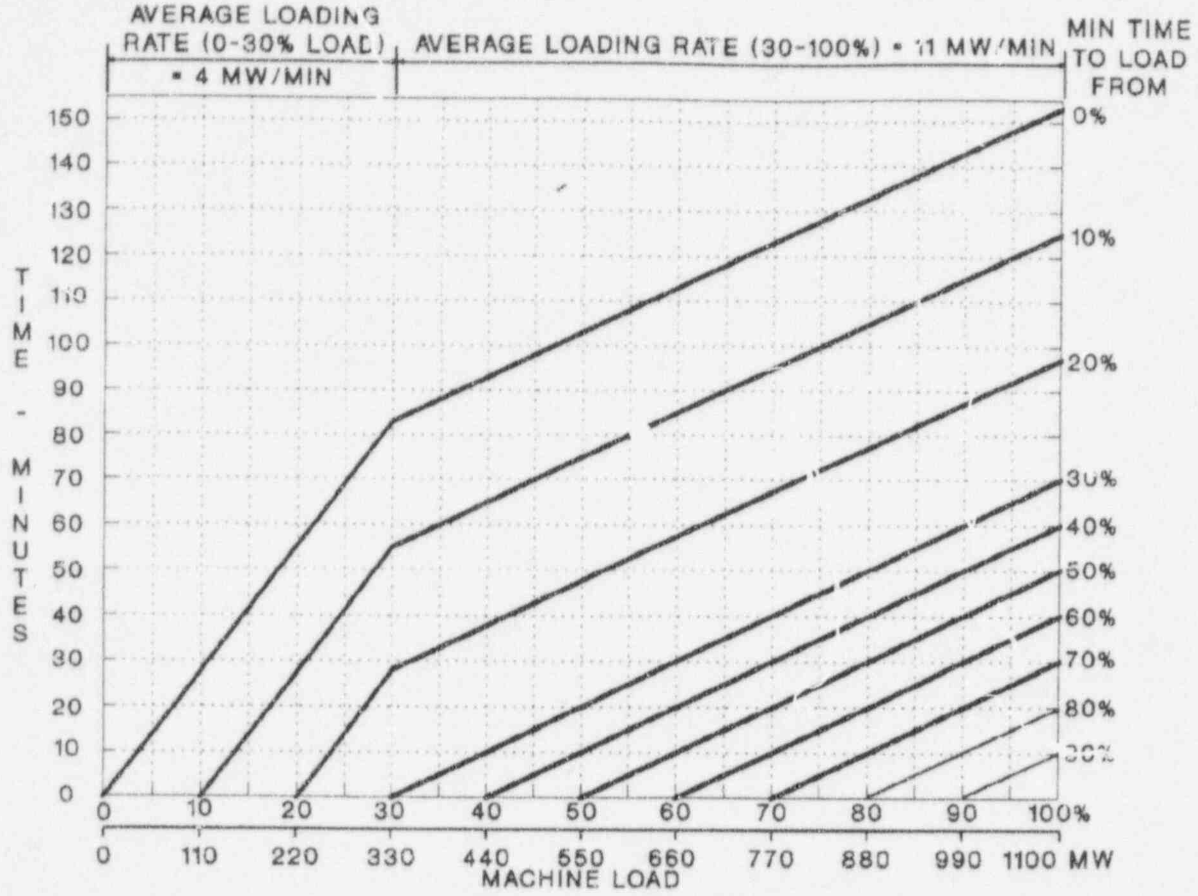
4. Following a Turbine startup, the loading rates and times provided by the appropriate startup curve must be followed in preference to the above rates.

5. The minimum time to heat soak the HP Turbine after a large load change is two (2) hours.

EXAMPLE

If the Turbine-Generator is Operating at 10% load and heat soaked (110 MWe), then the maximum block load that can be applied is 15% (165 MWe). Loading can then continue at 4 MW/min up to 30% load (330 MWe), and then at 11 MW/min up to full load. The total time to achieve full load would be 64 minutes.

RECOMMENDED MAXIMUM RATES FOR INCREASING LOAD ON A MACHINE NOT HEATSOAKED

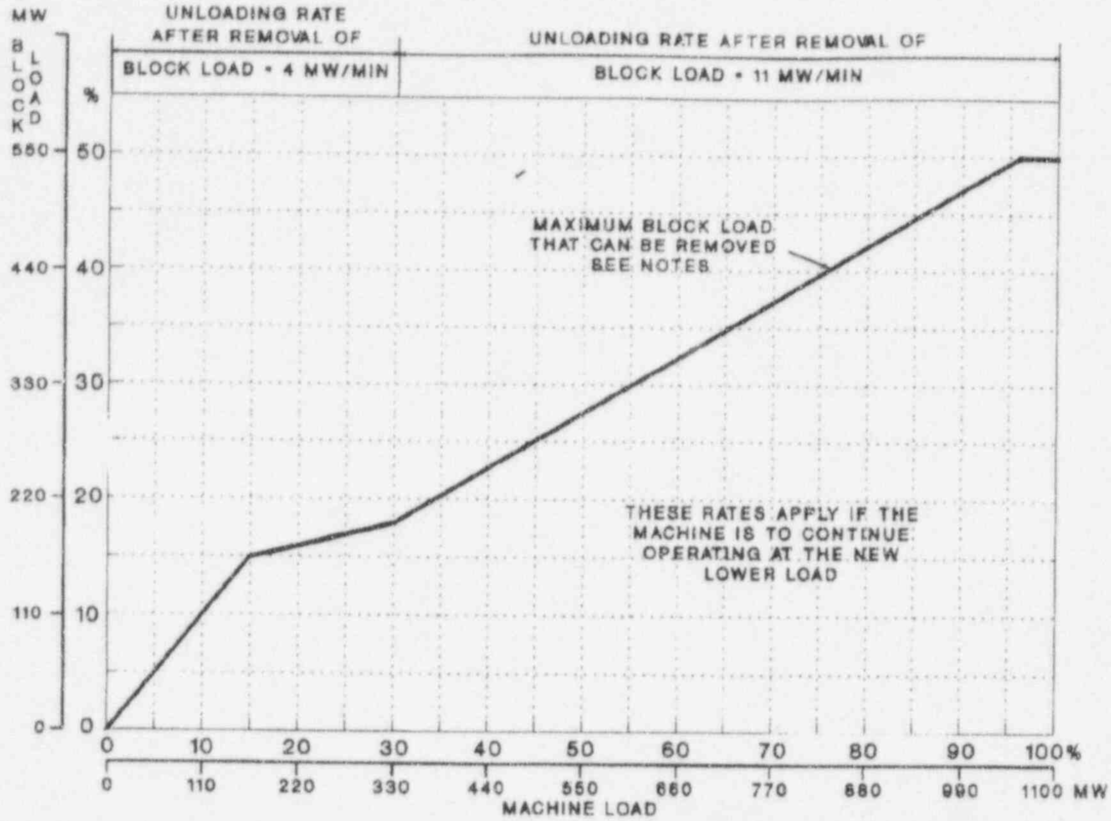


1. The above rates are the recommended maximum loading rates for the Turbine operating with full reheated steam temperature but not fully heatsoaked at the prevailing load.

2. The time to heat soak the HP Cylinder after reaching a steady load is dependent on the magnitude of the load change, but usually can be estimated at approximately two (2) hours.

3. Following a Turbine startup, the loading rates and times given in the appropriate startup curve should be followed in preference to the above rates.

RECOMMENDED MAXIMUM RATES FOR DECREASING LOAD



1. The above rates are the recommended maximum unloading rates when the Turbine-Generator is to continue operation at a new lower load.

2. The above recommended maximum block loads can only be removed if the prevailing high load on the Turbine-Generator has not been exceeded within the previous 2 hour period.

3. These maximum rates are not to be taken as permissible for frequent daily use but should be regarded as limiting during the occasions when the system demands rapid large load reductions.

4. If load changing is carried out on a frequent basis, then the recommended maximum block load is to be reduced as far as possible, and the given steady unloading rates used as the maximum rates.

5. In cases of emergency, such as load reduction followed by operation at low load, the above rates may be exceeded.

6. In the case of emergency shutdown, the above rates may be exceeded, but the Turbine is to be tripped upon reaching low load.

RECOMMENDED POWER PLATEAUS

1.0 The following list of examples are to be used as an aid in determining the desired reduced Power Level Plateau. Power/load conversions are based upon Attachment 7. (Ref. 2.4.2.3 and 2.4.2.13)

1.1 Existing or predicted plant conditions may warrant further adjustment of these values.

2.0 Equipment Out of Service		Reactor Power	Approximate Load (gross)
2.1	**Circulating Water System**		
2.1.1	One Circulating Water Pump Off	75% [2]	860 MWe
2.1.2	Two Circulating Water Pumps Off	65% [4]	740 MWe
2.1.3	Heat Treatment of the Circulating Water System	80-85%	920 MWe to 980 MWe
2.1.4	Circulating Water System Tunnel Swaps	80-85%	920 MWe to 980 MWe
2.1.5	Operation With Reversed Tunnels and Flow Restrictions Installed	90% [1]	1060 MWe
2.2	**Condensate/Feedwater System**		
2.2.1	One Condensate Pump Off and Two Heater Drain Pumps Off	75%	60 MWe
2.2.2	Two Condensate Pumps Off and Two Heater Drain Pumps Off	50%	540 MWe
2.2.3	One Main Feedwater Pump Off	75%-80% [3]	860 MWe to 920 MWe
2.2.4	One Feedwater Heater Train Out of Service	90%	1060 MWe
2.2.5	One First Point Feedwater Heater Out of Service	95%-98%	1085 MWe to 1115 MWe

[1] Maintain power level within Condenser Circ. Water ΔT limitations.

[2] This limit is necessary to prevent Condenser tube failures caused by high velocity steam in the midspan regions of the neighboring quadrant tube bundle. (Ref. 2.4.2.15)

[3] See Section 2.6 to determine specific guidance and monitoring requirements.

[4] The Security Shift Commander shall be notified when entering a condition of 2 or less Circulating Water Pumps running.

2.0	Equipment Out of Service (Continued)	Reactor Power	Approximate Load (gross)
2.3	**Turbine/Generator**		
2.3.1	One Turbine Stop/Throttle Valve Closed	95%	1120 MWe
2.3.2	One Generator Hydrogen Cooler Out of Service	75%	860 MWe
2.3.3	One Stator Cooling Water Heat Exchanger Out of Service	50%	540 MWe
2.3.4	One MSR Relief Valve Out of Service	92%	1070 MWe
2.4	**COLSS/CEAC**		
2.4.1	Core Operating Limit Supervisory System and COLSS Backup Computer Out of Service (Ref. 2.4.2.7)	92%	1070 MWe
2.4.2	Both CEACs Out of Service with COLSS or COLSS Backup Computer in Service.	[5]	
2.4.3	Both CEACs Out of Service with COLSS and COLSS Backup Computer out of Service.	[5]	
2.5	**Main Steam Safety Valves (MSSVs)** (Per Operable Steam Generator)		
2.5.1	One MSSV out of service. (8 MSSVs Operable)	90% [6]	1060 MWe
2.5.2	Two MSSVs out of service. (7 MSSVs Operable)	77% [6]	910 MWe
2.5.3	Three MSSVs out of service. (6 MSSVs Operable)	65% [6]	740 MWe
2.5.4	Four MSSVs out of service. (5 MSSVs Operable)	53% [6] [7]	625 MWe

[5] Determine Reactor Power level per SO23-3-2.13.
[6] Allowable power levels are approximately 9% below the linear power level-high trip setpoints of Technical Specification 3.7.1.1 Table 3.7-2. (Ref. 2.4.2.27)
[7] With less than 5 MSSVs Operable, then apply Tech. Spec. 3.7.1.1, Action b.

2.0 Equipment Out of Service (Continued)

2.6 Guidelines for Single Main Feedwater Pump Operation (Ref. 2.4.2.31)

2.6.1 75% Power Limitation

.1 Assumes the following MFW Pump support conditions:
- 4 Condensate Pumps in operation
- 2 Heater Drain Pumps in operation

.2 Exceptions to above support conditions are allowed when approved by Operations Management and Station Technical.

.3 Actual power level may vary depending on plant conditions e.g., Feedwater Heater O.O.S for tube repair, Heater Drain Pump O.O.S., or Condensate Pump O.O.S. (Ref. 2.4.2.24)

2.6.2 80% Power Limitation

.1 Assumes the following MFW Pump support conditions:
- 4 Condensate Pumps in operation
- 2 Heater Drain Pumps in operation

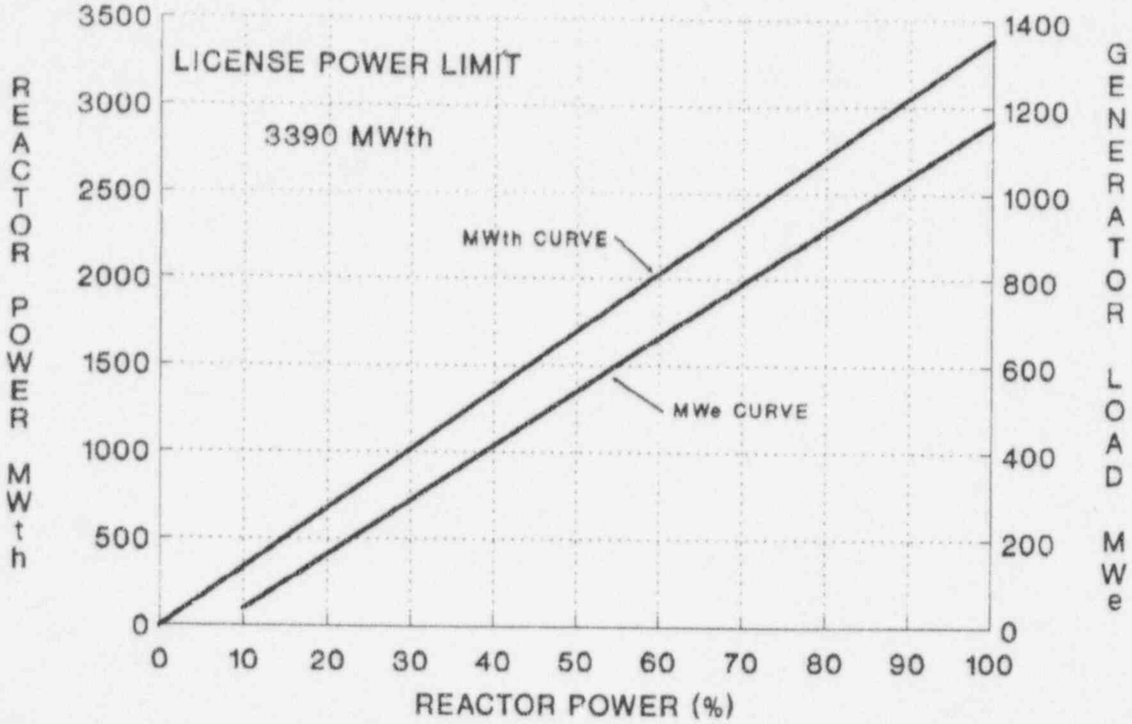
.2 Obtain approval from Operations Management and Station Technical.

.3 Periodically monitor the following parameters. Report any rising trends to Station Technical.

VIBRATION			**BEARING LUBE OIL TEMPERATURE**		
L-183	**K-005**	**K-006**	**TJR-8299**	**K-005**	**K-006**
PUMP OB	NIT 4533A	NIT 4532A	TURBINE IB	TE 4507	TE 4509
PUMP IB	NIT 4533B	NIT 4532B	TURBINE OB	TE 4506	TE 4508
PUMP THRUST	NIT 4533C	NIT 4532C	ACT THRUST	TE 4555	TE 4554
TURBINE IB	NIT 4533D	NIT 4532D	INACT THRUST	TE 4557	TE 4556
TURBINE OB	NIT 4533E	NIT 4532E	THRUST DRAIN	TE 4558	TE 4559
TURB THRUST	NIT 4533F	NIT 4532F	PUMP IB	TE 4520	TE 4514
TURBINE CASING DRAIN LEVEL			PUMP OB	TE 4517	TE 4510
Monitor Casing Drains; level is expected to rise due to increased steam flow.			THRUST	TE 4550	TE 4546
			THRUST	TE 4551	TE 4547

.4 If a Condensate Pump or Heater Drain Pump trips, or a MFW Pump Miniflow Valve fails, then monitor S/G levels. If level is lowering, then ramp power down until levels stabilize.

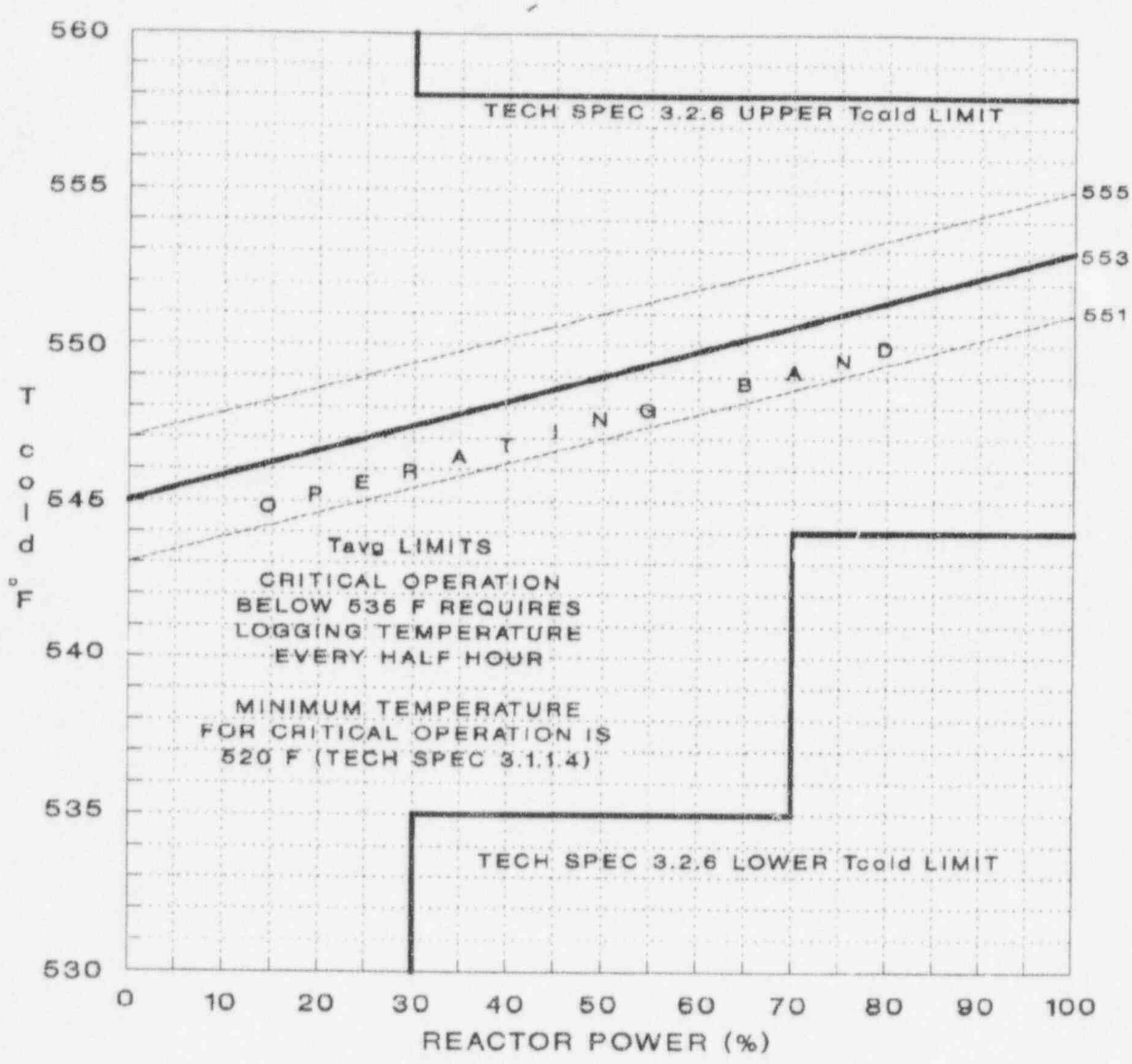
REACTOR POWER vs. MEGAWATTS



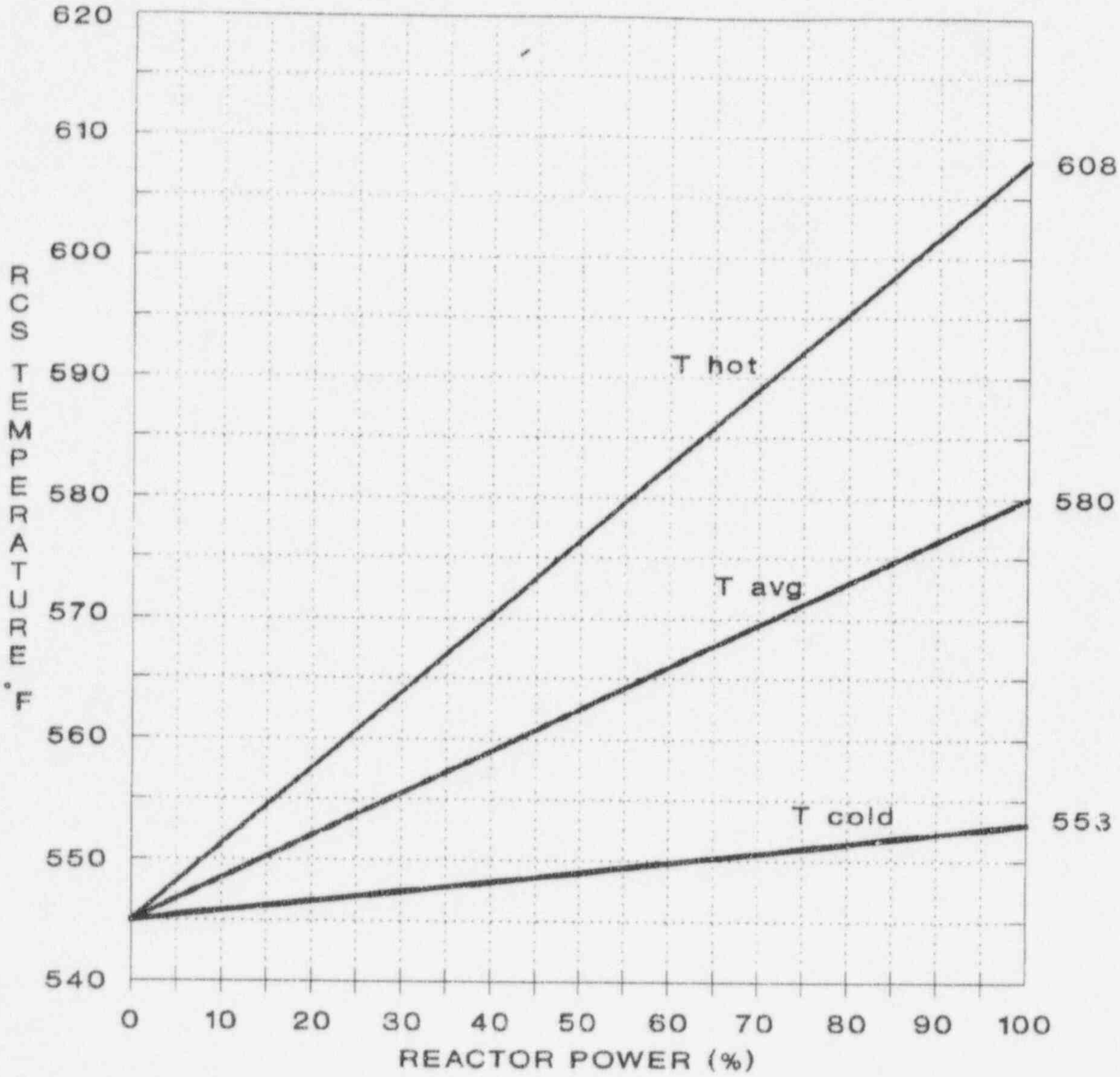
CONVERSIONS VARY WITH HEAT RATE.

Tcold vs. REACTOR POWER

NOTE: When Reactor Engineering is performing physics testing (e.g., ITC), then the associated procedures may direct that Tcold be raised above 555°F. This is acceptable, provided the **AVERAGE** Tcold value is ≤558°F with the **HOTTEST** Tcold ≤560°F. (Ref. 2.4.2.33)



Thot, Tavg AND Tcold PROGRAM



GUIDELINES FOR LOSS OF COLSS AND COLSS BACKUP COMPUTER

1.0 Power Reduction Guidelines

1.1 Initiate SO23-3-3.6, COLSS Out of Service Surveillance.

1.2 Power Operation with DNBR/LHR outside of acceptable limits may continue for up to 4 hours following both COLSS and COLSS Backup Computer being declared Inoperable, providing DNBR/LPD Margins are monitored and recorded every 15 minutes and no Adverse Trend is detected. (Adverse Trend is defined in SO23-3-3.6.)

1.2.1 Documentation of required 15 minute monitoring and recording of DNBR/LPD Margins is accomplished by performing SO23-3-3.6, Attachment for DNBR Margin/Linear Heat Rate Limit Monitoring.

1.3 If it is determined that either COLSS or COLSS Backup Computer may not be returned to service within 4 hours of Inoperability, then determine the magnitude of the Power reduction required to achieve an acceptable DNBR/LPD Margin.

1.3.1 Required power reduction shall be completed to ensure DNBR/LPD Margins are within Tech. Spec. acceptable limits prior to this 4 hour time limit. (Tech. Specs. 3.2.1, & 3.2.4)

1.3.2 Use the thumb rule that a 3% Power reduction will result in an increase in DNBR of 0.1.

1.4 During the Load reduction, control ASI per Section 6.6.2. (Reg. Group 5 is not permitted for ASI control under this condition.)

1.4.1 Monitor Average ASI (PID-268) using the average of the operable CPC channels.

1.5 _If_ acceptable DNBR/LPD Margins are not achieved within the 4 hour time limit of COLSS and COLSS Backup Computer Inoperability, _then_ reduce Thermal Power to less than or equal to 20% of Rated Thermal Power within the next 6 hours.

1.6 While operating at reduced Steady State load, maintain ASI at the ESI ± 0.01 Shape Index Units per the Section 6.4, Guidelines for Steady State Power Operation.

1.6.1 Establish an hourly plot of ASI using Attachment 13, to be used for predicting when Xenon oscillation dampening will be required.

1.0 Power Reduction Guidelines (Continued)

1.7 When operating at a reduced power to maintain DNBR Margin, then monitor DNBR Margin during ASI changes to ensure that it remains in the acceptable region of operation as required by Tech. Spec. Figure 3.2-1 or 3.2-2, as applicable.

1.7.1 If DNBR Margin approaches the region of unacceptable operation of Tech. Spec. Figure 3.2-1 or 3.2-2, then reduce Power an additional 5% or until an acceptable DNBR Operating Margin is reached.

2.0 Technical Specification Actions

2.1 Ensure within 2 hours all Regulating Group CEAs are above their Short Term Steady State Insertion Limit. (Tech. Spec. Fig.3.1-2)

2.2 Ensure CEA Reg. Group 5 is fully withdrawn per SO23-3-3.5, Attachment for CEA Position vs. EFPD (Tech. Spec. 3.1.3.6)

2.3 With one or both CEACs out of service, refer to SO23-3-2.13, Section for CEAC Inop.

CIRCULATING WATER INTAKE/DISCHARGE DELTA T

1.0 PREREQUISITES

1.1 The Unit is at a Steady State Power Level of greater than 50%, and any one of the following occurs:

1.1.1 The Circ. Water Temperature Data Logger 2(3)L-168 is out of service.

1.1.2 Window 2(3)64A14, CIRC. WTR. TEMP. MONITOR SYSTEM TROUBLE, is in the alarm condition. This alarm is inoperable when the Data Logger is measuring a negative delta T due to reverse Circulating Water conduit flow.

1.1.3 Circulating Water Conduit reverse flow for a period greater than 4 hours.

1.2 Heat Treatment of the Circulating Water system is NOT in progress.

2.0 PRECAUTION

2.1 The daily (24-hour period, midnight to midnight) average differential temperature of the Circulating Water Discharge and Intake shall not exceed 20.4°F ΔT. (Ref. 2.1.2)

2.1.1 The Daily Average ΔT limit ensures the NPDES ΔT limit of 20°F will not be exceeded. Insignificant figures are rounded in accordance with the NPDES Permit and Standard Methods (i.e., values up to 20.499°F are rounded down to 20°F by Environmental for the monthly NPDES report).

2.1.2 The Instantaneous ΔT limit is 21°F (one minute average).

NOTES: 1. Starting or stopping a Saltwater Cooling Pump in the opposite Unit Intake can affect Circ. Water ΔT. If the opposite Unit injection temperature is lower, then ΔT may lower. Conversely, a higher injection temperature may raise ΔT.

2. Prolonged operation with Fish Return Sluicing Water in service can raise Circ. Water ΔT on the affected Unit.

2.2 If Daily Average Circ. Water ΔT is close to the limit of 20.4 °F, then starting and stopping SWC Pumps in the opposite Unit Intake, or operating with flow through the Fish Return Sluicing line, must be evaluated for possible affect on ΔT.

3.0 PROCEDURE

3.1 When logging is required per Section 1.0, then monitor and record Circulating Water Intake and Discharge ΔT every two hours.

3.2 Determine Circulating Water Intake and Discharge differential temperature for the daily log sheet, as follows:

NOTE: The NPDES Engineer should be notified if the Circ. Water Temperature Data Logger, L-168, is not available.

3.2.1 If the Circulating Water Conduits are in normal flow, then the following methods should be used in descending order of preference:

.1 Circ. Water Temperature Data Logger, L-168

.2 PMS PIDs:

- TE-5228C, "Intake Sea Water Temperature"
- TE-5296C, "Discharge Sea Water Temperature"

OR average the following intake and discharge:

- TE-5129, "Main Condenser NE(SE) Inlet"
- TE-5125, "Main Condenser NW(SW) Inlet"
- TE-5179, "Main Condenser SW(NW) Inlet"
- TE-5180, "Main Condenser SE(NE) Inlet"
- TE-5119A, "Main Condenser NE(SE) Outlet"
- TE-5120A, "Main Condenser SW(NW) Outlet"
- TE-5170A, "Main Condenser NW(SW) Outlet"
- TE-5194A, "Main Condenser SE(NE) Outlet"

.3 Average of available points from recorder TJR-5159 (CR-59)

.4 Circ. Water Temperature Recorder, TR-5296 (L-111, Heat Treat Panel)

.5 Request I&C to monitor Temperatures at the Intake and Outfall Stop Gates using a calibrated portable temperature monitoring instrument.

3.0 PROCEDURE (Continued)

3.2.2 If the Circulating Water Conduits are in reverse flow, then only the following methods should be used in descending order of preference:

.1 Circ. Water Temperature Data Logger, L-168

.2 PMS PIDs:

- TE-5228C, "Intake Sea Water Temperature"
- TE-5296C, "Discharge Sea Water Temperature"

.3 Circ. Water Temperature Recorder, TR-5296

.4 Request I&C to monitor Temperatures at the Intake and Outfall Stop Gates using a calibrated portable temperature monitoring instrument.

NOTE: The NPDES requirement of maintaining a temperature difference of less than 20°F is waived during Heat Treatment. Hours of heat treatment should not be used to perform the following calculations.

3.3 Record Circ. Water ΔT every two hours on the daily log sheet. (Mark N/A log readings for the hours a heat treatment is in progress.)

3.3.1 If the requirement to log Circ. Water ΔT has just commenced, then obtain and record previous ΔT readings for the current day and mark N/A for the previous calculations.

3.3.2 If Circ. Water Temperature Data Logger, L-168 is out-of-service, then from the PMS, generate a two hour average trend at five minute intervals (using preferred PMS PIDs) and record this value on the daily log sheet.

3.4 After Circ. Water ΔT has been recorded, then perform the following:

3.4.1 Calculate and record a new daily average using the following formula:

$$\text{Daily Avg.} = \frac{\text{Sum of Actual Circ. Water } \Delta T \text{ 2 hour readings}}{\text{Total Number of Circ. Water } \Delta T \text{ 2 hour readings}}$$

.1 If the 2300 calculated Daily Average exceeds 20.4°F ΔT, then immediately notify the Unit Superintendent and the NPDES Engineer.

3.0 PROCEDURE (Continued)

3.4.2 Calculate and record a new allowable Circ. Water ΔT using the following formula: [1]

$$\textbf{Allowable } \Delta T = \frac{\textbf{489.6 - [Daily Average x (24 - Number Hours Remaining in Day)]}}{\textbf{Number of Hours Remaining in Day}}$$

.1 If actual Circ. Water ΔT is greater than Allowable ΔT, then notify the Shift Superintendent and reduce power as necessary until actual Circ. Water ΔT is ≤ Allowable ΔT.

3.5 Refer to SO23-5-1.1 for limitations during heat treating evolutions.

4.0 RECORDS

4.1 Route completed daily log sheet to the SRO Ops Supv. for review, then forward to the NPDES Engineer.

[1] The calculation is derived, as follows:

Allowable ΔT = Maximum ΔT available in order to remain within limits

489.6 = Cumulative ΔT limit constant for any day (20.4°F x 24 hrs.)

Daily Average = Current average hourly ΔT up to the present time

Number Hours Remaining in Day = Number of hours left until midnight

24 - Number Hours Remaining in Day = Number of hours to present time

CIRCULATING WATER INTAKE/DISCHARGE ΔT

UNIT ______ DATE ______

CAUTION: If Actual Circ. Water ΔT is greater than Allowable ΔT, then the Shift Superintendent must be notified and power reduced as necessary until Actual Circ. Water ΔT is ≤ Allowable ΔT.

TIME (Line Thru unused column)	PLANT POWER (CV9005AVG)	ACTUAL CIRC WATER ΔT (°F)	CALCULATED DAILY AVG. ΔT (°F) [2]	CALCULATED ALLOWABLE ΔT (°F) [3]
0000/0100				
0200/0300				
0400/0500				
0600/0700				
0800/0900				
1000/1100				
1200/1300				
1400/1500				
1600/1700				
1800/1900				
2000/2100				
2200/2300				

R TCN

[2] Calculate per Step 3.4.1.
[3] Calculate per Step 3.4.2.

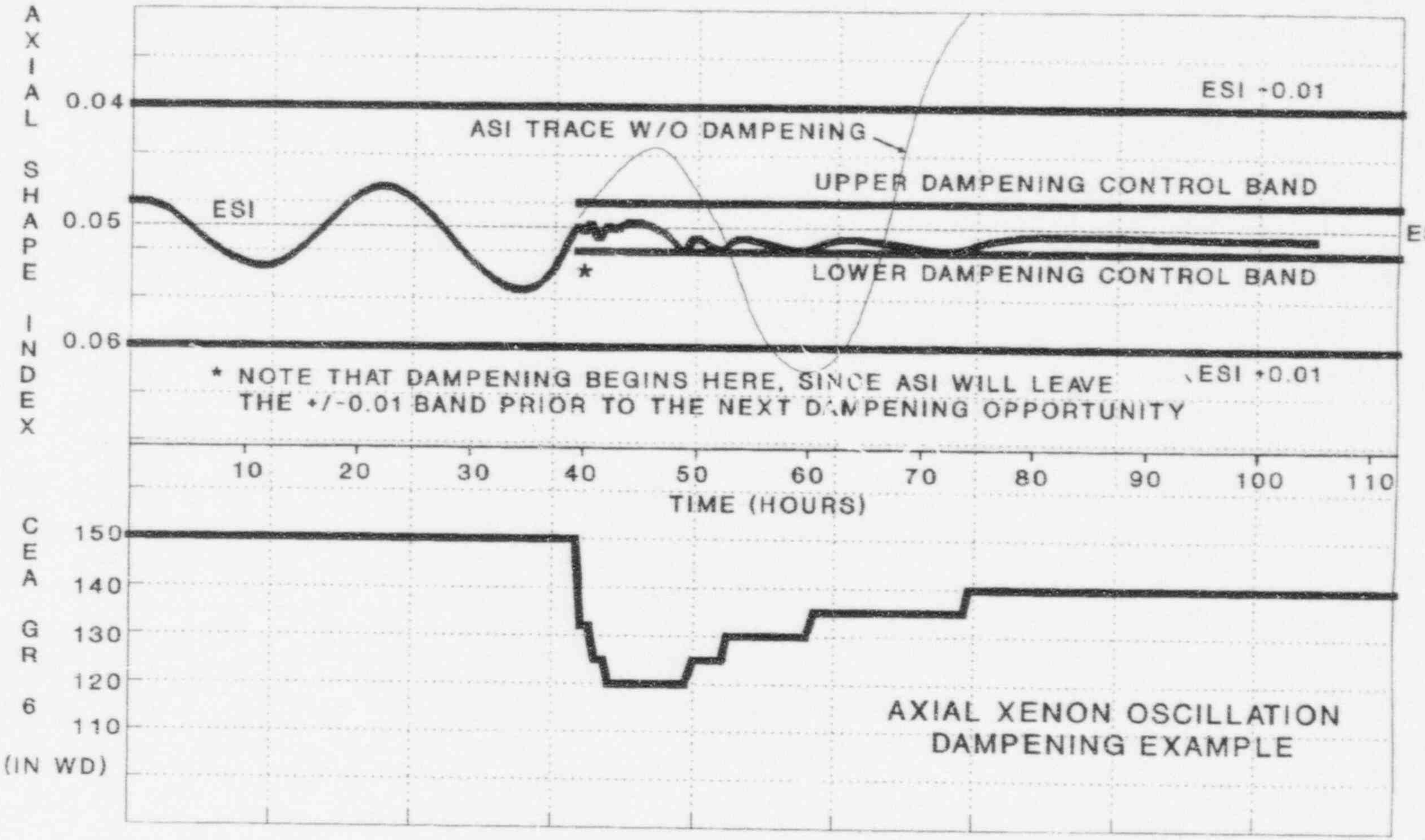
0100-0600: PERFORMED BY: ______________ REVIEWED BY: ______________ / ______
SRO Ops. Supv./ Date

0600-1800: PERFORMED BY: ______________ REVIEWED BY: ______________ / ______
SRO Ops. Supv./ Date

1800-2300: PERFORMED BY: ______________ REVIEWED BY: ______________ / ______
SRO Ops. Supv./ Date

File Disposition: Route to SRO Ops. Supv. for review, then forward to NPDES Engineer.

AXIAL XENON OSCILLATION DAMPENING EXAMPLE



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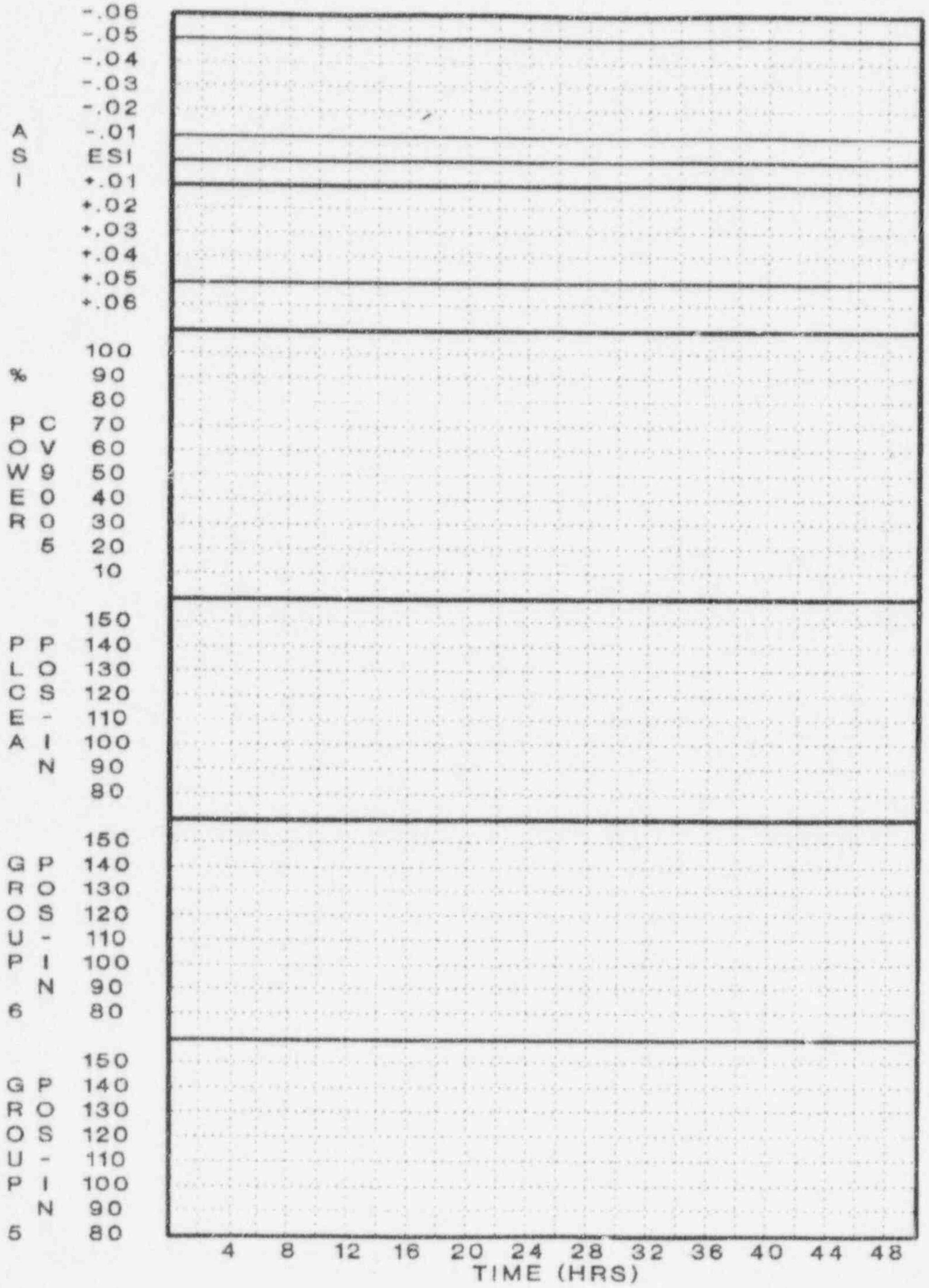
ASI PLOT

UNIT _____ DATE ______________



FILE DISPOSITION: File per Section 7.0 of this instruction.

ASI CONTROL STRATEGY DURING STEADY STATE OPERATION

1.0 **ASI Guidelines**

NOTE: To minimize possibility of ASI exceeding band of ESI ± 0.05 Shape Index Units, ASI is typically maintained within a band of ESI ± 0.01 Shape Index Units.

1.1 Operations Physics Summary, Figure 6-1, or as directed by a memorandum approved in accordance with SO23-V-13. (Ref. 2.2.3 and 2.4.2.2)

1.1.1 If the ESI per the Operations Physics Summary differs from the "observed ESI" (ASI average over an oscillation cycle), then the "observed ESI" may be used at the SRO Ops. Supv. discretion. (Ref. 2.4.2.23)

NOTE: ASI may be permitted to swing for determining ESI if directed by Reactor Engineering.

1.1.2 If the ASI oscillations are of small magnitude, then perform Section 2.0 at the SRO Ops. Supv. discretion. (Ref. 2.4.2.23)

1.1.3 If CEAs are required to dampen ASI oscillations, then perform Section 3.0. However, to minimize potential for pellet/clad interaction in the CEA affected zone, move CEAs in small smooth, frequent movements of less than 3 inches per minute. Offset CEA movement by dilutions or borations, as applicable.

2.0 **Control of Small Magnitude ASI Oscillations** (Ref. 2.4.2.5)

2.1 To minimize CEA motion, the initial control of ASI oscillations of small magnitude may be attempted at SRO Ops. Supv. discretion by utilizing temperature changes within the full power temperature band, as follows:

2.1.1 To prevent large oscillations from starting, attempt to maintain the size of the Xenon oscillation to less than or equal to 0.01 ASI units, peak-to-peak.

2.0 **Control of Small Magnitude ASI Oscillations** (Continued)

NOTE: An approximate value for ASI worth as a function of temperature is 0.002 ASI Units/°F.

2.1.2 Attempt to perform RCS dilutions to return Tc to the upper half of its Control Band (Attachment 8) to coincide with periods when the ASI is more negative than the ESI.

2.1.3 Attempt to perform RCS borations to return Tc to the lower half of its Control Band (Attachment 8) to coincide with periods when the ASI is more positive than the ESI.

3.0 **Control of Large Magnitude ASI Oscillations**

NOTE: Attachment 12 is an example of ASI dampening by CEA insertion.

3.1 If CEA half wave dampening is required on projected ASI shift outside the target band, then while power is moving toward the top of the Core, commence inserting PLCEAs or Reg. Group 6 to hold ASI at ESI ± 0.01 shape index units (PLCEAs is preferred). Complete one of the following steps: (See Step 1.1.3)

3.1.1 Insert the PLCEAs per SO23-3-1.3 until the ASI target is reached, or until 112.5 inches [1] is reached, whichever is more limiting. (Tech. Spec. Fig. 3.1-3)

3.1.2 Insert Reg. Group 6 CEAs until the ASI target is reached, or until 120 inches is reached, whichever is more limiting. (Tech. Spec. Fig. 3.1-2)

3.1.3 If additional CEA insertion is required to maintain ASI within the target band, then perform Step 3.1.1 again for the CEAs not yet inserted.

[1] If Reactor Power level is between 20% and 50%, then PLCEAs may be inserted until 75 inches is reached. However, in this case the time limits of Tech. Spec. 3.1.3.7 apply and logging is required per SO123-0-42, Att. 26.

[2] If COLSS is out-of-service, then the Short Term Insertion limit may be more limiting than the Transient Insertion Limit. See Tech. Spec. 3.1.3.6.

3.0 **Control of Large Magnitude ASI Oscillations** (Continued)

3.1.4 If further CEA insertion is required to maintain ASI within the target band, then complete the following: (See Step 1.1.3)

CAUTION Inserting Group 6 CEAs below 80 inches for control of a strongly negative ASI will worsen the problem.

.1 Insert Reg. Group 6 CEAs until the ASI target is reached, or until the Transient Insertion Limit [2] is reached, or until CEAs are 80 inches withdrawn, whichever is most limiting. (Tech. Spec. Fig. 3.1-2)

.2 When below the Long Term Steady State Insertion limits, then adhere to the time limitations of Tech Spec. 3.1.3.6 and logging requirements of SO123-0-42, Attachment 25.

3.1.5 If further CEA insertion is required to maintain ASI within the target band, then insert Reg. Group 5 while ensuring at least 15 inches of separation is maintained between Groups 5 and 6. (Ref. 2.4.2.9, 2.4.2.10, and 2.4.2.12)

3.1.6 If ASI cannot be maintained within the ± 0.05 steady state band, then a Power reduction should be considered to restore ASI within the operating band.

3.1.7 As Xenon distribution reverses and shifts the power distribution back toward the bottom of the core, commence withdrawing CEAs to hold the ASI at the ESI ± 0.01 Shape Index Units. (See Step 1.1.3)

POWER MANEUVERING BORATION/DILUTION GUIDELINES

UNIT ________

PERF. BY INITIALS

1.0 PREREQUISITES

1.1 Verify this document is current by checking a controlled copy or by using the method described in SO123-VI-0.9. ________

NOTES: 1. Enter values as positive within this procedure.

2. The values required in this attachment may be obtained from Reactor Engineering.

3. Data supplied by Reactor Engineering shall be in the format specified by SO23-V-13 with a copy of the transmittal affixed to this Attachment.

2.0 POWER MANEUVERING GUIDELINES

2.1 Increasing Power

2.1.1 Determine the maximum loading rate for the power increase based on Turbine temperatures and fuel conditioning. Use the most restrictive loading rate. Review the following attachments:

.1 Attachment 1, Maximum Core Power Escalation Rate

.2 Attachment 2, Turbine Run-up and Loading Rates With Reheat Temperature Control

.3 Attachment 3, Recommended Maximum Rates for Increasing Load on a Heatsoaked Machine

.4 Attachment 4, Recommended Maximum Rates for Increasing Load on a Machine NOT Heatsoaked

2.1.2 _If_ equipment required for the target power plateau is or will be removed from service, _then_ determine the reduced steady state power plateau per Attachment 6, Recommended Power Plateaus. (Ref. 2.4.2.3)

2.1.3 Determine the time expected to remain at each intermediate power plateau. Ensure action has been taken to restore deficient equipment to operability to support reaching the target power plateau.

2.0 POWER MANEUVERING GUIDELINES (Continued)

2.1.4 Obtain a Xenon profile based on past power history and the projected power history for the transient to the target power level. The Xenon profile may be obtained by:

.1 Generating the Xenon profile by inputting the necessary data into the Reactivity Calculator Xenon option on the applicable PC, or R | TCN

.2 Requesting Reactor Engineering provide the Xenon profile.

2.1.5 Calculate the boration/dilution volumes and injection rates required to achieve the load increase at the desired loading rates per Step 3.0.

2.2 **Decreasing Power**

NOTES: 1. If the power decrease is occurring at End Of Cycle (RCS boron concentration less than 50 ppm), and plans are to come off line without stopping at some lower power level, then the optimum is a steady load drop of at least 10% per hour.

2. If the power decrease is occurring at End Of Cycle (RCS boron concentration less than 50 ppm), and plans are to stop the power decrease at some lower power plateau, then the optimum is a slow and steady power reduction of 2% per hour or less.

2.2.1 Determine the maximum unloading rate for the power decrease by reviewing Attachment 5, Recommended Maximum Rates for Decreasing Load.

.1 During an emergency situation, power may be decreased by either CEA insertion, boration, or both, and the limits of Attachment 5 may be exceeded.

.2 During normal maneuvering, power decrease should be accomplished by boration, while CEAs are used for ASI control.

2.2.2 If equipment required for the current power plateau is to be removed from service, then determine the reduced steady state power plateau per Attachment 6, Recommended Power Plateaus. (Ref. 2.4.2.3)

2.2.3 If a load reduction is required to restore DNBR Operating margin due to a loss of COLSS and COLSS Backup Computer, then refer to Attachment 10 for additional guidelines.

2.0 POWER MANEUVERING GUIDELINES (Continued)

2.2.4 If one or both CEACs is lost, then refer to SO23-3-2.13, Section for CEAC Inoperability.

2.2.5 Determine the time expected to remain at each intermediate power plateau. Ensure action has been taken to restore deficient equipment to operability to support reaching the target power plateau.

2.2.6 Obtain a Xenon profile based on past power history and the projected power history for the transient to the target power level. The Xenon profile may be obtained by:

.1 Generating the Xenon profile by inputting the necessary data into the Reactivity Calculator Xenon option on the applicable PC, or

TCN

.2 Requesting Reactor Engineering provide the Xenon profile.

2.2.7 Calculate the boration/dilution volumes and injection rates required to achieve the load decrease at the desired unloading rate per Step 3.0.

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION

3.1 Record the present power plateau data:

Reactor Power: _________ % Boron Concentration: ________ ppm

CEA Position: Group _____ at _____ " Burnup: ________ EFPD

3.2 Record target power data:

Target Power level: _______ %

NOTE: In the following steps, the subscripts +1, +2, +3....etc. indicate the time in hours since the initiation of the power transient at time zero (T_0).

3.3 Power Defect (PD)

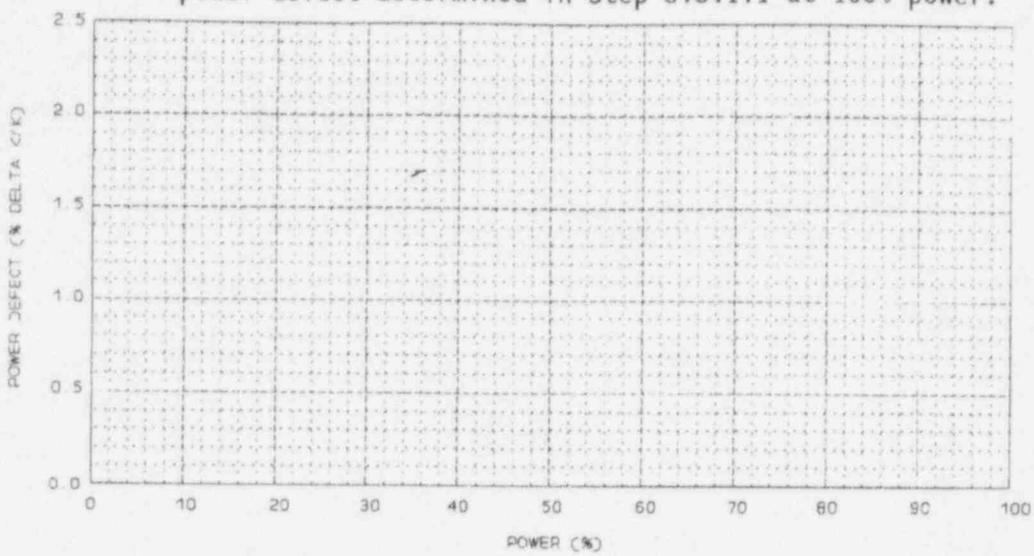
3.3.1 Determine incremental power defect (PD) for power transient:

.1 Determine the current 100% power defect based on core life (EFPD) from the OPS Summary Physics data book figure 5.4.

100% Power Defect ______ % Δk/k

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.3.1.2 On the figure below, draw a line from the zero to the 100% power defect determined in Step 3.3.1.1 at 100% power.



.3 Determine the hourly power defect for the power transient in the following table using the data from the line drawn based on the current 100% power defect. Each entry should reflect the rate of power change.

Power defect at initial power ____,	PD_0 :	________	% ΔK/K
Power defect at T_{+1}, power ____,	PD_{+1} :	________	% ΔK/K
Power defect at T_{+2}, power ____,	PD_{+2} :	________	% ΔK/K
Power defect at T_{+3}, power ____,	PD_{+3} :	________	% ΔK/K
Power defect at T_{+4}, power ____,	PD_{+4} :	________	% ΔK/K
Power defect at T_{+5}, power ____,	PD_{+5} :	________	% ΔK/K
Power defect at T_{+6}, power ____,	PD_{+6} :	________	% ΔK/K
Power defect at T_{+7}, power ____,	PD_{+7} :	________	% ΔK/K
Power defect at T_{+8}, power ____,	PD_{+8} :	________	% ΔK/K
Power defect at T_{+9}, power ____,	PD_{+9} :	________	% ΔK/K
Power defect at T_{+10}, power ____,	PD_{+10} :	________	% ΔK/K
Power defect at T_{+11}, power ____,	PD_{+11} :	________	% ΔK/K
Power defect at T_{+12}, power ____,	PD_{+12} :	________	% ΔK/K
Power defect at T_{+13}, power ____,	PD_{+13} :	________	% ΔK/K
Power defect at T_{+14}, power ____,	PD_{+14} :	________	% ΔK/K
Power defect at T_{+15}, power ____,	PD_{+15} :	________	% ΔK/K
Power defect at T_{+16}, power ____,	PD_{+16} :	________	% ΔK/K
Power defect at T_{+17}, power ____,	PD_{+17} :	________	% ΔK/K
Power defect at T_{+18}, power ____,	PD_{+18} :	________	% ΔK/K
Power defect at T_{+19}, power ____,	PD_{+19} :	________	% ΔK/K
Power defect at T_{+20}, power ____,	PD_{+20} :	________	% ΔK/K
Power defect at T_{+21}, power ____,	PD_{+21} :	________	% ΔK/K
Power defect at T_{+22}, power ____,	PD_{+22} :	________	% ΔK/K
Power defect at T_{+23}, power ____,	PD_{+23} :	________	% ΔK/K
Power defect at T_{+24}, power ____,	PD_{+24} :	________	% ΔK/K

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.3.2 Determine incremental ΔPD:

ΔPD_{+1} = PD0 ________ - PD_{+1} ________ = ________ % ΔK/K
ΔPD_{+2} = PD_{+1} ________ - PD_{+2} ________ = ________ % ΔK/K
ΔPD_{+3} = PD_{+2} ________ - PD_{+3} ________ = ________ % ΔK/K
ΔPD_{+4} = PD_{+3} ________ - PD_{+4} ________ = ________ % ΔK/K
ΔPD_{+5} = PD_{+4} ________ - PD_{+5} ________ = ________ % ΔK/K
ΔPD_{+6} = PD_{+5} ________ - PD_{+6} ________ = ________ % ΔK/K
ΔPD_{+7} = PD_{+6} ________ - PD_{+7} ________ = ________ % ΔK/K
ΔPD_{+8} = PD_{+7} ________ - PD_{+8} ________ = ________ % ΔK/K
ΔPD_{+9} = PD_{+8} ________ - PD_{+9} ________ = ________ % ΔK/K
ΔPD_{+10} = PD_{+9} ________ - PD_{+10} ________ = ________ % ΔK/K
ΔPD_{+11} = PD_{+10} ________ - PD_{+11} ________ = ________ % ΔK/K
ΔPD_{+12} = PD_{+11} ________ - PD_{+12} ________ = ________ % ΔK/K
ΔPD_{+13} = PD_{+12} ________ - PD_{+13} ________ = ________ % ΔK/K
ΔPD_{+14} = PD_{+13} ________ - PD_{+14} ________ = ________ % ΔK/K
ΔPD_{+15} = PD_{+14} ________ - PD_{+15} ________ = ________ % ΔK/K
ΔPD_{+16} = PD_{+15} ________ - PD_{+16} ________ = ________ % ΔK/K
ΔPD_{+17} = PD_{+16} ________ - PD_{+17} ________ = ________ % ΔK/K
ΔPD_{+18} = PD_{+17} ________ - PD_{+18} ________ = ________ % ΔK/K
ΔPD_{+19} = PD_{+18} ________ - PD_{+19} ________ = ________ % ΔK/K
ΔPD_{+20} = PD_{+19} ________ - PD_{+20} ________ = ________ % ΔK/K
ΔPD_{+21} = PD_{+20} ________ - PD_{+21} ________ = ________ % ΔK/K
ΔPD_{+22} = PD_{+21} ________ - PD_{+22} ________ = ________ % ΔK/K
ΔPD_{+23} = PD_{+22} ________ - PD_{+23} ________ = ________ % ΔK/K
ΔPD_{+24} = PD_{+23} ________ - PD_{+24} ________ = ________ % ΔK/K

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

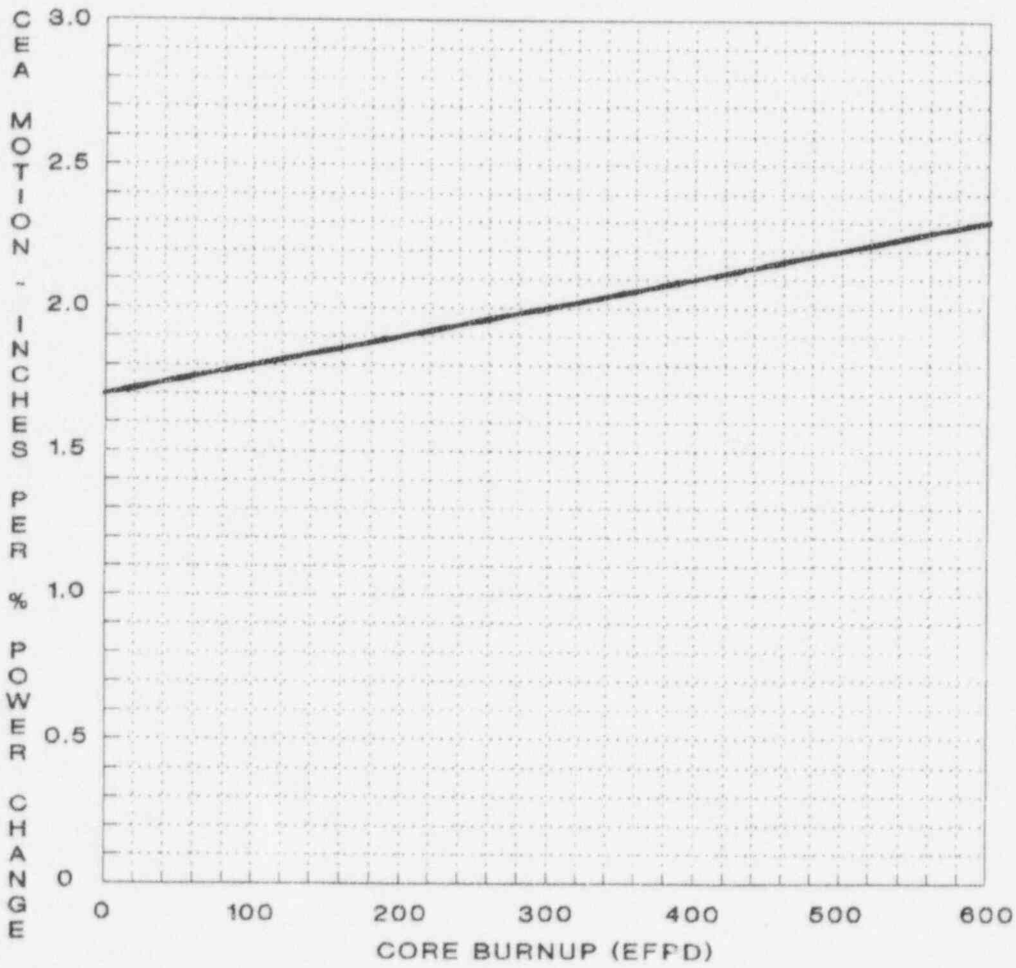
3.4 CEA Worth (CEA)

NOTE: The CEA insertion strategy in the following steps maintains the initial equilibrium ASI value.

3.4.1 The recommended CEA insertion strategy for maintaining Average ASI close to ESI is, as follows: (Ref. 2.4.2.26)

.1 Determine inches of CEA insertion per percent power change based on core life from the figure below:

_________ inches CEA insertion per % power change



3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

NOTE: The CEA positions determined in the following steps is a recommendation for maintaining the initial equilibrium ASI. Deviation from these positions is allowed if required for ASI control and may require adjustments to the boration/dilution rates or allowing RCS temperature to swing within the control band.

3.4.1.2 Determine the total CEA insertion (ΔP) required for the hourly power change by multiplying the value obtained in Step 3.4.1.1 times the expected rate of power change.

ΔP_{+1} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+2} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+3} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+4} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+5} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+6} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+7} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+8} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+9} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+10} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+11} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+12} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+13} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+14} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+15} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+16} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+17} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+18} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+19} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+20} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+21} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+22} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+23} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"
ΔP_{+24} = Rate of change ____% × Step 3.4.1.1 ____ in/% = _____"

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.4.1.3 Determine CEA position required for ASI control based on insertion required in Step 3.4.1.2:

NOTES: 1. In determining CEA insertion for ASI control, CEA sequencing overlap is ignored. The CEA insertion is the total insertion of all groups inserted into the RX Core (e.g., PLCEAs at 115", Group 6 at 90" and Group 5 at 140" *results in* 105" of CEA insertion: PLCEAs for 35" + Group 6 for 60" + Group 5 for 10").

2. CEA insertion for ASI control is limited to:
PLCEAs - 115" withdrawn
Group 6 - 80" withdrawn
Group 5 - Minimum of 15" above Group 6

3. Indicate position for CEA group selected for ASI control until insertion limit is reached.

4. Indicate CEA withdrawal by circling (+) and CEA insertion by circling (-) when determining new CEA positions.

Position P_{+1} = P_0 +/- ΔP_{+1} = ______ +/- ______ = Gr ______ at ______"
Position P_{+2} = P_{+1} +/- ΔP_{+2} = ______ +/- ______ = Gr ______ at ______"
Position P_{+3} = P_{+2} +/- ΔP_{+3} = ______ +/- ______ = Gr ______ at ______"
Position P_{+4} = P_{+3} +/- ΔP_{+4} = ______ +/- ______ = Gr ______ at ______"
Position P_{+5} = P_{+4} +/- ΔP_{+5} = ______ +/- ______ = Gr ______ at ______"
Position P_{+6} = P_{+5} +/- ΔP_{+6} = ______ +/- ______ = Gr ______ at ______"
Position P_{+7} = P_{+6} +/- ΔP_{+7} = ______ +/- ______ = Gr ______ at ______"
Position P_{+8} = P_{+7} +/- ΔP_{+8} = ______ +/- ______ = Gr ______ at ______"
Position P_{+9} = P_{+8} +/- ΔP_{+9} = ______ +/- ______ = Gr ______ at ______"
Position P_{+10} = P_{+9} +/- ΔP_{+10} = ______ +/- ______ = Gr ______ at ______"
Position P_{+11} = P_{+10} +/- ΔP_{+11} = ______ +/- ______ = Gr ______ at ______"
Position P_{+12} = P_{+11} +/- ΔP_{+12} = ______ +/- ______ = Gr ______ at ______"
Position P_{+13} = P_{+12} +/- ΔP_{+13} = ______ +/- ______ = Gr ______ at ______"
Position P_{+14} = P_{+13} +/- ΔP_{+14} = ______ +/- ______ = Gr ______ at ______"
Position P_{+15} = P_{+14} +/- ΔP_{+15} = ______ +/- ______ = Gr ______ at ______"
Position P_{+16} = P_{+15} +/- ΔP_{+16} = ______ +/- ______ = Gr ______ at ______"
Position P_{+17} = P_{+16} +/- ΔP_{+17} = ______ +/- ______ = Gr ______ at ______"
Position P_{+18} = P_{+17} +/- ΔP_{+18} = ______ +/- ______ = Gr ______ at ______"
Position P_{+19} = P_{+18} +/- ΔP_{+19} = ______ +/- ______ = Gr ______ at ______"
Position P_{+20} = P_{+19} +/- ΔP_{+20} = ______ +/- ______ = Gr ______ at ______"
Position P_{+21} = P_{+20} +/- ΔP_{+21} = ______ +/- ______ = Gr ______ at ______"
Position P_{+22} = P_{+21} +/- ΔP_{+22} = ______ +/- ______ = Gr ______ at ______"
Position P_{+23} = P_{+22} +/- ΔP_{+23} = ______ +/- ______ = Gr ______ at ______"
Position P_{+24} = P_{+23} +/- ΔP_{+24} = ______ +/- ______ = Gr ______ at ______"

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.4.2 Determine incremental CEA worth: (OPS Figure 4.1, 4.2, 4.5 or 4.11)

.1 Group 6 incremental CEA worth at HFP may be taken from OPS Figure 4.1.

NOTE: Position at which ASI control shifts from PLCEAs to Group 6 requires addition of PLCEA and Group 6 worth and is indicated by placing Group 6 position in blanks.

CEA Worth at P_0, CEA_0 = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+1}, CEA_{+1} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+2}, CEA_{+2} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+3}, CEA_{+3} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+4}, CEA_{+4} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+5}, CEA_{+5} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+6}, CEA_{+6} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+7}, CEA_{+7} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+8}, CEA_{+8} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+9}, CEA_{+9} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+10}, CEA_{+10} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+11}, CEA_{+11} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+12}, CEA_{+12} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+13}, CEA_{+13} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+14}, CEA_{+14} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+15}, CEA_{+15} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+16}, CEA_{+16} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+17}, CEA_{+17} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+18}, CEA_{+18} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+19}, CEA_{+19} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+20}, CEA_{+20} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+21}, CEA_{+21} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+22}, CEA_{+22} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+23}, CEA_{+23} = Gr ____ at ______" = ______ % ΔK/K
CEA Worth at P_{+24}, CEA_{+24} = Gr ____ at ______" = ______ % ΔK/K

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.4.3 Determine change in inserted CEA worth (ΔCEA):

ΔCEA_{+1}	= CEA_0	________	- CEA_{+1}	________	=	________	% ΔK/K
ΔCEA_{+2}	= CEA_{+1}	________	- CEA_{+2}	________	=	________	% ΔK/K
ΔCEA_{+3}	= CEA_{+2}	________	- CEA_{+3}	________	=	________	% ΔK/K
ΔCEA_{+4}	= CEA_{+3}	________	- CEA_{+4}	________	=	________	% ΔK/K
ΔCEA_{+5}	= CEA_{+4}	________	- CEA_{+5}	________	=	________	% ΔK/K
ΔCEA_{+6}	= CEA_{+5}	________	- CEA_{+6}	________	=	________	% ΔK/K
ΔCEA_{+7}	= CEA_{+6}	________	- CEA_{+7}	________	=	________	% ΔK/K
ΔCEA_{+8}	= CEA_{+7}	________	- CEA_{+8}	________	=	________	% ΔK/K
ΔCEA_{+9}	= CEA_{+8}	________	- CEA_{+9}	________	=	________	% ΔK/K
ΔCEA_{+10}	= CEA_{+9}	________	- CEA_{+10}	________	=	________	% ΔK/K
ΔCEA_{+11}	= CEA_{+10}	________	- CEA_{+11}	________	=	________	% ΔK/K
ΔCEA_{+12}	= CEA_{+11}	________	- CEA_{+12}	________	=	________	% ΔK/K
ΔCEA_{+13}	= CEA_{+12}	________	- CEA_{+13}	________	=	________	% ΔK/K
ΔCEA_{+14}	= CEA_{+13}	________	- CEA_{+14}	________	=	________	% ΔK/K
ΔCEA_{+15}	= CEA_{+14}	________	- CEA_{+15}	________	=	________	% ΔK/K
ΔCEA_{+16}	= CEA_{+15}	________	- CEA_{+16}	________	=	________	% ΔK/K
ΔCEA_{+17}	= CEA_{+16}	________	- CEA_{+17}	________	=	________	% ΔK/K
ΔCEA_{+18}	= CEA_{+17}	________	- CEA_{+18}	________	=	________	% ΔK/K
ΔCEA_{+19}	= CEA_{+18}	________	- CEA_{+19}	________	=	________	% ΔK/K
ΔCEA_{+20}	= CEA_{+19}	________	- CEA_{+20}	________	=	________	% ΔK/K
ΔCEA_{+21}	= CEA_{+20}	________	- CEA_{+21}	________	=	________	% ΔK/K
ΔCEA_{+22}	= CEA_{+21}	________	- CEA_{+22}	________	=	________	% ΔK/K
ΔCEA_{+23}	= CEA_{+22}	________	- CEA_{+23}	________	=	________	% ΔK/K
ΔCEA_{+24}	= CEA_{+23}	________	- CEA_{+24}	________	=	________	% ΔK/K

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.5 Xenon Worth (XE)

NOTE: Obtain Xenon worth from Xenon option of Reactivity Calculator or Reactor Engineering calculations using detailed power history and expected power history projections.

3.5.1 Determine incremental Xenon concentration (XE) worth:

NOTE: Use the Xenon worth for an additional one half hour, i.e., for T_{+1} use the xenon worth for 1.5 hours into the transient and for T_{+2} the worth for 2.5 hours into the transient, to compensate for the delay time required for boration or dilution to reach the Core.

Xenon worth at initial power, XE_0: ________ % ΔK/K
Xenon worth at T_{+1}, XE_{+1}: ________ % ΔK/K
Xenon worth at T_{+2}, XE_{+2}: ________ % ΔK/K
Xenon worth at T_{+3}, XE_{+3}: ________ % ΔK/K
Xenon worth at T_{+4}, XE_{+4}: ________ % ΔK/K
Xenon worth at T_{+5}, XE_{+5}: ________ % ΔK/K
Xenon worth at T_{+6}, XE_{+6}: ________ % ΔK/K
Xenon worth at T_{+7}, XE_{+7}: ________ % ΔK/K
Xenon worth at T_{+8}, XE_{+8}: ________ % ΔK/K
Xenon worth at T_{+9}, XE_{+9}: ________ % ΔK/K
Xenon worth at T_{+10}, XE_{+10}: ________ % ΔK/K
Xenon worth at T_{+11}, XE_{+11}: ________ % ΔK/K
Xenon worth at T_{+12}, XE_{+12}: ________ % ΔK/K
Xenon worth at T_{+13}, XE_{+13}: ________ % ΔK/K
Xenon worth at T_{+14}, XE_{+14}: ________ % ΔK/K
Xenon worth at T_{+15}, XE_{+15}: ________ % ΔK/K
Xenon worth at T_{+16}, XE_{+16}: ________ % ΔK/K
Xenon worth at T_{+17}, XE_{+17}: ________ % ΔK/K
Xenon worth at T_{+18}, XE_{+18}: ________ % ΔK/K
Xenon worth at T_{+19}, XE_{+19}: ________ % ΔK/K
Xenon worth at T_{+20}, XE_{+20}: ________ % ΔK/K
Xenon worth at T_{+21}, XE_{+21}: ________ % ΔK/K
Xenon worth at T_{+22}, XE_{+22}: ________ % ΔK/K
Xenon worth at T_{+23}, XE_{+23}: ________ % ΔK/K
Xenon worth at T_{+24}, XE_{+24}: ________ % ΔK/K

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.5.2 Determine incremental ΔXE:

ΔXE_{+1}	= XE_0	______	- XE_{+1}	______	= ______	% ΔK/K
ΔXE_{+2}	= XE_{+1}	______	- XE_{+2}	______	= ______	% ΔK/K
ΔXE_{+3}	= XE_{+2}	______	- XE_{+3}	______	= ______	% ΔK/K
ΔXE_{+4}	= XE_{+3}	______	- XE_{+4}	______	= ______	% ΔK/K
ΔXE_{+5}	= XE_{+4}	______	- XE_{+5}	______	= ______	% ΔK/K
ΔXE_{+6}	= XE_{+5}	______	- XE_{+6}	______	= ______	% ΔK/K
ΔXE_{+7}	= XE_{+6}	______	- XE_{+7}	______	= ______	% ΔK/K
ΔXE_{+8}	= XE_{+7}	______	- XE_{+8}	______	= ______	% ΔK/K
ΔXE_{+9}	= XE_{+8}	______	- XE_{+9}	______	= ______	% ΔK/K
ΔXE_{+10}	= XE_{+9}	______	- XE_{+10}	______	= ______	% ΔK/K
ΔXE_{+11}	= XE_{+10}	______	- XE_{+11}	______	= ______	% ΔK/K
ΔXE_{+12}	= XE_{+11}	______	- XE_{+12}	______	= ______	% ΔK/K
ΔXE_{+13}	= XE_{+12}	______	- XE_{+13}	______	= ______	% ΔK/K
ΔXE_{+14}	= XE_{+13}	______	- XE_{+14}	______	= ______	% ΔK/K
ΔXE_{+15}	= XE_{+14}	______	- XE_{+15}	______	= ______	% ΔK/K
ΔXE_{+16}	= XE_{+15}	______	- XE_{+16}	______	= ______	% ΔK/K
ΔXE_{+17}	= XE_{+16}	______	- XE_{+17}	______	= ______	% ΔK/K
ΔXE_{+18}	= XE_{+17}	______	- XE_{+18}	______	= ______	% ΔK/K
ΔXE_{+19}	= XE_{+18}	______	- XE_{+19}	______	= ______	% ΔK/K
ΔXE_{+20}	= XE_{+19}	______	- XE_{+20}	______	= ______	% ΔK/K
ΔXE_{+21}	= XE_{+20}	______	- XE_{+21}	______	= ______	% ΔK/K
ΔXE_{+22}	= XE_{+21}	______	- XE_{+22}	______	= ______	% ΔK/K
ΔXE_{+23}	= XE_{+22}	______	- XE_{+23}	______	= ______	% ΔK/K
ΔXE_{+24}	= XE_{+23}	______	- XE_{+24}	______	= ______	% ΔK/K

3.6 Record Inverse Boron Worth as a function of EFPD:
(OPS Figure 3.1)

Inverse Boron Worth : ______ ppm/% ΔK/K

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.7 Calculate Reactivity Defect (C_R) by totaling Δ Power Defects (Step 3.3), Δ CEA worth (Step 3.4), and Δ Xenon worth (Step 3.5):

(Step 3.3) (Step 3.4) (Step 3.5)

ΔPD_{+1} ______ + ΔCEA_{+1} ______ + ΔXE_{+1} ______ = C_{R1} ______ % ΔK/K
ΔPD_{+2} ______ + ΔCEA_{+2} ______ + ΔXE_{+2} ______ = C_{R2} ______ % ΔK/K
ΔPD_{+3} ______ + ΔCEA_{+3} ______ + ΔXE_{+3} ______ = C_{R3} ______ % ΔK/K
ΔPD_{+4} ______ + ΔCEA_{+4} ______ + ΔXE_{+4} ______ = C_{R4} ______ % ΔK/K
ΔPD_{+5} ______ + ΔCEA_{+5} ______ + ΔXE_{+5} ______ = C_{R5} ______ % ΔK/K
ΔPD_{+6} ______ + ΔCEA_{+6} ______ + ΔXE_{+6} ______ = C_{R6} ______ % ΔK/K
ΔPD_{+7} ______ + ΔCEA_{+7} ______ + ΔXE_{+7} ______ = C_{R7} ______ % ΔK/K
ΔPD_{+8} ______ + ΔCEA_{+8} ______ + ΔXE_{+8} ______ = C_{R8} ______ % ΔK/K
ΔPD_{+9} ______ + ΔCEA_{+9} ______ + ΔXE_{+9} ______ = C_{R9} ______ % ΔK/K
ΔPD_{+10} ______ + ΔCEA_{+10} ______ + ΔXE_{+10} ______ = C_{R10} ______ % ΔK/K
ΔPD_{+11} ______ + ΔCEA_{+11} ______ + ΔXE_{+11} ______ = C_{R11} ______ % ΔK/K
ΔPD_{+12} ______ + ΔCEA_{+12} ______ + ΔXE_{+12} ______ = C_{R12} ______ % ΔK/K
ΔPD_{+13} ______ + ΔCEA_{+13} ______ + ΔXE_{+13} ______ = C_{R13} ______ % ΔK/K
ΔPD_{+14} ______ + ΔCEA_{+14} ______ + ΔXE_{+14} ______ = C_{R14} ______ % ΔK/K
ΔPD_{+15} ______ + ΔCEA_{+15} ______ + ΔXE_{+15} ______ = C_{R15} ______ % ΔK/K
ΔPD_{+16} ______ + ΔCEA_{+16} ______ + ΔXE_{+16} ______ = C_{R16} ______ % ΔK/K
ΔPD_{+17} ______ + ΔCEA_{+17} ______ + ΔXE_{+17} ______ = C_{R17} ______ % ΔK/K
ΔPD_{+18} ______ + ΔCEA_{+18} ______ + ΔXE_{+18} ______ = C_{R18} ______ % ΔK/K
ΔPD_{+19} ______ + ΔCEA_{+19} ______ + ΔXE_{+19} ______ = C_{R19} ______ % ΔK/K
ΔPD_{+20} ______ + ΔCEA_{+20} ______ + ΔXE_{+20} ______ = C_{R20} ______ % ΔK/K
ΔPD_{+21} ______ + ΔCEA_{+21} ______ + ΔXE_{+21} ______ = C_{R21} ______ % ΔK/K
ΔPD_{+22} ______ + ΔCEA_{+22} ______ + ΔXE_{+22} ______ = C_{R22} ______ % ΔK/K
ΔPD_{+23} ______ + ΔCEA_{+23} ______ + ΔXE_{+23} ______ = C_{R23} ______ % ΔK/K
ΔPD_{+24} ______ + ΔCEA_{+24} ______ + ΔXE_{+24} ______ = C_{R24} ______ % ΔK/K

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

NOTE: Calculation of the adjusted boron concentration provides data needed for the computer SONGS 2/3 Boration/Dilution Program.

3.8 Calculate Boron deviation (ΔC_B) using Inverse Boron Worth (Step 3.6) and Reactivity defects (Step 3.7):

Initial Boron Concentration (Step 3.1) ________

	(Step 3.6)		(Step 3.7)				Adjusted Boron Concentration	
IBW	________	X C_{R1}	________	= ΔC_{B1}	________	ppm	________	ppm
IBW	________	X C_{R2}	________	= ΔC_{B2}	________	ppm	________	ppm
IBW	________	X C_{R3}	________	= ΔC_{B3}	________	ppm	________	ppm
IBW	________	X C_{R4}	________	= ΔC_{B4}	________	ppm	________	ppm
IBW	________	X C_{R5}	________	= ΔC_{B5}	________	ppm	________	ppm
IBW	________	X C_{R6}	________	= ΔC_{B6}	________	ppm	________	ppm
IBW	________	X C_{R7}	________	= ΔC_{B7}	________	ppm	________	ppm
IBW	________	X C_{R8}	________	= ΔC_{B8}	________	ppm	________	ppm
IBW	________	X C_{R9}	________	= ΔC_{B9}	________	ppm	________	ppm
IBW	________	X C_{R10}	________	= ΔC_{B10}	________	ppm	________	ppm
IBW	________	X C_{R11}	________	= ΔC_{B11}	________	ppm	________	ppm
IBW	________	X C_{R12}	________	= ΔC_{B12}	________	ppm	________	ppm
IBW	________	X C_{R13}	________	= ΔC_{B13}	________	ppm	________	ppm
IBW	________	X C_{R14}	________	= ΔC_{B14}	________	ppm	________	ppm
IBW	________	X C_{R15}	________	= ΔC_{B15}	________	ppm	________	ppm
IBW	________	X C_{R16}	________	= ΔC_{B16}	________	ppm	________	ppm
IBW	________	X C_{R17}	________	= ΔC_{B17}	________	ppm	________	ppm
IBW	________	X C_{R18}	________	= ΔC_{B18}	________	ppm	________	ppm
IBW	________	X C_{R19}	________	= ΔC_{B19}	________	ppm	________	ppm
IBW	________	X C_{R20}	________	= ΔC_{B20}	________	ppm	________	ppm
IBW	________	X C_{R21}	________	= ΔC_{B21}	________	ppm	________	ppm
IBW	________	X C_{R22}	________	= ΔC_{B22}	________	ppm	________	ppm
IBW	________	X C_{R23}	________	= ΔC_{B23}	________	ppm	________	ppm
IBW	________	X C_{R24}	________	= ΔC_{B24}	________	ppm	________	ppm

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.9 Calculate gallons of boration/dilution required to adjust Boron concentration per SONGS 2/3 Boration/Dilution Program or SO23-3-2.2 for: R TCN

3.9.1 Indicate BAMU Tank and Boron concentration on which calculations are based:

☐ T-071 C_B = ________ PPM

☐ T-072 C_B = ________ PPM

3.9.2 Boration/dilution required to change C_B by:

NOTE: Positive ΔC_B indicates boration required and negative ΔC_B indicates dilution required.

ΔC_{B1} _____ at T_{+1} = __________ gal. [] Boration [] Dilution
ΔC_{B2} _____ at T_{+2} = __________ gal. [] Boration [] Dilution
ΔC_{B3} _____ at T_{+3} = __________ gal. [] Boration [] Dilution
ΔC_{B4} _____ at T_{+4} = __________ gal. [] Boration [] Dilution
ΔC_{B5} _____ at T_{+5} = __________ gal. [] Boration [] Dilution
ΔC_{B6} _____ at T_{+6} = __________ gal. [] Boration [] Dilution
ΔC_{B7} _____ at T_{+7} = __________ gal. [] Boration [] Dilution
ΔC_{B8} _____ at T_{+8} = __________ gal. [] Boration [] Dilution
ΔC_{B9} _____ at T_{+9} = __________ gal. [] Boration [] Dilution
ΔC_{B10} _____ at T_{+10} = __________ gal. [] Boration [] Dilution
ΔC_{B11} _____ at T_{+11} = __________ gal. [] Boration [] Dilution
ΔC_{B12} _____ at T_{+12} = __________ gal. [] Boration [] Dilution
ΔC_{B13} _____ at T_{+13} = __________ gal. [] Boration [] Dilution
ΔC_{B14} _____ at T_{+14} = __________ gal. [] Boration [] Dilution
ΔC_{B15} _____ at T_{+15} = __________ gal. [] Boration [] Dilution
ΔC_{B16} _____ at T_{+16} = __________ gal. [] Boration [] Dilution
ΔC_{B17} _____ at T_{+17} = __________ gal. [] Boration [] Dilution
ΔC_{B18} _____ at T_{+18} = __________ gal. [] Boration [] Dilution
ΔC_{B19} _____ at T_{+19} = __________ gal. [] Boration [] Dilution
ΔC_{B20} _____ at T_{+20} = __________ gal. [] Boration [] Dilution
ΔC_{B21} _____ at T_{+21} = __________ gal. [] Boration [] Dilution
ΔC_{B22} _____ at T_{+22} = __________ gal. [] Boration [] Dilution
ΔC_{B23} _____ at T_{+23} = __________ gal. [] Boration [] Dilution
ΔC_{B24} _____ at T_{+24} = __________ gal. [] Boration [] Dilution

3.0 BORATION/DILUTION VOLUME AND RATE DETERMINATION (Continued)

3.10 Calculate rates of boration/dilution to support power level change per SO23-3-2.2.

NOTES: 1. Borations of less than 120 gallons should be injected as a batch at a flow rate of 2 gpm.

2. Dilutions of less than 600 gallons should be injected as a batch at a flow rate of 10 gpm.

Rate of [] Boration [] Dilution (T_0 to T_{+1}): __________ gpm
Rate of [] Boration [] Dilution (T_{+1} to T_{+2}): __________ gpm
Rate of [] Boration [] Dilution (T_{+2} to T_{+3}): __________ gpm
Rate of [] Boration [] Dilution (T_{+3} to T_{+4}): __________ gpm
Rate of [] Boration [] Dilution (T_{+4} to T_{+5}): __________ gpm
Rate of [] Boration [] Dilution (T_{+5} to T_{+6}): __________ gpm
Rate of [] Boration [] Dilution (T_{+6} to T_{+7}): __________ gpm
Rate of [] Boration [] Dilution (T_{+7} to T_{+8}): __________ gpm
Rate of [] Boration [] Dilution (T_{+8} to T_{+9}): __________ gpm
Rate of [] Boration [] Dilution (T_{+9} to T_{+10}): __________ gpm
Rate of [] Boration [] Dilution (T_{+10} to T_{+11}): __________ gpm
Rate of [] Boration [] Dilution (T_{+11} to T_{+12}): __________ gpm
Rate of [] Boration [] Dilution (T_{+12} to T_{+13}): __________ gpm
Rate of [] Boration [] Dilution (T_{+13} to T_{+14}): __________ gpm
Rate of [] Boration [] Dilution (T_{+14} to T_{+15}): __________ gpm
Rate of [] Boration [] Dilution (T_{+15} to T_{+16}): __________ gpm
Rate of [] Boration [] Dilution (T_{+16} to T_{+17}): __________ gpm
Rate of [] Boration [] Dilution (T_{+17} to T_{+18}): __________ gpm
Rate of [] Boration [] Dilution (T_{+18} to T_{+19}): __________ gpm
Rate of [] Boration [] Dilution (T_{+19} to T_{+20}): __________ gpm
Rate of [] Boration [] Dilution (T_{+20} to T_{+21}): __________ gpm
Rate of [] Boration [] Dilution (T_{+21} to T_{+22}): __________ gpm
Rate of [] Boration [] Dilution (T_{+22} to T_{+23}): __________ gpm
Rate of [] Boration [] Dilution (T_{+23} to T_{+24}): __________ gpm

3.11 Transfer the following data to Attachment 18, Boration/Dilution Schedule:

3.11.1 Expected CEA positions from Step 3.4.1.3.

3.11.2 Adjusted (expected) RCS boron concentration from Step 3.8.

3.11.3 Boration and/or dilution volumes from Step 3.9.

3.11.4 Boration and/or dilution flow rates from Step 3.10.

COMMENTS ____

____

____

____

____

____

PERFORMED BY: ______________________ DATE/TIME: __________

INDEPENDENTLY VERIFIED BY: ______________________ DATE/TIME: __________

REVIEWED BY: ______________________ DATE/TIME: __________
SRO Ops. Supv.

TCN

FILE DISPOSITION: File per SO123-0-32.

REACTIVITY CALCULATOR - XENON PROGRAM

TCN

1 Select **Reactivity Calculations** from the applicable PC menu.

2 Select **Reactivity Calculator** from submenu.

3 Select **Unit**.

4 Select option 3) **Xenon Calculations.**

5 Enter data prompted by program.

5.1 Cycle burnup (EFPD)

5.2 Equilibrium Power (%)

5.2.1 Enter last power level maintained until xenon equilibrium reached.

6 Select option **N - to key in a new profile.**

7 Enter the new input profile for each power level and/or power plateau expected during the transient. No blanks - use zero (0) instead.

7.1 Percent power (%) <ENTER> (Target power level)

7.2 Ramp Time (Hours) <ENTER> (Time to reach target power level)

7.3 Plateau Time (Hours) <ENTER> (Time remaining at target power level)

7.4 <ENTER> (After last data entry for each power level, duration of ramp and time at plateau - <ENTER><ENTER>)

8 Select option **E - to evaluate the xenon transient.**

9 Answer **N** to option **Do you want the xenon profile consisting of 289 lines printed to the screen?**

10 Answer **Y** to option **Would you like a hardcopy of this xenon profile?**

11 Answer option **Would you like to run another xenon case?**

12 Exit Reactivity Calculator.

BORATION/DILUTION CALCULATION

R TCN

1 Select **Reactivity Calculations** from the applicable PC menu.

2 Select **Boration/Dilution** from submenu.

3 Select **Unit**.

4 Enter data prompted by program:

4.1 Present RCS boron concentration (ppm)

4.2 Desired RCS boron concentration (ppm)

4.3 RCS T_{AVG} (deg F)

4.4 PZR level (%)

4.5 Do you want to divert? (Y or N)

4.6 BAMU concentration (WT%) [requested only if boration required]

5 After results displayed, answer **Y** to option **Would you like a printout of this calculation?**

6 Answer **Y** to option **Would you like to run another case?**

7 After all necessary cases have been run, answer **N** to option **Would you like to run another case?**

BORATION/DILUTION SCHEDULE

The Boration/Dilution Schedule provides the anticipated requirements for controlling the expected power maneuver. **Power and ASI control requirements shall override this schedule as necessary to maintain the appropriate limits.**

Each time point assumes the conditions for the prior time points have been maintained and a significant reduction in accuracy will occur following deviations from the schedule. Therefore, it is important to attempt to maintain these guidelines as closely as possible.

CLOCK TIME	ELAPSED TIME	EXPECTED CEA POS.	EXPECTED RCS C_B	BORATE (GAL.)	DILUTE (GAL.)	FLOW RATE
	T-INITIAL			———	———	———
	T+1					
	T+2					
	T+3					
	T+4					
	T+5					
	T+6					
	T+7					
	T+8					
	T+9					
	T+10					
	T+11					
	T+12					
	T+13					
	T+14					
	T+15					
	T+16					
	T+17					
	T+18					
	T+19					
	T+20					
	T+21					
	T+22					
	T+23					
	T+24					

DISPOSITION: File per SO123-0-32.

RAPID AND ACCELERATED DOWNPOWER BORATION/CEA INSERTION DETERMINATION

UNIT ______ DATE ______________ TIME _________

1.0 PREREQUISITES

PERF. BY INITIALS

1.1 Verify this document is current by checking a controlled copy or by using the method described in SO123-VI-0.9. ________

NOTES: 1. The values required in this attachment may be obtained from Reactor Engineering.

2. Data supplied by Reactor Engineering shall be in the format specified by SO23-V-13 with a copy of the transmittal affixed to this Attachment.

2.0 BORATION VOLUME DETERMINATION

2.1 Record the following:

Present EFPD ________

Full Power Boron Concentration _________ ppm

NOTE: In the following steps, the subscripts 5, 10, 15....etc. indicate the total expected power level decrease for the rapid/accelerated downpower transient.

2.2 Determine Power Defect (PD) for expected rapid/accelerated downpower transients.

2.2.1 Determine the current 100% power defect based on Core life (EFPD) from the OPS Summary Physics Data Book figure 5.4.

100% Power Defect, PD_{HFP} = __________ % $\Delta k/k$

2.0 BORATION VOLUME DETERMINATION (Continued)

2.2.2 Determine the power defect for the expected downpower transients:

5% decrease, $PD_5 = 0.05 \times PD_{HFP}$ _______ = _______ % ΔK/K

10% decrease, $PD_{10} = 0.10 \times PD_{HFP}$ _______ = _______ % ΔK/K

15% decrease, $PD_{15} = 0.15 \times PD_{HFP}$ _______ = _______ % ΔK/K

20% decrease, $PD_{20} = 0.20 \times PD_{HFP}$ _______ = _______ % ΔK/K

25% decrease, $PD_{25} = 0.25 \times PD_{HFP}$ _______ = _______ % ΔK/K

30% decrease, $PD_{30} = 0.30 \times PD_{HFP}$ _______ = _______ % ΔK/K

35% decrease, $PD_{35} = 0.35 \times PD_{HFP}$ _______ = _______ % ΔK/K

40% decrease, $PD_{40} = 0.40 \times PD_{HFP}$ _______ = _______ % ΔK/K

45% decrease, $PD_{45} = 0.45 \times PD_{HFP}$ _______ = _______ % ΔK/K

50% decrease, $PD_{50} = 0.50 \times PD_{HFP}$ _______ = _______ % ΔK/K

2.3 Record Inverse Boron Worth as a function of EFPD: (OPS Figure 3.1)

Inverse Boron Worth : __________ ppm/% ΔK/K

2.4 Calculate the required change in boron concentration (ΔC_B) using Power Defect (PD) [Step 2.2.2] and Inverse Boron Worth (IBW), [Step 2.3]:

(Step 2.2.2) × (Step 2.3)

PD_5 _______ × IBW _______ = ΔC_{B5} _______ ppm

PD_{10} _______ × IBW _______ = ΔC_{B10} _______ ppm

PD_{15} _______ × IBW _______ = ΔC_{B15} _______ ppm

PD_{20} _______ × IBW _______ = ΔC_{B20} _______ ppm

PD_{25} _______ × IBW _______ = ΔC_{B25} _______ ppm

PD_{30} _______ × IBW _______ = ΔC_{B30} _______ ppm

PD_{35} _______ × IBW _______ = ΔC_{B35} _______ ppm

PD_{40} _______ × IBW _______ = ΔC_{B40} _______ ppm

PD_{45} _______ × IBW _______ = ΔC_{B45} _______ ppm

PD_{50} _______ × IBW _______ = ΔC_{B50} _______ ppm

2.0 BORATION VOLUME DETERMINATION (Continued)

NOTE: Calculation of the adjusted boron concentration provides data needed for the computer SONGS 2/3 Boration/Dilution Program.

2.5 Calculate adjusted Boron concentration (C_{Bf}) using change in boron concentration required (ΔC_B), (Step 2.4) and initial boron concentration (ΔC_{Bi}), (Step 2.1):

(Step 2.4)	+	(Step 2.1)	=	Adjusted Boron Concentration
ΔC_{B5} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf5} _______ ppm
ΔC_{B10} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf10} _______ ppm
ΔC_{B15} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf15} _______ ppm
ΔC_{B20} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf20} _______ ppm
ΔC_{B25} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf25} _______ ppm
ΔC_{B30} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf30} _______ ppm
ΔC_{B35} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf35} _______ ppm
ΔC_{B40} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf40} _______ ppm
ΔC_{B45} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf45} _______ ppm
ΔC_{B50} _______ ppm	+	C_{Bi} _______ ppm	=	C_{Bf50} _______ ppm

2.6 Calculate gallons of boration required to adjust Boron concentration per SONGS 2/3 Boration/Dilution Program, or SO23-3-2.2 for: TCN

2.6.1 Indicate BAMU Tank and Boron concentration on which calculations are based:

☐ T-071 C_B = _______ PPM

☐ T-072 C_B = _______ PPM

2.0 BORATION VOLUME DETERMINATION (Continued)

2.6.2 Boration required:

ΔC_{Bf5} ______ = __________ gal.

ΔC_{Bf10} ______ = __________ gal.

ΔC_{Bf15} ______ = __________ gal.

ΔC_{Bf20} ______ = __________ gal.

ΔC_{Bf25} ______ = __________ gal.

ΔC_{Bf30} ______ = __________ gal.

ΔC_{Bf35} ______ = __________ gal.

ΔC_{Bf40} ______ = __________ gal.

ΔC_{Bf45} ______ = __________ gal.

ΔC_{Bf50} ______ = __________ gal.

3.0 POWER DEFECT EQUIVALENT CEA WORTH DETERMINATION

3.1 Determine Group 6 CEA positions based on CEA worth equivalent to the power defect (Step 2.2.2) for the expected rapid/accelerated downpower transients using OPS Physic Summary book Figure 4.1.

Enter N/A if required position for Group 6 below 75".

CEA Group 6 worth = PD_5 ______ = ________" withdrawn

CEA Group 6 worth = PD_{10} ______ = ________" withdrawn

CEA Group 6 worth = PD_{15} ______ = ________" withdrawn

CEA Group 6 worth = PD_{20} ______ = ________" withdrawn

CEA Group 6 worth = PD_{25} ______ = ________" withdrawn

CEA Group 6 worth = PD_{30} ______ = ________" withdrawn

CEA Group 6 worth = PD_{35} ______ = ________" withdrawn

CEA Group 6 worth = PD_{40} ______ = ________" withdrawn

CEA Group 6 worth = PD_{45} ______ = ________" withdrawn

CEA Group 6 worth = PD_{50} ______ = ________" withdrawn

4.0 UPDATE ATTACHMENT 20

4.1 Transfer the BAMU tank selection from Step 2.6.1, boration volumes from Step 2.6.2 and Group 6 CEA positions from Step 3.1 to Attachment 20, Rapid and Accelerated Downpower Boration/CEA Insertion Guidelines.

COMMENTS ______________________________

PERFORMED BY: ______________________ DATE/TIME: __________

INDEPENDENTLY VERIFIED BY: ______________________ DATE/TIME: __________

TCN

REVIEWED BY: ______________________ DATE/TIME: __________
SRO Ops. Supv.

FILE DISPOSITION: File per SO123-0-32.

RAPID AND ACCELERATED DOWNPOWER BORATION/CEA INSERTION GUIDELINES

UNIT _______ FOR WEEK OF _________

% POWER LEVEL DECREASE	BORATION ONLY (BASED ON BAMU T-____)	GROUP 6 CEAs ONLY (N/A BELOW 75") [1]
5%	GAL	"
10%	GAL	"
15%	GAL	"
20%	GAL	"
25%	GAL	"
30%	GAL	"
35%	GAL	"
40%	GAL	"
45%	GAL	"
50%	GAL	"

[1] Technical Specification 3.1.3.5 Transient Insertion Limits require tracking below LTSSIL per SO123-0-42 and restoration to greater than 120" withdrawn within required time frames.

<u>Recommended method of performing rapid/accelerated downpower maneuvers:</u>
Refer to main body Section 6.8.3.

1) If a combination of CEA insertion and boration is to be used, then:

   a. Initiate boration of the required volume.

   b. After boration is initiated, then make initial 5% or 10% power decrease using Group 6 CEAs <u>only</u>.

2) Make additional power decrease on Group 6 CEAs (maximum insertion 75") <u>or</u> boration only (gallons based on percent power decrease) <u>or</u> combination of CEAs and boration (for example, 20% by boration and 10% by CEAs for total 30% decrease).

Rapid downpower transients are expected to reach the target power level in less than one hour using turbine controls to establish the rate of power decrease and Group 6 CEAs <u>and/or</u> boron for reactivity and RCS temperature control.

The boration volume should be injected in a batch mode as rapidly as possible and is calculated for no CEA insertion. Boration volume may require adjustment if Group 6 CEA positions are adjusted due to ASI control considerations.

Allow RCS cold leg temperature to drift above the control band for short periods of time provided it can be reduced to less than 558°F within 2 hours as required by Technical Specification 3.2.6.

Varying RCS temperature and CEA withdrawal/insertion are used to compensate for xenon buildup and small reactivity changes to maintain the target power level.

FILE DISPOSITION: Maintain in "In-Use" Procedure book <u>or</u> post on Control Board.

EOC UNIT SHUTDOWN PARAMETER EXPECTATIONS EXAMPLE

Included in the following table are selected parameters that were recorded during the Unit 2 EOC (Cycle 7) Shutdown from 75% Power to Turbine/Rx Trip at approximately 20% Power. This shutdown occurred on Feb. 10/11, 1995. This table was developed for use as a pre-shutdown tailboard tool to show an example of some plant parameter expectations during a EOC shutdown.

The table time span is from 2112 - 2/10/95 to 0018 - 2/11/95.
The turbine was tripped at 0019 and the Reactor was tripped at 0021 - 2/11/95.

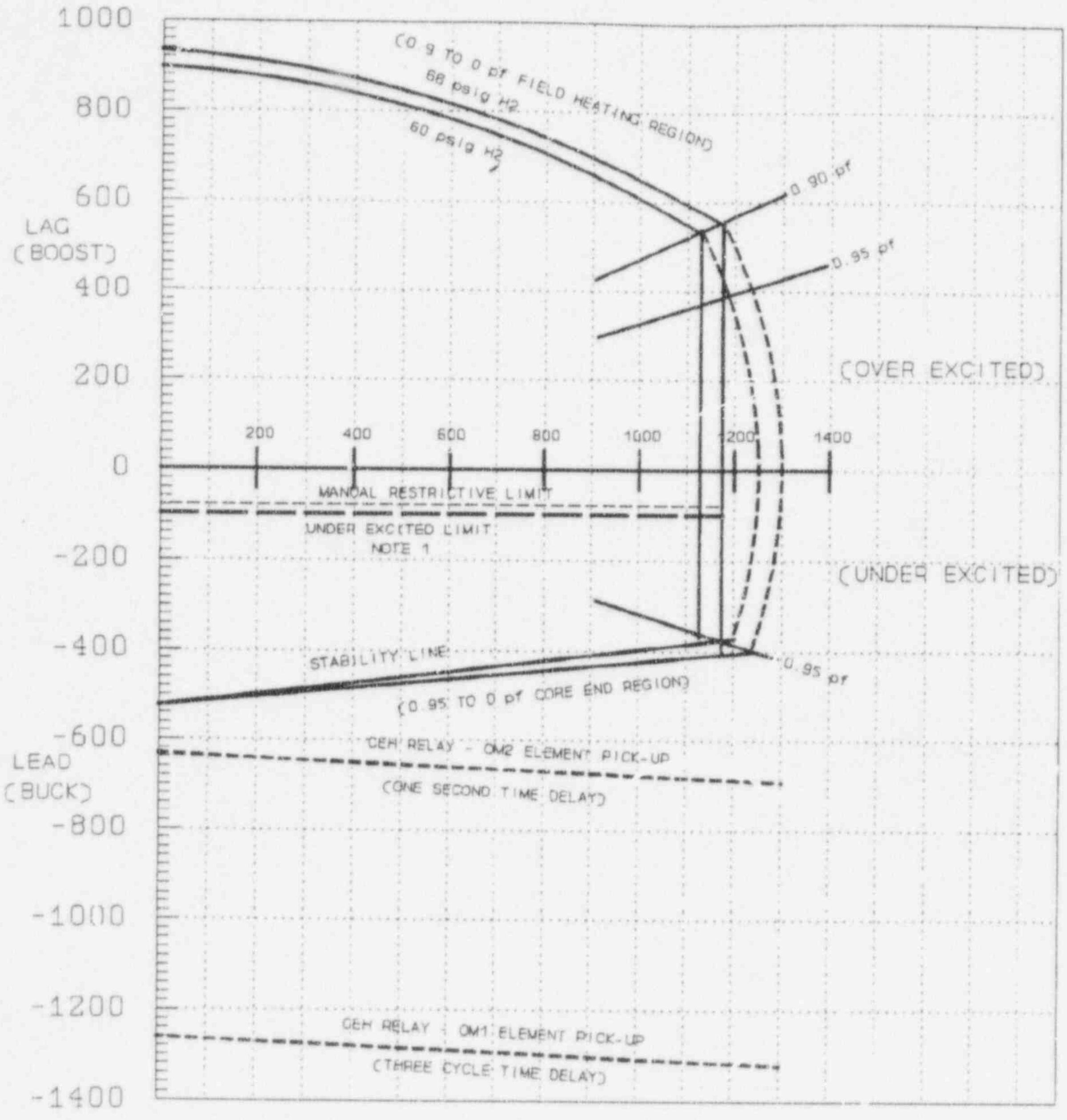
TIME	PWR. [1]	CV9000	CPC 171	CV9198	CPC 187	PLCEA in.	GRP 6 in.	GRP 5 in.	T112CA	MWe
2112	75.0	75.4	76.3	-.078	-.089	140.5	150	150	551.6	835
2140	75.0	75.2	74.7	-.066	-.064	129.2	150	150	550.5	824
2155	70.0	67.2	66.3	.007	.008	115	126	150	549.9	727
2210	65.0	64.6	64.3	.007	.007	115	126	150	549.6	700
2225	60.0	62.0	61.7	.010	.008	115	123.8	150	549.4	660
2240	55.0	59.0	58.5	.008	.005	115	122.3	150	549.3	631
2255	50.0	57.0	56.2	.014	.002	115	120	150	549.7	560
2310	45.0	51.1	50.2	.006	.0001	115	115	150	549.5	504
2325	40.0	45.1	43.9	.0055	.0001	106	115	150	549.5	433
2340	35.0	36.7	35.0	.007	-.011	85	109	150	549.1	329
2355	30.0	33.3	32.3	.013	-.004	85	102.7	150	549.0	241
0010	25.0	28.1	25.3	.006	-.021	85	85	150	548.0	200
0018	20.0	19.6	18.1	-.007	-.009	85	85	145	548.0	140

[1] Planned Power decrease, (For this shutdown it was 18-20%/Hr.)

Additional Information:

CV9000 - PMS PID, Plant Power
CPC 171 - CPC PID, Calibrated Neutron power
CV9198 - PMS PID, COLSS ASI
CPC 187 - CPC PID, Hot Pin ASI
T112CA - Loop #1 T-Cold

GENERATOR CAPABILITY CURVE



EXPLANATION OF CURVE

1. The two vertical lines (corresponding to generator hydrogen pressures of 60 and 68 psig) at their point of intersections with the solid horizontal line signify the MW output from the Generator with the Turbine operating at its rated 100% load and at its maximum capability. The 1180 MW figure read from the vertical line (farther to the right) in the capability curve represents the maximum Generator MW output, limited not by the Generator operating limits, but by Turbine limitations.

2. The dashed curved lines represent the maximum MVA loadings of the Generator. The Generator may be operated at rated MVA (1313 MVA at 68 psig hydrogen pressure; 1251 MVA at 60 psig Hydrogen pressure) between the limits of rated power factor (0.9 power factor lagging and 0.95 power factor leading).

3. The Generator design fully allows the Generator to be operated in the region between the solid vertical lines and the dashed curved lines. Generator operations in this region are governed by Turbine output limitations, and by restrictions imposed by SCE System Operations on Generator power factor and MVAR loadings.

NOTE: For example: If SOB-17 limits Generator MVARs to less than 200 MVAR boost, the Generator limits for MWe are as follows:

@ 60 psig Hz = ~1234 MWe gross is the limit

@ 68 psig Hz = ~1299 MWe gross is the limit

END OF ATTACHMENT