CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

PSTP-02

INITIAL APPROACH TO CRITICALITY AND LOW POWER PHYSICS TESTING PROCEDURE

REVISION 30

CONTINUOUS USE

Effective Date: 3/9/09

Safety Related ___X___

Non-Safety Related _____

Sponsor: Engineering Supervisor – Primary Systems Engineering Unit

Approval: General Supervisor – Systems Engineering

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1.0 PURPOSE

1.1 The purpose of this procedure is:

A. To provide a method for performing pre-critical testing.

B. To provide a safe, organized method for reaching initial criticality.

C. To provide a method for performing low power physics testing for the reload core once criticality has been established.

1.2 The results of this procedure shall be acceptable when the Acceptance Criteria of Attachment A-1, "Test Predictions and Acceptance/ Review Criteria," have been met **OR**, when results do not meet acceptance criteria, the results have been reviewed by PORC and the Plant General Manager in accordance with EN-1-310, "Requirements for Use of Nuclear Engineering Procedures."

2.0 APPLICABILITY/SCOPE

2.1 Low Power Physics Tests are performed to verify physics design parameters.

2.2 Unless specifically called out differently in this procedure, all general precautions and initial conditions of referenced Operating Procedures (OPs) and Operating Instructions (OIs) shall be complied with.

2.3 The instructions and method for reaching criticality contained in PSTP-02 are to be used for the startup immediately following refueling only.

2.4 PSTP-02 is identified as an infrequent test or evolution per NO-1-117, "Integrated Risk Management." Therefore, testing shall be performed in accordance with NO-1-117. **[B-37]**

2.5 This procedure shall be considered a part of PHYSICS TESTS, **PER** the Technical Specifications definition, and certain Special Test Exceptions of the Technical Specifications apply as explained below. The SE shall inform the Shift Manager, the Reactor Operator(s) and the dedicated SRO prior to invoking any Special Test Exception. The surveillance requirements of the Special Test Exceptions are satisfied by the following procedural actions.

A. Technical Specification 3.1.7 - During CEA Worth Measurements, only the shutdown CEAs are fully withdrawn. The predicted worth of the shutdown CEAs less the stuck CEA allowance could be less than the Technical Specification Beginning of Cycle (BOC) SHUTDOWN MARGIN limit. Therefore, this special test exception is invoked prior to measurement of CEA reactivity worth in Appendix D. Appendix D satisfies Surveillance Requirement SR 3.1.7.1 by recording CEA group heights hourly. CEA trip verifications will have been performed by CEDM Performance Testing, in accordance with SR 3.1.4.6, which will meet the requirements of SR 3.1.7.2.

2.5 APPLICABILITY/SCOPE (continued)

B. Technical Specification 3.1.8 - The surveillance requirements of this special test exception are satisfied by maintaining THERMAL POWER below 1% power. This power level is considerably below the 85% THERMAL POWER limit allowed by Technical Specifications. The Surveillance Requirement SR 3.1.8.1 is satisfied by continuously trending power on the RMAS display and recording once per hour on Attachment 3 that power is less than 1%.

2.6 Once the approach to criticality is commenced, RCS average temperature (T_{avg}) is recorded at least once every thirty (30) minutes until criticality is reached and thirty minutes thereafter if Tavg < 525 °F. This fulfills the requirements of Technical Specifications Surveillance Requirement SR 3.4.2.1.

2.7 The preferred lineup is for the Boric Acid Storage Tanks (BASTs) to be used as two sources of borated water for CVCS injection for this procedure, and to be operable in accordance with Technical Normal Condition (TNC) 15.1.2.

2.8 This procedure contains steps which are Reactivity Management sensitive. Pre-job briefs shall include discussion of the Reactivity Management aspects of this procedure. **[B-132]**

2.9 The determination of the Moderator Temperature Coefficient (MTC) in this procedure satisfies SR 3.1.3.1.

3.0 REFERENCES AND DEFINITIONS

3.1 Developmental References

A. ANSI 19.6.1, "Reload Startup Physics Tests for Pressurized Water Reactors."

B. "Calvert Cliffs Nuclear Power Plant Technical Requirements Manual."

C. "Calvert Cliffs Nuclear Power Plant Unit-1 (2) Technical Specifications," Appendix A to License No. DPR-53 (69).

D. "Calvert Cliffs Nuclear Power Plant Updated Final Safety Analysis Report," Revision 37, Chapter 13, Section 4, "Post-Refueling Startup Testing."

E. EN-1-310, "Requirements for Use of Nuclear Engineering Procedures."

F. NO-1-117, "Integrated Risk Management."

G. CNG-OP-3.01-1000, "Reactivity Management."

H. OP-02-1 (2), "Plant Startup from Hot Standby to Minimum Load."

I. TR-1-301, "Fuel Services Qualification and Training Program."

J. "Reactimeter Measurement and Analysis Software System (RMAS), Instruction Manual for RMAS6," 01-5041739-00, Framatome ANP, Inc., March, 2004.

K. CNG-HU-1.01-1002, "Pre-Job Briefings and Post-Job Critiques."

3.2 Performance References

A. AOP-1B, "CEA Malfunctions."

B. CP-204, "Specification and Surveillance: Primary Systems."

C. CP-217, "Specifications and Surveillance: Secondary Chemistry."

D. ETP 99-015R, "CEDM Performance Testing."

E. NFMSP-36, "Gamma Bucking Circuit Operation."

F. NO-1-117, "Integrated Risk Management."

G. NO-1-108, "Temporary Notes, Operator Aids, and Permanent Labels."

H. OI-1H, "Pressurizer Pressure Control."

I. OI-2B, "CVCS Boration, Dilution and Makeup Operations."

J. OI-2D-1 (2), "Purification System Operation."

K. OI-12A-1 (2), "Feedwater System."

L. OI-30, "Nuclear Instrumentation."

M. OI-42, "CEDM System Operation."

N. OI-50A, "Plant Computer."

O. OP-2-1 (2), "Plant Startup From Hot Standby to Minimum Load."

P. OP-6, "Pre-Startup Checkoff."

Q. PSTP-02 "Shift Log."

R. PSTP-23, "Physics Test Equipment Hookup."

S. PSTP-301, "RCS Flow Measurement Procedure."

T. STP-O-6-1 (2), "RPS Startup Test."

U. OI-17C-2, "Reactor Coolant Waste Receiver Tank Operation."

3.3 Definitions

A. 1/M Computer - Any computer software package that interprets neutron count rate data and calculates and plots inverse count rate (1/M). This includes the Plant Computer 1/M function.

B. All Rods Out (ARO) - At this condition, all CEAs are at the Upper Electrical Limit, also known as "full-out."

C. Critical Boron Concentration (CBC) – The average of two consecutive samples taken approximately 15 minutes apart that are within 20 ppm of each other or the average of three samples that are within 15 ppm of that average, concurrent with a change in reactivity that is no more than +/- 5 pcm in the previous 10 minutes or +/- 2 pcm in the previous 5 minutes.

D. Engineering Workstation – A computer (usually a laptop) configured to run the RMAS application.

E. Essentially All Rods Out (EARO) - At this condition, all CEAs are "full-out" with the exception of Group 5, which is partially inserted for reactivity control.

F. Essentially Full-in (EFI) - At this condition, all Regulating groups are "full-in" except that the last inserted group may be partially withdrawn, or the next group partially inserted for reactivity and criticality control.

G. Full-in - At this point, Shutdown and Regulating CEAs are at their lower electrical limit (LEL), approximately 3 inches from the bottom of the core. CEAs could also be at the Lower Computer Stop, approximately 4.5 inches from the bottom of the core.

H. Full-out - At this point, Shutdown and Regulating CEAs are at their upper electrical limit (UEL), approximately 135 inches from the bottom of the core.

I. Fully Inserted - At this point, a CEA is at its lower mechanical stop, the amber light is lit or the green light is lit.

J. Low Power - For the purposes of tests conducted under PSTP-02, any power level at or below an indication of 1% power as seen by the highest reading Wide Range (WR) Log Channel.

K. Operator Workstation – A computer (usually a laptop) configured to provide a Reactimeter interface to the Operators at 1C05 (2C05).

L. pcm – A unit of reactivity worth, equivalent to 10^{-3} $\%\Delta\rho$. (1000 pcm = $1\%\Delta\rho$).

M. Point of Adding Nuclear Heat (POAH) - The POAH can be found following a positive reactivity insertion that results in increasing flux. The POAH has been reached when flux continues to increase, but reactivity begins to decrease. A slight rise in RCS temperature and/or pressurizer level should also occur at the POAH.

N. Reactimeter - This term refers to the REWG Reactivity Computer System.

O. RMAS – Software package capable of analyzing startup testing data.

4.0 PREREQUISITES

4.1 Personnel Skill Levels Required

A. At least two Fuel Operations Support (FOS) or Reactor Engineering personnel should be assigned to each shift. At least two personnel shall be qualified as Shift Engineers (SEs) for Startup Testing **PER** TR-1-301, "Nuclear Fuel Services Qualification and Training Program," or an equivalent qualification program. The remainder of the shift may be comprised of SEs or trainees. The SE has the following responsibilities:

1. Collecting and analyzing the data required for completion of the testing procedure.

2. Ensuring that procedure problems found during the performance of this procedure are documented on Attachment 6.

3. Ensuring that all Initial Conditions are met prior to beginning a test.

4. Briefing each person on the shift whose watch station is affected by the test.

5. Briefing the oncoming shift.

6. Ensuring that all on-shift personnel fully understand the reason for any plant manipulation requested in support of PSTP-02.

7. Ensuring instructions to the Reactor Operators are directed through the Dedicated SRO (DSRO), as required by the DSRO. **[B-58]**

B. One Shift Engineer per shift shall be designated as Shift Test Coordinator (STC). The STC has the following responsibilities:

1. Functioning as the Designated Lead Point of Contact per NO-1-117, "Integrated Risk Management." **[B-37]**

2. Ensuring that plant conditions which may affect testing results are identified and the impact minimized.

3. Ensuring that applicable Acceptance Criteria are applied to testing done under this procedure.

4. Deciding when further testing is necessary and performing test repeats in accordance with Step 4.2.B.

5. Assisting the Shift Engineers in completion of testing.

6. Determining acceptability of preliminary test results and assessing the need for final data reduction.

7. Acting as an interface between Shift Engineers and Control Room personnel.

8. Ensuring SEs are qualified to perform assigned tasks.

4.1 Personnel Skill Levels Required (Continued)

C. On-shift Operations personnel are responsible for the safe operation of the plant at all times during the test. Operations personnel should:

1. Discuss any plant manipulations which could affect test results with the SE and STC.

2. Ensure full understanding of plant manipulations requested by the SE.

3. Suspend testing in the event personnel think safe operation is being compromised.

4. Provide a Dedicated SRO. **[B-37]**

D. The Director, Fuel Services Section (D-FSS), the Principal Engineer, Nuclear Fuel Management (PE-NFM), the Principal Engineer, Fuel Operations Support (PE-FOS), the General Supervisor, System Engineering (GS-SE), or the Principal Engineer, Primary Systems Engineering Unit shall function as the Responsible Group Supervisor per NO-1-117, "Integrated Risk Management." **[B-37]**

E. All issues shall be evaluated by the Responsible Group Supervisor, the Designated Lead Point of Contact, and the Shift Manager to determine if testing can continue prior to correction and resolution of the issue. If the issue will have a significant impact on testing or the margin of safety of the plant, testing shall be suspended until the issue is resolved.

F. All communications between Control Room and plant personnel involving control of plant equipment shall be clear, concise, and specific, using proper terminology. The recipient of such communications shall repeat the instructions back in sufficient detail so as to allow the originator to ensure that the instructions were understood. **[B-6, B-58]**

G. Management and pre-evolution briefings shall be conducted for each Operations section performing this procedure. Management briefings shall be conducted per NO-1-117, "Integrated Risk Management." **[B-37]**

H. Contractors who are qualified as RMAS operators through a contractor qualification program have the following responsibilities:

1. Collecting and analyzing data using the RMAS system.

2. Reviewing RMAS printouts which will be attached to the procedure.

4.2 Documentation and Support

A. Shift Logs shall be maintained to document identified problems, actions taken, and decisions made during the performance of this procedure. Entries should be initialed by the person performing the entry. Entries may be made by non-testing personnel with approval of the SE. These entries shall identify the author, in the event that follow-up is necessary.

4.2 Documentation and Support (Continued)

B. Portions of a specific test may be repeated, provided that the test has not yet been exited. A portion of a test may also be repeated if permission is specifically given in the procedure. This ensures that the conditions required for the test still exist. Any test shall be considered exited when the next major subsection of Section 6.0 of the Main Procedure is begun. Test Repeats shall be documented on Attachment 4, Test Repeat Documentation. Documentation shall include a reason for the repeat and a listing of the steps to be repeated, as they appear in the procedure, and the appropriate placekeeping steps. Reprinted procedure pages are an acceptable listing of the steps to be repeated.

C. PSTP-02 has been written to eliminate unit-specific identifiers. Where necessary, both unit identifiers are listed, with Unit 1 identifiers first and Unit 2 identifiers following in parentheses.

D. Portions of PSTP-2 contain placekeeping blanks. If specified "SE", or other position descriptions, initials or a signature are required.

4.3 Initial Conditions

A. An initial page check of this procedure has been performed. **[B-5, B-7]**

_____
SE

NOTE

Steps 4.3.B through 4.3.U may be performed in any order.

B. Post-Refueling Core Verification has been completed.

_____
SE

C. The license amendment for the fuel cycle being tested has been received, or the 50.59 for the fuel cycle has been approved by the Plant General Manager and operation through MODE 1 has been authorized.

Unit _____ Cycle _____

_____
SE

4.3 Initial Conditions (Continued)

D. The following special trend block has been set up to trend at two minute intervals.

Parameter	ID	Parameter	ID
CEA A-38	CR38	Wide Range Pwr, A	NR1A!
CEA B-6	CR06	Wide Range Pwr, B	NR2B!
CEA C-46	CR46	Wide Range Pwr, C	NR3C!
CEA 1-54	CR54	Wide Range Pwr, D	NR4D!
CEA 2-18	CR18	Reactivity	RHO
CEA 3-26	CR26	Reactivity	NRRHO2
CEA 4-2	CR02		
CEA 5-1	CR01		
RPS Nuclear Power, Ch. A	NR5A		
Pressurizer Pressure	P100X		
Tcold 11A (21A)	T111Y		
Tcold 12A (22A)	T121Y		
Thot 11 (21)	T111X		
Thot 12 (22)	T121X		
Tavg Reg Ch 1	T191		
Tavg Reg Ch 2	T192		

Trend Group Number _____ Trend Block Number 31

_____
SE

E. The physics testing predictions for the new fuel cycle have been obtained, and transferred to Attachment A-1, "Test Predictions and Acceptance/Review Criteria." Attachment A-1 has been independently reviewed to assure that the data was transferred correctly.

Reference: _____

_____

Transferred by: _____ Reviewed by: _____
SE SE

F. The physics testing predictions for the new fuel cycle have been transferred to the Physics Test Manual on the Engineering Workstation and independently reviewed to assure that the data was transferred correctly.

Reference: _____

_____

Transferred by: _____ Reviewed by: _____
SE SE

4.3 Initial Conditions (Continued)

G. The worth of a Shutdown CEA Group has been verified greater than the highest estimated worth of any one CEA. **[B-39]**

Shutdown Group _____ worth _____ pcm

Highest Estimated CEA worth _____ pcm

Reference: _____

_____

_____ _____
SE Verify: SE

H. The Reactor Protective System Setpoint changes required prior to startup by Setpoint Requirements for the current cycle have been implemented, or have been verified not to change.

_____
E&C Sys. Eng.or SE

I. The Startup Rate Trip enabling Setpoint, along with neutron flux leakage data for this fuel cycle to verify that the 10^{-4}% bistable enables prior to 10^{-4}% power, have been reviewed. If the review found that a change was needed, the change has been implemented. **[B-20]**

_____
E&C Sys. Eng.or SE

J. Chemistry has been notified to take boron samples every four hours, saving one sample following criticality to perform B-10 analysis (step 6.11.C), **AND** RCS boron sample results are being logged on Attachment 2, RCS Boron Concentration vs. Time.

_____
SE

NOTE

In the past, samples drawn from the CVCS filter inlet have not provided consistent or meaningful results during startup physics testing. **[B-121]**

K. Chemistry has been notified to keep the NSSS sink lined up for recirculation to the RCS hot leg sample point for the duration of PSTP-02 for Chemistry Boron sampling concerns.

_____
SE

L. The reactimeter has been calibrated.

Reactimeter Serial Number: _____

Date of Calibration: _____

_____
SE

M. The RCS boron concentration is greater than or equal to refueling boron concentration, by grab sample, if the shutdown CEAs are inserted. **[B-82]**

Measured Boron Concentration _____ ppm

_____ Verify: _____
SE SE

N. Temporary Notes, PER NO-1-108, Temporary Notes, Operator Aids, and Permanent Labels, have been prepared (but not posted) for:

- Boric Acid Pump 11 (21), Handswitch 1-HS-226X (2-HS-226X)
- Boric Acid Pump 12 (22), Handswitch 1-HS-226Y (2-HS-226Y)
- Makeup Mode Selector Switch, Handswitch 1-HS-210 (2-HS-210)

These Boric Acid Pump Notes shall ensure that the SE is notified prior to the use of any boric acid **EXCEPT** in an emergency. The Makeup Mode Selector Switch Note shall ensure that the SE is notified prior to makeup to the VCT, **EXCEPT** in an emergency.

_____
SE or Ops

O. A pre-test briefing of the initial shift personnel involved in PSTP-02 testing has been conducted prior to the beginning of testing and documented. The briefing covered the topics below. **[B-37]**

- Test objectives, prerequisites, and precautions.
- Expected indications, plant performance, and sequence of events.
- Personnel duties and responsibilities.
- Risks involved and potential problems.
- Previous events and significant incidents resulting from similar activities.
- Actions to be taken if unexpected or abnormal conditions occur.

Ops Section _____

_____
SE

4.3 Initial Conditions (Continued)

P. A management briefing of the initial shift personnel involved in PSTP-02 testing has been conducted prior to the beginning of testing **PER** NO-1-117 **AND** a NO-1-117 Attachment 15, Management Briefing for Infrequent Tests or Evolutions, was completed for the briefing. The briefing covered the topics below. **[B-37]**

- The need for exercising caution and conservatism during the test or evolution, especially when uncertainties are encountered.
- Emphasis on maintaining the highest margins of safety and placing the proper perspective on any prevailing sense of urgency.
- Assigned responsibilities for the activity and any deviation from normal shift duties and accountabilities.
- The need for open communications.
- The application of lessons learned from pertinent in-house and industry operating experience to assist operations and other involved personnel in internalizing these lessons.
- The need to stop the activity, stop power ascension, decrease power, or trip the reactor when unexpected or abnormal conditions arise or unexpected plant behavior is experienced.

Ops Section _____

_____
Responsible Group Supervisor
or STC

Q. Information Technology – Process Computing Systems Unit (IT-PCS) has verified that the plant computer is operable.

_____
IT-PCS or SE

R. A Dedicated SRO has been assigned. **[B-37]**

_____
SE

S. The reactor coolant waste receiver tanks have sufficient volume available to accommodate a discharge of up to 36,000 gallons of water from the dilution to critical. OI-17C-2 contains data for level vs. volume.

_____
Ops or SE

T. The boron equivalents in Sections 6.5, 6.9, and 6.10 have been entered into the procedure and independently reviewed.

Entered: _____ Reviewed: _____
SE SE

4.3 Initial Conditions (Continued)

U. **VERIFY** that the wide range power recorder on 1CO5 (2C05) is operating satisfactorily on at least one WR Log Channel.

_____
Ops or SE

V. The Shift Manager has noted the start of this test in his log.

_____
SM or SE

W. All prerequisites listed above have been met.

_____/_____/_____
Date Time STC

X. Each oncoming shift after the first shift shall be briefed on the same items as the initial brief covered in Steps 4.3.O and 4.3.P, unless the shift has already been briefed. Briefings shall also be held prior to any significant change in plant conditions, or at the beginning of a test. These briefs shall be documented. **[B-37]**

4.4 Special Tools and Equipment Required

A. High Voltage Power Supply (Power Designs Inc. Model AEC-315B or equivalent)

B. Four coaxial cables.

C. Isolation Transformers

D. Reactimeter(s)

E. Set of four Gamma Metrics Cables, short cables for Unit 1, long cables for Unit 2

F. Plant Computer Interface Cable

G. Two laptop computers

H. RS-232 to RS 422/485 Converter (Black Box).

I. Power cords – reactimeter, laptops

J. Reactimeter keyboard (optional).

4.4 Special Tools and Equipment Required (continued)

K. Nine pin female to female cable.

L. Long low voltage Black Box cable.

M. Power Strip(s) with GFI circuit.

N. Printer for reactimeter laptop.

O. Printer cable.

P. Metal handrail tray for Operator laptop (if desired).

5.0 PRECAUTIONS

5.1 Boration/Dilution

A. During RCS boration and dilution, pressurizer and reactor coolant loop boron concentrations should be kept as equal as possible by energizing all available pressurizer backup heater banks and adjusting the selected PZR PRESS CONTR CHX or CHY, 1(2)-PIC-100X or 1(2)-PIC-100Y, setpoint to maintain pressure at 2250 psia.

B. During RCS borations/dilutions, while maintaining reactivity approximately zero pcm, the boration/dilution shall be stopped so as to minimize overshoot of the desired end point. Also, the pressurizer and the VCT boron concentrations will lag the RCS boron concentration during periods of boration/dilution. The time required for the pressurizer and RCS boron concentrations to equalize could be five hours or more, even using maximum pressurizer spray.

C. The RCS shall not be diluted at a rate greater than 4 ppm/min.

D. Dilution below the refueling boron concentration shall not be performed unless the Shutdown CEAs are fully withdrawn. **[B-82]**

E. NFMSP-36 may begin at any time, however it is recommended to start after the dilution to criticality has commenced.

5.2 Criticality

A. Criticality shall be anticipated at any time during the approach to critical, and especially whenever positive reactivity changes are being made, including CEA withdrawals, dilutions, and heatups and cooldowns during reactor startup. **[B-8]**

B. A stable startup rate greater than 0.5 decades per minute (DPM) shall not be attempted or sustained during or after the critical approach.

C. Dilution to critical shall not continue beyond 500 pcm below the predicted critical boron concentration until an evaluation has been performed by the SE.

5.3 Reactivity Management

A. This procedure has the potential to impact the monitoring or control of core reactivity by changing RCS temperature, RCS boron concentration, and CEA position. This procedure should be treated as a Reactivity Management sensitive evolution, and appropriate discussion of reactivity management should be included during pre-job briefs. **[B-132]**

B. T_{cold} shall not intentionally be allowed outside the range of 525 to 535°F while critical at Hot Zero Power (HZP). **[B-66]**

C. No valves in the CVCS shall be realigned for the purpose of pumping BA or DI water to a location other than the RCS without first notifying the STC. Leaking valves in the CVCS can lead to an unexpected reactivity change to the RCS.

D. In order to prevent an unexpected addition of negative reactivity, the lines should be flushed with deionized (DI) water or blend following boric acid (BA) addition to the RCS or the VCT.

E. Any changes in plant operating conditions that could produce unplanned changes in RCS temperature, pressure, or boron concentration should be avoided. All plant parameters shall be maintained as constant as possible except for the particular parameter(s) to be changed during a given step.

F. CEAs, boric acid, or DI water may be used to adjust flux levels or reactivity as needed during performance of this procedure. The SE shall be notified when CEAs, boric acid, or DI water is used.

G. After boron equilibrium has been established, it is better to move power within the operating band using CEAs.

H. Reactivity insertions of up to +/- 50 pcm may be made to reposition flux.

I. CEA withdrawal and dilution shall not be performed simultaneously. **[B-100]**

J. Every attempt should be made to coordinate with Chemistry to avoid Li additions during reactivity measurements.

5.4 CEAs

A. Except where otherwise specified, CEA operations should be in the Manual Sequential mode of operation.

B. In order to verify test results or to temporarily hold power or reactivity in a desired band, CEAs may be inserted or withdrawn.

C. If a CEA drops **PRIOR** to initiating the dilution to criticality, then the CEA may be withdrawn to its position prior to the drop. The boron concentration prior to the start of dilution will ensure that the reactor will not go critical. Appendix E provides the necessary instructions. Multiple CEA drops prior to initiating dilution may be handled similarly.

D. If a CEA drops **DURING** the dilution to criticality, then the dilution shall be secured prior to recovering the dropped CEA. Boration will be required prior to withdrawing the CEA if in MODE 2 to ensure that the reactor will not go critical. With concurrence of the STC, DSRO, and Shift Manager, the CEA may be withdrawn to its position prior to the drop. Appendix E provides the necessary instructions. Multiple CEA drops while still in MODE 3 may be handled similarly.

E. If a CEA drops **AFTER** initial criticality, then the reactivity computer's reactivity indication shall be used to determine whether the reactor is critical or subcritical. If the CEA drop has caused the reactor to go subcritical, then AOP-1B, CEA Malfunctions, shall be implemented. If the reactor remains critical, then with concurrence of the STC, DSRO, and Shift Manager, the CEA may be withdrawn to its position prior to the drop. Appendix E provides the necessary instructions.

F. If more than one CEA drops while in MODE 2, then the reactor shall be tripped by implementing AOP-1B, CEA Malfunctions.

G. If a CEA(s) is declared inoperable while in MODE 3, then any dilution shall be secured and the CEA(s) shall be restored to operable prior to entering MODE 2. Dilution, if in progress at the time of the CEA drop(s), may resume once the CEA(s) is restored to operable.

H. If a CEA(s) is declared inoperable while in MODE 2, then AOP-1B, CEA Malfunctions, shall be implemented.

5.5 Power

A. Indicated power level should not be allowed to exceed 1% power as shown on the highest reading operable Wide Range (WR) Log Channels except where indicated in the procedure. Power shall not exceed 5% of Rated Thermal Power while performing this procedure.

B. During reactivity measurements, the reactor power level shall be maintained below the point of adding nuclear heat. This, by definition, maintains the core in an isothermal condition during reactivity measurements.

5.6 Equipment

A. If the reactivity computer is found to be or is suspected of being out of calibration, an internal test of the reactivity computer shall be performed promptly to determine whether the reactivity computer performs in the desired manner. This may be performed and repeated at any time after establishing an appropriate power level as required by the STC. Tests of the Reactivity Computer may also be done when time permits if it is suspected that a calibration problem is occurring. This shall be performed using Attachment 4.

B. Caution should be taken if any input is connected to the Physics Test Equipment to ensure that multiple live signals can not be connected to each other via the Physics Test Equipment. **[B-28]**

C. The reactivity computer receives signals from the plant computer for temperature and CEA position. If the plant computer signal is lost, testing may be continued, as CEA position and temperature can be entered manually into the RMAS program.

D. If the input to the reactivity signal is changed from using the Reactor Regulating System to the Gammametrics detectors, the physics testing range historically used may change. **[B-94]**

E. An identified bad signal should remain isolated during the performance of any reactivity changes used for obtaining measurements.

F. A tripped GFI Circuit could potentially reverse the polarity of a reactivity signal. If the polarity is found to be positive, an I&C Technician should be asked to inspect the GFI Circuit. **[B-114]**

5.7 Conduct of Testing

A. If any abnormal or unexpected conditions occur during testing the Shift Manager shall be notified immediately and testing shall be suspended. The DSRO/Shift Manager shall evaluate the situation and determine the course of action, including the necessary procedures to put the plant in a safe condition. **[B-37, B-38]**

B. Concurrence of both the Responsible Group Supervisor and the Shift Manager shall be required to restart testing after a suspension, per NO-1-117, Integrated Risk Management. If concurrence can not be reached, the Responsible Group Supervisor shall escalate resolution to the next higher level of management. **[B-37]**

C. Following a reactor trip or delay in testing during which a change in plant conditions takes place, which could affect the results of the tests, the applicable initial conditions shall be reestablished under the direction of the Shift Test Coordinator (STC) before restarting or resuming this procedure. This shall be done by a procedure change and recorded on Attachment 5, Restart Documentation.

5.7 Conduct of Testing (continued)

D. In the event of a delay in testing for non-test related reasons, the Responsible Group Supervisor (Section 4.1.D) may recommend that the reactor be placed in a sub-critical or stable critical configuration to the Shift Manager or Dedicated Senior Reactor Operator. He should ensure a change to this procedure is generated to interrupt the test program and operate the plant in accordance with OI's and OP's.

E. If any review criteria are exceeded, an evaluation will be made to determine first, the applicability of the prediction to the precise plant conditions under which the measurement was performed, and second, the accuracy of the measurement. As a result of this review, the measurement may be repeated and/or the prediction may be updated, if required, to reflect actual plant conditions at the time of measurement. **[B-3]**

F. If a test has been completed, it is a good practice for data reduction of a particular test to be started and finished by the same crew. **[B-92]**

6.0 PERFORMANCE

NOTE
Section 6.1 may be performed in parallel with Section 6.2 through Section 6.4.

6.1 CEDM Performance Testing

A. **PERFORM** ETP-99-015R, CEDM Performance Testing, **WHEN** permitted by OP-2.

Ops or SE

B. **VERIFY** that ETP-99-015R has been completed and that the results are satisfactory.

Ops or SE

6.2 RCS Flow Measurement

NOTE
Step 6.2.A may be performed in parallel with Section 6.1 through Section 6.6.

NOTE
Use of pressurizer spray and pressurizer heaters to equalize pressurizer and reactor coolant loop boron concentrations can be suspended, if deemed advantageous by the STC, for the performance of PSTP-301. However if boron ingress from the pressurizer is still occurring at the conclusion of PSTP-301, use of pressurizer spray and heaters to equalize boron concentrations should be resumed.

A. **PERFORM** PSTP-301 data collection **WHEN** permitted by OP-2.

Ops or SE

6.3 Preparation for CEA Withdrawal

NOTE
Steps 6.3.A through 6.3.D may be performed in parallel.

A. **VERIFY** that all initial conditions are met in OP-2 for withdrawing CEAs.

Ops or SE

NOTE
For testing to proceed, a minimum of two 1/m channels are required to be on-scan.

B. **PERFORM** a base count rate (C_O) determination and **RECORD** base count data below.

C_O(counts/sec) WR Log Channel	A	B	C	D
	_____	_____	_____	_____

6.3 Preparation for CEA Withdrawal (Continued)

C. **START** and **MAINTAIN** an inverse count rate (1/M) plot using a 1/M Computer.

SE

D. **VERIFY** that pressurizer level and steam generator level are being maintained within the normal operating band in accordance with applicable OIs and OPs.

Ops or SE

6.4 Shutdown CEA Withdrawal

A. **CLOSE** or **VERIFY** closed the Shutdown CEAs CPP 240 VAC circuit breakers for Groups A, B and C.

Ops or SE

B. **WITHDRAW** all Shutdown CEA Groups **PER** OI-42, CEDM System Operation, to approximately 4.5 inches **OR** until the amber light is off.

Ops or SE

C. **WITHDRAW** the Shutdown CEA Group listed on Table 6.4 PER OI-42, CEDM System Operation, using MG mode, to the approximate inches withdrawn listed on Table 6.4. Manual Individual (MI) mode may be used to raise CEAs to the UEL.

D. **ENSURE** that each CEA in the group being moved is within (+/-) three (3) inches of the specified group position following withdrawal. **IF NOT, THEN MOVE** the CEA to the specified position using Manual Individual (MI) mode.

E. **IF** 1/M continues to be satisfactory, **THEN INITIAL** the appropriate blocks in Table 6.4.

F. **REPEAT** Steps 6.4.C through 6.4.E for the remaining group withdrawals shown on Table 6.4.

G. **AFTER** withdrawal of all Shutdown CEAs, **ENSURE** that all fully withdrawn CEAs display 135.0 inches on the primary CEA position indication display on 1C05 (2C05).

6.4 Shutdown CEA Withdrawal (continued)

TABLE 6.4: Shutdown CEA Withdrawal

Shutdown CEA Group	Approximate Inches Withdrawn	1/M Satisfactory	
A	135.0	_____ SE	Verify: _____ SE
B	135.0	_____ SE	Verify: _____ SE
C	135.0	_____ SE	Verify: _____ SE

6.5 Dilution Below Refueling Boron Concentration

NOTE

No dilution shall be performed until all shutdown banks have been withdrawn.

A. **REQUEST** Chemistry to begin RCS boron sampling once every 15 minutes.

_____ SE

B. **START** and **MAINTAIN** a 1/M plot for each operable WR Log Channel using a 1/M computer. The average value may be plotted if all four channels are operable. The plot shall be updated at least once per half hour.

_____ SE

C. **REQUEST** use of pressurizer spray and pressurizer heaters, as necessary, in order to equalize pressurizer and reactor coolant loop boron concentrations in accordance with Precaution 5.1.B.

_____ SE

D. **START** diluting with pre-determined volumes of DI water, in accordance with OI-2B, "CVCS Boration, Dilution and Makeup Operations," using two (2) charging pumps. **REDUCE** the charging rate as necessary to maintain the dilution rate less than the limit specified in Precaution 5.1.C.

_____ SE

6.5 Dilution Below Refueling Boron Concentration (continued)

NOTE

The boron concentration specified in Step 6.5.E is a target value, not a hard requirement. If boron sample results obtained after the performance of Step 6.5.E and in parallel with Section 6.6 indicate that there was an excessive dilution overshoot, the need to delay or suspend Regulating CEA withdrawal in Section 6.6 to commence boration is at the discretion of the STC and SRO.

E. **WHEN** RCS boron concentration is approximately equal to _____ppm (250 ppm above the predicted critical boron concentration (CBC) from Attachment A-1 for Group 5 @ 99"), **SECURE** the dilution.

SE

6.6 Regulating CEA Withdrawal

CAUTION

All Shutdown CEAs shall be fully withdrawn PRIOR to Regulating Group withdrawal.

A. **CLOSE** or **VERIFY** closed the Regulating CEAs CPP 240 VAC circuit breakers for Groups 1, 2, 3, 4, and 5.

Ops or SE

B. **WITHDRAW** all Regulating CEA Groups **PER** OI-42, CEDM System Operation, to approximately 4.5 inches **OR** until the amber light is off.

Ops or SE

C. **WITHDRAW** the Regulating CEA Group listed on Table 6.6 **PER** OI-42, CEDM System Operation, and Precaution 5.2.A, using MS mode, to the approximate inches withdrawn listed on Table 6.6. Manual Individual (MI) mode may be used to raise CEAs to the UEL.

D. **VERIFY** that each CEA in the group being moved is within (+/-) three (3) inches of the specified group position following withdrawal.

E. **IF** a CEA is further than three (3) inches (+/-) from the specified position, **THEN MOVE** the CEA to the specified group position using the Manual Individual (MI) mode.

F. **IF** 1/M continues to be satisfactory, **THEN INITIAL** the appropriate blocks in Table 6.6.

6.6 Regulating CEA Withdrawal (continued)

G. **REPEAT** Steps 6.6.C through 6.6.F for the remaining group withdrawals shown on Table 6.6.

H. **AFTER** withdrawal of all Regulating CEAs, **ENSURE** that all fully-withdrawn Regulating CEAs display 135.0 inches on the primary CEA position indication display on 1C05 (2C05).

I. **PERFORM** a new Base Count Rate (C_0) determination and **RECORD** base count rate data below.

C_0(counts/sec) WR Log Channel	A	B	C	D
	_____	_____	_____	_____

J. **PRINT** a CEA Data Log using the following options from a terminal with OPERATOR or higher access level:

- Main Menu
- CEA Functions
- CEA Data Log
- Initialize File And Start Data Collection After Printing The Report

_____
SE

TABLE 6.6: Regulating CEA Withdrawal

Regulating CEA Group	Approximate Inches Withdrawn	1/M Satisfactory	
1 (2)	135.0 (45.0)	_____ SE	Verify: _____ SE
2 (3)	135.0 (45.0)	_____ SE	Verify: _____ SE
3 (4)	135.0 (45.0)	_____ SE	Verify: _____ SE
4 (5)	135.0 (45.0)	_____ SE	Verify: _____ SE
5	99.0	_____ SE	Verify: _____ SE

6.7 Preparations for Dilution

NOTE
In the past, a tripped GFI Circuit has reversed the polarity of the Channel X reactivity signal. If the polarity is found to be positive, an I&C Technician should be asked to inspect the GFI Circuit. **[B-114]**

A. **VERIFY** that the physics testing equipment has been hooked up per PSTP-23, Physics Test Equipment Hookup.

_____
SE

B. **START** and **MAINTAIN** a 1/M plot for each operable WR Log Channel using a 1/M computer. The average value may be plotted if all four channels are operable. The plot shall be updated at least once per half hour.

_____
SE

C. **VERIFY** that Mode 1 and 2 Checklist of OP-6, Pre-Startup Checkoff, has been completed to allow entry into MODE 2.

_____
SE

D. **ENSURE** that all 4 ZERO POWER MODE bypass keyswitches are in OFF (located on the RPS cabinets).

_____
Ops or SE

NOTE
Step 6.7.E may be performed in parallel with the dilution to criticality.

NOTE
A noisy reactivity signal may be an indication that power level is too low or that gamma bucking is necessary. A final decision on the acceptability of the reactivity signal may be delayed until the power level is in the physics testing range (usually 10^{-2}% to 10^{-1}%).

NOTE
If one or more of the four detectors cannot be observed to respond as specified, the STC shall decide the best configuration of signal inputs to use. This decision shall be documented in the shift log.

E. **CHECK** the power range channel signals that input to the reactivity computer.

1. **DISCONNECT** all but the first signal input from the power range channel to the picoammeter and **RECORD** the signal value.

   First Input Cable ID number _____Signal Value_____

2. **DISCONNECT** the first signal input and **RECONNECT** the second signal input. The signal values should be consistent.

   Second Input Cable ID number _____Signal Value _____

3. **DISCONNECT** the second signal input and **RECONNECT** the third signal input. The signal values should be consistent.

   Third Input Cable ID number _____Signal Value _____

6.7 Preparations for Dilution (Continued)

4. **DISCONNECT** the third signal input and **RECONNECT** the fourth signal input. The signal values should be consistent.

   Fourth Input Cable ID number _____Signal Value _____

5. **RECONNECT** the signal inputs.

   _____
   SE

   Verify: _____
   SE

NOTE

Step 6.7.E.6 may be marked "N/A" if not required.

6. **IF** the STC determines that the power level was too low for an effective signal evaluation, **THEN,** during the reactivity computer checkout (step 6.12):

   a. **ESTABLISH** a power level between 10^{-3}% and 10^{-2}% power on the highest reading WR Log Channel using Group 5.

      _____
      SE

   b. **REPEAT** Steps 6.7.E.1 through 6.7.E.4 for the signal inputs. The signal values should be consistent.

      First Input Cable ID number _____

      Signal Value_____

      Second Input Cable ID number _____

      Signal Value _____

      Third Input Cable ID number _____

      Signal Value _____

      Fourth Input Cable ID number _____

      Signal Value _____

   c. **RECONNECT** the signal inputs.

      _____
      SE

      Verify: _____
      SE

CAUTION

Although Technical Specifications permit criticality at temperatures above 515°F, T_{cold} shall not intentionally be allowed outside the range of 525 to 535°F while critical at Hot Zero Power (HZP). **[B-66] [B-83]**

6.8 Dilution to Criticality

NOTE

The preferred method for approaching criticality is a continuous dilution.

A. **REQUEST** the Operators to begin verifying that RCS average temperature is greater than 525° F, by documenting RCS T_{avg} at least once every 30 minutes in the CRO's log, while dilution is in progress. (Technical Specifications SR 3.4.2.1)

_____/_____/_____
Date Time SE

B. **IF** suspended in Section 6.2, **THEN REQUEST** use of pressurizer spray and pressurizer heaters, as necessary, in order to equalize pressurizer and reactor coolant loop boron concentrations in accordance with Precaution 5.1.A.

_____
SE

C. **START** diluting at a direct boron dilution rate of approximately 3 to 4 ppm/min (88 gpm of DI water), in accordance with OI-2B, "CVCS Boration, Dilution and Makeup Operations," using at least two (2) charging pumps. **REDUCE** the charging rate as necessary to maintain the dilution rate less than the limit specified in Precaution 5.1.C.

_____
SE

D. **INFORM** Health Physics Supervision that the dilution to take the reactor critical has been started.

_____
SE

NOTE

NFMSP-36 may begin at any time, however it is recommended to start after the dilution to criticality has commenced.

E. **IF** not already begun, **THEN START** NFMSP-36 to determine the gamma bucking current.

_____
SE

6.8 Dilution to Criticality (Continued)

NOTE

Step 6.8.F may be performed any time prior to Step 6.9.A. Revision to the Operator Logs for the RCS Low Flow Trip Setpoints per PSTP-301 is not required until MODE 1.

F. **ENSURE** the RCS Low Flow Trip Setpoints per PSTP-301 have been installed prior to MODE 2.

_____/_____/_____
Date Time FOS/SE/Sys Eng

G. **VERIFY** with Chemistry that the startup hold requirements for MODE 2 of CP-204, Specification and Surveillance Primary Systems, and CP-217, Specification and Surveillance: Secondary Chemistry, are satisfied.

_____
SE

6.9 Dilution Verifications

A. **WHEN** RCS boron concentration is diluted to _____ppm (approximately 200 ppm above the predicted CBC from Attachment A-1 for Group 5 @ 99"), **THEN DECLARE** MODE 2.

_____/_____/_____
Date Time SE

B. **WHEN** RCS boron concentration is diluted to _____ppm (approximately 150 ppm above the predicted critical boron concentration (CBC) from Attachment A-1 for Group 5 @ 99"), **THEN**:

1. **DETERMINE** whether at least two (2) of the WR Log Channels show a count rate greater than 0.5 cps.

WR Channel	(circle one)
A	SAT / UNSAT / N/A
B	SAT / UNSAT / N/A
C	SAT / UNSAT / N/A
D	SAT / UNSAT / N/A

_____
SE

2. **DETERMINE** whether the 1/M plot confirms an increase in reactivity.

(circle one) SAT / UNSAT / N/A

_____
SE

6.9 Dilution Verifications (Continued)

3. **IF** either 6.9.B.1 **OR** 6.9.B.2 was not satisfied, **THEN PERFORM** Steps 6.9.B.3.a and 6.9.B.3.b below; **OTHERWISE, MARK** Step 6.9.B.3 "N/A."

   a. **INCREASE** the collection and plotting of count data to at least once every 15 minutes.

   _____
   SE

   b. **REDUCE** the RCS dilution rate to approximately 1 ppm/min (44 gpm DI water) using one (1) charging pump.

   _____
   SE

NOTE

Step 6.9.C may be skipped if criticality is not indicated prior to diluting to _____ppm (boron equivalence to 500 pcm above the predicted CBC, from Attachment A-1 for Group 5 @ 99").

C. Early Criticality

IF WRNIs or Startup Rate Monitors (including 1/M) indicate that criticality is going to happen PRIOR to reaching a RCS boron concentration of _____ppm (boron equivalence to 500 pcm above the predicted CBC, from Attachment A-1 for Group 5 @ 99"), **THEN**

1. **STOP** RCS dilution.
2. **INSERT** the Regulating CEAs to the fully inserted position using Manual Sequential.
3. **STABILIZE** reactor and plant conditions.
4. **INITIATE** a Condition Report to document the condition.
5. **EVALUATE** the situation.
6. **TAKE** corrective actions.
7. **DOCUMENT** the corrective actions in the log.
8. **ENSURE** that the reason for the errant prediction is understood.
9. **OBTAIN** concurrence for reactor startup from the Assistant Operations Manager or his alternate.
10. **ESTABLISH** initial conditions for the dilution to criticality via a procedure change and document using Attachment 5.

This step may be marked "N/A" if not performed.

_____
SE

6.9 Dilution Verifications (Continued)

D. **WHEN** RCS boron concentration is diluted to _____ppm (boron equivalence to approximately 500 pcm above the predicted CBC, from Attachment A-1 for Group 5 @ 99"), **THEN**:

1. **DETERMINE** whether at least two (2) of the WR Log Channels have a count rate of greater than 0.5 cps.

WR Channel	(circle one)
A	SAT / UNSAT / N/A
B	SAT / UNSAT / N/A
C	SAT / UNSAT / N/A
D	SAT / UNSAT / N/A

_____
SE

NOTE

The substeps of 6.9.D.2 may be marked "N/A" if at least two (2) WR Log Channels have a count rate greater than 0.5 cps.

2. **IF** less than two (2) of the WR Log Channels have a count rate greater than 0.5 cps, **THEN**:

   a. **STOP** the dilution and **INSERT** the CEAs to PDIL, maintaining reactor and plant conditions stable while the situation is evaluated.

   b. **RECORD** the evaluation in the log, prior to continuation.

   c. **REPEAT** steps 6.6.C to 6.6.J, **WITHDRAWING** the Regulating CEA Group listed on Table 6.6 starting with the withdrawal of Group 3 to 135.0 inches. **DOCUMENT** the performance on Attachment 4, Test Repeat Documentation.

   d. **RESUME** the dilution of the RCS.

_____
SE

NOTE

Step 6.9.D.3 should be performed before Step 6.12, and may be performed in parallel with the remaining steps prior to Step 6.12. The step may also be marked "N/A" if it has been decided that it is not necessary. If the gamma bucking circuit is not used, the physics test range should be increased to the next decade. **[B-94]**

3. **ENABLE** the gamma bucking circuit on the picoammeter, if available. NFMSP-36 may be referenced for guidance.

_____
SE

6.10 Criticality

NOTE

Step 6.10.A may be skipped if criticality is indicated prior to diluting to _____ppm (boron equivalence to 500 pcm below the predicted CBC, from Attachment A-1 for Group 5 @ 99").

CAUTION

Dilution shall not be allowed to continue to less than _____ppm (boron equivalence to 500 pcm below the predicted CBC, from Attachment A-1 for Group 5 @ 99").

A. **IF** criticality has not been achieved, **OR** it appears that criticality will not be achieved, when the RCS boron concentration reaches approximately _____ppm (boron equivalence to 500 pcm below the predicted CBC, from Attachment A-1 for Group 5 @ 99"), **THEN**

1. **STOP** RCS dilution.

2. **INSERT** the Regulating CEAs to the fully inserted position using Manual Sequential.

3. **STABILIZE** reactor and plant conditions.

4. **INITIATE** a Condition Report to document the condition.

5. **EVALUATE** the situation.

6. **TAKE** corrective actions.

7. **DOCUMENT** the corrective actions in the log.

8. **ENSURE** that the reason for the errant prediction is understood.

9. **OBTAIN** concurrence for reactor startup from the Assistant Operations Manager or his alternate.

10. **ESTABLISH** initial conditions for the dilution to criticality via a procedure change and document using Attachment 5.

This step may be marked "N/A" if not performed.

_____
SE

6.10 Criticality (continued)

NOTE

Dilution may be secured if criticality is suspected and resumed if criticality has not been declared.

B. **WHEN** flux level is first observed to be increasing (positive SUR), with no further dilution, **THEN DECLARE** the reactor critical, and **PERFORM** the following:

1. **SECURE** dilution.

2. **LOG** the time of criticality.

3. **ENSURE** CEA overlap.

4. **DIRECT** the Operators to secure the shutdown monitor per OI-30, Nuclear Instrumentation.

_____/_____/_____
Date Time SE

CAUTION

Although Technical Specifications permit criticality at temperatures above 515°F, T_{cold} shall not intentionally be allowed outside the range of 525 to 535°F while critical at Hot Zero Power (HZP). **[B-66] [B-83]**

C. **IF** RCS average temperature is less than 525 °F, **THEN DIRECT** the Operators to ensure T_{avg} is greater than 515 °F and to record T_{avg} in the CRO Log at least once every 30 minutes (Technical Specifications SR 3.4.2.1) as long as T_{avg} is less than 525°F; **OTHERWISE, SECURE** from logging RCS T_{avg}.

_____
SE

NOTE

Previous experience has shown that Group 5 CEAs should be close to 105 inches in order to have enough positive reactivity available for the next test. If reactor power is continuing to drop, this may be an indication that coolant with a higher boron concentration is ingressing from the pressurizer. If this is suspected, power should be stabilized at 10^{-4}% using CEA Group 5 until reaching 105 inches, then using dilution.

D. **RAISE** power to 10^{-4}% and **STABILIZE** power.

_____
SE

6.10 Criticality (continued)

NOTE
RCS Boron Concentration grab sample taken after criticality may not be indicative of stable RCS conditions.

E. **RECORD** the parameters for Initial Criticality listed below and **DIRECT** the Operators to record the same information in the CRO Log.

Date/Time _____

CEA Group Positions A_____ B_____ C_____

1_____ 2_____ 3_____ 4_____ 5_____

RPS Wide Range Pwr A_____ B_____ C_____ D_____

RPS T_{hot} A_____ B_____ C_____ D_____

Tavg _____

RCS Boron Concentration (Grab Sample) _____ ppm

_____
SE

F. **VERIFY** that Wide Range NI channels are at approximately 10^{-4}%.

_____
SE

G. **DIRECT** the Operators to verify that the "S/U Rate Trip A, B, C, D Enable" alarm is present at 1C05 (2C05).

_____
SE

H. **NOTIFY** Health Physics Supervision that the reactor is critical at 10^{-4}% power.

_____
SE

I. **POST** the temporary note tags from Step 4.3.N on Boric Acid Pumps 11 (21) and 12 (22) handswitches in the Control Room, 1-HS-226X (2-HS-226X) and 1-HS-226Y (2-HS-226Y).

_____
SE

J. **POST** the temporary note tag from Step 4.3.N on the Makeup Mode Selector Switch in the Control Room, 1-HS-210 (2-HS-210).

_____
SE

K. **SECURE** 1/M monitoring.

_____
SE

NOTE

The Reactivity Computer Checkout in Step 6.12 can begin as soon as reactor conditions are stable.

6.11 Stabilizing Reactor Conditions

A. **VERIFY** pressurizer pressure is nominally 2250 psia (2225 - 2275 psia).

_____
SE

B. **VERIFY** RCS temperature is nominally 532°F (530 - 534°F).

_____
SE

NOTE

Step 6.11.C may be performed in parallel with Steps 6.12.A through 6.12.C.

NOTE

The samples will be used to calculate the ARO Critical Boron Concentration.

NOTE

Chemistry should be given at least a three hour notice prior to the resumption of 15 minute boron sampling for the EFI critical boron concentration measurement (Step 6.15). **[B-102]**

C. **WHEN** two (2) consecutive RCS grab samples are within 20 ppm of each other **OR** three (3) consecutive RCS grab samples are within 15 ppm of the average

AND

reactivity has not changed by more than +/- 5 pcm in the previous 10 minutes or +/- 2 pcm in the previous 5 minutes, **NOTIFY** Chemistry that they may suspend boron sampling, and to save a sample for B-10 isotopic analysis. **[B-102] [B-115]**

_____
SE

6.12 Reactivity Computer Checkout

A. **VERIFY** inputs per the following steps:

NOTE

In the following steps, "channel" refers to a channel on the reactivity computer or RMAS computer.

1. **ENSURE** that reactivity is connected to one channel and that the channel is set on zero in the center of the display with a –100 pcm to +100 pcm scale.

_____ Verify: _____
SE SE

2. **ENSURE** that flux is connected to a second channel.

_____ Verify: _____
SE SE

6.12 Reactivity Computer Checkout (Continued)

3. **ENSURE** that T_{cold} is connected to a third channel. Note that the label in RMAS is Tave.

_____ Verify: _____
SE SE

4. **VERIFY** that the reactivity displayed on the reactivity computer has changed in response to CEA movement.

_____ Verify: _____
SE SE

NOTE

If the STC determines that the power level was too low for an effective signal evaluation in step 6.7.E, step 6.7.E.6 may be performed now.

NOTE

Step 6.12.B may be deferred until power is within the physics testing power range.

B. **IF** desired, **RESCALE** the Flux 1 units to % power by performing the following:

1. **CALCULATE** the ratio of WRLC power to Flux 1 amps (neglect units):

$$\text{Ratio} = \frac{\text{WRLC Power}}{\text{Flux 1 Amps}} = \frac{\qquad}{\qquad} = \underline{\qquad\qquad}$$

2. From the RMAS Runtime menu, **SELECT** "Reactimeter Interface"
3. **SELECT** "Menu."
4. **SELECT** "Flux Input Flow Path."
5. **SELECT** "Flux EU Conversion."
6. **SELECT** "Edit."
7. **SELECT** Flux Channel 1.
8. **SELECT** "R" Factor.
9. **ENTER** the Ratio value from Step 1 above and **CLICK** OK. ENTER:_____ SE
10. **INDEPENDENTLY VERIFY** the new "R" factor. VERIFY:_____ SE
11. **SELECT** "View."
12. **SELECT** "Done."
13. **SELECT** "Menu."
14. **SELECT** "Local RMAS Station Setup."
15. **SELECT** the "%RxPwr" radio button under "Power".
16. **SELECT** "Done."
17. **SELECT** "RMAS."

_____
SE

6.12 Reactivity Computer Checkout (Continued)

C. **RECORD** the average CEA Group 5 position to the nearest step.

Group 5 Position:_____

_____
SE

D. **PERFORM** the Doubling Time and ARO CBC Tests per Appendix B.

_____
SE

6.13 EARO Isothermal Temperature Coefficient (ITC)

A. **MEASURE** the Isothermal Temperature Coefficient per Appendix C.

_____
SE

NOTE

Step 6.13.B may be performed concurrently with the remainder of the procedure.

B. **CALCULATE** the corrected predicted ITC value on Attachment 7, Isothermal Temperature Coefficient Prediction Correction for Actual Test Conditions. Items 1 through 8 shall be recorded on Attachment 7.

1. **RECORD** the ARO predicted boron concentration from Attachment A-1.

2. **RECORD** the average boron concentration used for the ARO CBC from Appendix B.

3. **SUBTRACT** the predicted boron concentration from the average boron concentration.

4. **MULTIPLY** the difference by the ITC derivative from Attachment A-1.

5. **ADD** the result to the predicted ITC. This is the corrected predicted ITC.

6. **RECORD** the corrected predicted ITC on Attachment A-1.

7. **SUBTRACT** the corrected predicted ITC from the measured ITC on Attachment 7.

8. **PERFORM** Appendix A for the difference between the corrected predicted ITC and the measured ITC.

_____
SE

NOTE

Step 6.15 may be performed in parallel with the CEA worth data reduction of Step 6.14.

NOTE

Chemistry should be given at least a three hour notice prior to the resumption of 15 minute boron sampling for the EFI critical boron concentration measurement (Step 6.15). **[B-102]**

6.14 Regulating CEA Group Worth

NOTE

While performing the CEA worth measurements and evaluating data, the STC and SE should be cognizant of the assumptions utilized in the predictions and their correlation to actual plant conditions. **[B-122]**

A. **MEASURE** non-overlapped Group worth of CEA Groups 5, 4, 3, 2, and 1 by performing Appendix D through Step 6.1.

_____
SE

6.15 EFI Critical Boron Concentration (CBC)

NOTE

Chemistry should be given at least a three hour notice prior to the resumption of 15 minute boron sampling for the EFI critical boron concentration measurement (Step 6.15). **[B-102]**

A. **CONTACT** Plant Chemistry and **REQUEST** at least two RCS boron samples at approximately 15 minute intervals.

_____
SE

B. **RECORD** the samples on Attachment 2.

C. **WHEN** two (2) consecutive RCS grab samples are within 15 ppm of each other **OR** three (3) consecutive RCS grab samples are within 10 ppm of the average

AND

reactivity has not changed by more than +/- 5 pcm in the previous 10 minutes or +/- 2 pcm in the previous 5 minutes, **INFORM** Chemistry that they may suspend boron sampling. **[B-102] [B-115]**

_____
SE

D. **IF** Group C is inserted below 135 inches, **THEN WITHDRAW** CEA Group C to the full-out position, **ALLOW** reactivity to stabilize, **THEN RESTORE** reactivity to approximately zero pcm, using CEA Group C.

_____
SE

E. **CALCULATE** the EFI Critical Boron Concentration using RMAS.

1. **OPEN** the Rod worth application under the Physics Testing menu if not there already.

2. **SELECT** "Measure Boron End Point".

3. **SCROLL** back to where the two boron samples were taken.

EFI Critical Boron Concentration (CBC) (continued)

4. **SELECT** "Initial Conditions".

5. **SELECT** "Rod Position Setup", **ENSURE** that the CEA Group used for controlling reactivity, either "GP1" or "GPC", is selected for the green pen, **AND SELECT** "DONE".

NOTE

On some computers, the blue and red hairlines may appear gray.

6. **DRAG** the blue hairlines to the initial conditions (when samples were taken).

7. **SELECT** "Initial Conditions Selected".

8. **SELECT** "OK".

9. **SELECT** "Done".

10. **SELECT** "BEP Conditions".

11. **SELECT** "Rod Position Setup", **ENSURE** that the CEA Group used for controlling reactivity, either "GP1" or "GPC", is selected for the green pen, **AND SELECT** "DONE".

12. **MOVE** the red hairlines to the final conditions (after the rod movement to bring the CEA Position to EFI).

13. **SELECT** "Final Conditions Selected".

14. **SELECT** "OK".

15. **SELECT** "Done".

16. **SELECT** "Calculate Boron End Point".

17. **SELECT** "Measured Boron" and **ENTER** measured boron values (if not already there). **ENSURE** that the boxes are checked.

18. **SELECT** "OK" .

19. **SELECT** "Calculate".

20. **REVIEW** and **PRINT** Results.

21. **CLOSE** the "Boron End Point Results" window.

22. **SELECT** "Done" twice.

23. **SAVE** the results to a file. file:_____ _____.
A suggested format is C:\RMAS\RESULTS\UxCynnmmyy\EFICBC.WBC, where x is the unit number, nn is the cycle number, mm is the month and yy is the year.

6.15 EFI Critical Boron Concentration (CBC) (continued)

NOTE

This step may be performed in parallel with the rest of the procedure.

F. **PERFORM** Appendix A for the measured EFI Critical Boron Concentration.

SE

6.16 Group C CEA Worth

IF the CEA group worth measurements (individual groups or total) did not fall within acceptance limits, **THEN MEASURE** the worth of CEA Group C in accordance with Appendix D Step 6.2; **OTHERWISE, MARK** this step and Appendix D, Step 6.2 "N/A." **[B-70]**

SE

6.17 CEA Group Withdrawal.

A. **WITHDRAW** CEA Groups C (if necessary), 1, 2, 3, 4, and 5, using Appendix D, Step 6.3.

SE

B. **IF** desired, **REPEAT** Appendix C at the CEA configuration specified by the SE.

SE

NOTE

If Step 6.17.B has been marked "N/A", Step 6.17.C may be performed in parallel with Step 6.17.A and the remainder of the procedure. Reactivity 2 may be used for reactivity trend information.

C. **DISCONNECT** the Channel X NI Signal and the Channel Y NI Signal from the physics test equipment per PSTP-23, Physics Test Equipment Hookup, Step 6.7.

SE

D. **IF** necessary, **CALCULATE** the rodded corrected predicted ITC value on Attachment 7, Isothermal Temperature Coefficient Prediction Correction for Actual Test Conditions. Items 1 through 7 shall be recorded on Attachment 7.

1. **RECORD** the ARO predicted boron concentration from Attachment A-1.

2. **RECORD** the last stable boron concentration from Attachment 2.

3. **SUBTRACT** the predicted boron concentration from the measured boron concentration.

4. **MULTIPLY** the difference by the ITC derivative from Attachment A-1.

5. **ADD** the result to the predicted ITC. This is the corrected predicted ITC.

6.17 CEA Group Withdrawal (Continued)

6. **RECORD** the corrected predicted ITC on Attachment A-1.

7. **SUBTRACT** the corrected predicted ITC from the measured ITC on Attachment 7.

8. **PERFORM** Appendix A for the difference between the corrected predicted ITC and the measured ITC.

SE

NOTE

Step 6.18 may be performed at any time following the completion of Step 6.15, and is optional. If Step 6.18 will not be performed, it may be marked "N/A".

6.18 Differential Boron Worth (DBW)

A. **OPEN** the RMAS Rod Worth application under the Physics Testing window if not there already.

B. **SELECT** "Differential Boron Worth".

C. **SELECT** "Starting Boron Concentration" and **ENTER** the samples used for the ARO boron concentration measurement. **ENSURE** that the boxes are checked.

D. **SELECT** "Final Boron Concentration" and **ENTER** the samples used for the EFI boron concentration measurement. **ENSURE** that the boxes are checked.

E. **SELECT** "Measure DBW".

F. **SCROLL** back to the time when the ARO boron samples were taken.

G. **SELECT** "Initial Conditions".

NOTE

On some computers, the blue and red cursors may appear gray.

H. **DRAG** the blue hairlines to the initial conditions when the ARO samples were taken.

I. **SELECT** "Initial Conditions Selected".

J. **SELECT** "OK" and "Done".

K. **SCROLL** forward to the time when the EFI boron samples were taken.

L. **SELECT** "Final Conditions".

M. **DRAG** the red hairlines to the final conditions when the EFI samples were taken.

N. **SELECT** "Final Conditions Selected".

6.18 Differential Boron Worth (DBW) (continued)

O. **SELECT** "OK" and "Done".

P. **SELECT** "Calculate DBW".

Q. **REVIEW** the data in the box.

R. **SELECT** "Calculate" and print the results.

S. **CLOSE** the results window

T. **SELECT** "Done" twice.

U. **SAVE** the results to a file. File:_____.
A suggested format is C:\RMAS\RESULTS\UxCynnmmyy\DBW.DBW, where x is the unit number, nn is the cycle number, mm is the month and yy is the year.

SE

6.19 Completion of Testing

A. **INFORM** Plant Chemistry to return to routine boron sampling frequency and **SECURE** from collecting data on Attachment 2.

SE

B. **COMPLETE** preliminary data reductions for all tests conducted and **PERFORM** Appendix A for all tests conducted, if not already performed.

SE

C. **VERIFY** that all preliminary test results have met Review Criteria **OR** PORC has reviewed the test results and the Plant General Manager has approved operation above 5% Rated Thermal Power. **[B-3]**
PORC Meeting Number:_____

STC

D. **VERIFY** that all preliminary test results have met Acceptance Criteria **OR** have been reviewed by PORC and accepted by the Plant General Manager, in accordance with EN-1-310, "Requirements for Use of Nuclear Engineering Procedures." **[B-3]**

PORC Meeting Number_____

STC

E. **DISCONTINUE** STE 3.1.8, **INFORM** the Shift Manager, the Control Room Operators, and the DSRO, and **DISCONTINUE** verifying power on Attachment 3.

STC

F. **INFORM** the Shift Manager that PSTP-02 testing is complete.

STC

6.19 Completion of Testing (continued)

G. **ADVISE** Operations to consider borating all the Purification IXs to the ECC boron concentration **PER** OI-2D-1 (2), "Purification System Operation."

SE

H. **DIRECT** Operations to raise reactor power to approximately 1% by LRNI and **PERFORM** the following:

1. **CHECK** that ALL WRNI channels are indicating less than 2%.

   - **LOG** verification of at least two decades of overlap between the Wide Range Logarithmic Neutron Flux Monitoring Channels and the Power Range Neutron Flux Monitoring Channels (TS B.3.3.1).

SE or OPS

CAUTION
Linear Range NI channels must be observed on the RPS 1C15 (2C15), as indication on 1C05 (2C05) may be indicating ΔT Power **AND NOT** NI power.

2. **CHECK** that indication on the Linear Range channels is beginning to rise.

OPS or SE

3. **VERIFY** 1C05 (2C05) digital power indication, 1-XI-5515 (2-XI-5515), is set up PER OI-50A, Plant Computer, for indicating LRNI Power.

OPS or SE

I. **IF** available, **THEN PLACE** NRRHO1 (preferred) or NRRHO2 on pen recorder trending **PER** OI-50A, "Plant Computer," **OR** as prescribed by the DSRO.

OPS or SE

J. **WHEN** power is being maintained between 1% and 5% **AND IF** using NR5A for power indication, **THEN** periodically **COMPARE** redundant 1C05 (2C05) power range indications to ensure that the highest channel of power does **NOT** exceed 5% power **PRIOR** to declaring MODE 1.

OPS or SE

K. **GO TO** OP-2-1(2), Plant Startup from Hot Standby to Minimum Load, Section 6.8, Mode 1 Preparations.

SE

7.0 POST PERFORMANCE ACTIVITIES

NOTE
Steps and substeps of 7.1 and 7.2 may be completed in any order.

7.1 Restoration From Testing

A. **REMOVE** the temporary note tags from Boric Acid Pumps 11 (21) and 12 (22) handswitches and the Makeup Mode Selector Switch in the Control Room, 1-HS-226X (2-HS-226X), 1-HS-226Y (2-HS-226Y), and 1-HS-210 (2-HS-210).

_____
Ops or SE

B. **ENSURE** that Attachment A-1 is complete.

_____
SE

C. **ENSURE** that all Appendices have been completed.

_____
SE

D. **REVIEW** the Appendices and Attachments used **AND VERIFY** one of the following using Attachment A-1: **[B-69]**

All Review and Acceptance Criteria have been met.

OR

- **IF** any Review Criteria were not met, **THEN** the results have been reviewed by PORC.

OR

- **IF** any Acceptance Criteria were not met, **THEN** the results have been reviewed by PORC **AND** approved by the Plant General Manager.

_____
PE-FOS

E. **IF** any acceptance criteria were not met, **THEN** notify the Reload Coordinator and Operations Training to **EVALUATE** the potential effects on the Simulator. **[B-112]**

_____
SE

F. **REMOVE** the Trend Block set up in Step 4.3.D from trending.

_____
SE

NOTE
The physics test equipment may be left connected following the completion of testing for possible use in PSTP-3. Disconnection of the physics test equipment is not a restraint to entering MODE 1.

G. **DISCONNECT** the physics test equipment, using PSTP-23, Physics Test Equipment Hookup.

_____
SE

H. **DOCUMENT** any deficiencies, suggestions, or positive comments found during the performance of this procedure on Attachment 6.

_____
SE

NOTE
Steps and substeps of 7.1 and 7.2 may be completed in any order.

7.2 Data Collection and Annotation.

A. **COLLECT** all documents generated and file with the completed controlled copy of the procedure.

_____
SE

B. **PERFORM** a page check of this procedure. Each Attachment shall be checked against the number of copies of that Attachment as documented on the Attachment Log Sheet (Attachment 1).

_____
SE

C. **UPDATE** REP-11(21) for the results of the ITC test. _____
SE

Category 1 Procedure Performance Block
Completed by: _____ Date: _____ STC

8.0 BASES

[B-3] Calvert Cliffs Nuclear Power Plant Updated Final Safety Analysis Report, Chapter 13, Section 4, "Post-Refueling Startup Testing."

[B-5] NCR 9909, 6/1/90.

[B-6] Memorandum, dated August 30, 1989, L. B. Russell to General Supervisors, "Formality in Communications."

[B-7] Calvert Cliffs Unit 1 LER 89-001 dated March 7, 1989, "Perform page checks for Category 1 procedures."

[B-8] SOER 88-2, "Premature Criticality Events During Reactor Startup."

[B-20] PORC OI-91-144-01, "Calibration of the WRNIs."

[B-28] IR 199401318 (IRO-055-696)

[B-37] SOER 91-01, "Conduct of Infrequently Performed Tests or Evolutions," 6/12/91.

[B-38] SER 19-90, "Suspending Testing after Equipment Failure."

[B-39] Memorandum, N. P. Cox to K. G. Tietjen, "Response to Technical Adequacy Review of PSTP-2," NFM 92-048, January 28, 1992.

[B-40] Memorandum, C. B. Fountain to PSTP-2 History File, "Review of U2C9 Low Power Physics Test (LPPT) Anomaly for Root Cause," NFM 91-461, September 9, 1991.

[B-58] BGE Response to SOER 96-02, Recommendation 4, "Formality in Communications/Responsibilities."

[B-66] Plant Parameters Groundrules for reload address T_{cold} range of 525-535°F for criticality at Hot Zero Power.

[B-69] UFSAR 13.4.6 requires the PE-FOSU to review the comparison of results to review and acceptance criteria.

[B-70] UFSAR 13.4.6 requires the worth of bank C to be measured if any individual group worth or total worth fails to meet acceptance criteria.

[B-82] UFSAR 9.1.4.1 requires RCS to be at refueling boron concentration until the shutdown CEAs are withdrawn.

[B-83] TS-33.05, Revision 1, Tech Spec Action Value Basis Document Module 5 - RCS Average Temperature.

8.0 BASES (Continued)

[B-92] Memorandum, N. P. Cox to G. S. Pavis, "Closure of 2F20010029-001, ECD 8/31/2001, Category III IR, PSTP-2 Dual CEA Symmetry Tilt was incorrectly calculated", NFM 01-213, August 24, 2001.

[B-94] Memorandum, N. P. Cox to G. S. Pavis, "Determine whether POAH needs to be determined.", NFM 01-286, November 28, 2001.

[B-100] NPAD Technical Specialist Report, "Reactor Engineering and Unit-1 Startup Testing," 02-AR-04-EAU, July 18, 2002.

[B-102] Memorandum, M. W. Dicus to P. A. File, "Evaluation of Doubling Time and POAH Measurements and Boron Sampling," NFM 03-052, March 31, 2003.

[B-112] SOER 03-2, Recommendation 1a.

[B-114] A tripped GFI Circuit was found to be the source of positive polarity of the Channel X reactivity signal during Unit 1 Cycle 13 startup testing. The problem and resolution are described on page 12 of the shift log, recorded on 6/24/96 at 21:30.

[B-115] Memorandum, W. S. Miller to M. T. Finley, "Evaluation of the Boron Stability Criteria," DE05793, December 24, 2003.

[B-116] Memorandum, W. S. Miller to M. T. Finley, "Evaluation of the Physics Testing Range," DE05792, December 23, 2003.

[B-118] Engineering Evaluation ES200400251, "Elimination of the Group C CEA Symmetry Test Performed as Part of Post-Refueling Startup Testing," William S. Miller, November 29, 2004.

[B-121] Excerpts from completed PSTP-02 Revision 26, performed for U1C17 startup, May 2004.

[B-122] RL00188, "ACA for Calvert Cliffs Unit 2 Cycle 16 LPPT CEA Worth Error (CAPS Issue 05-076-W002)," April 20, 2005 [Westinghouse document PCT-05-304].

[B-132]CNG-OP-3.01-1000, "Reactivity Management."

9.0 RECORDS

Lifetime Records - All records generated by this procedure, including Shift Logs, shall be retained for the life of the plant. The Procedure Sponsor shall be responsible for the legibility and completeness of these records until they are transferred to Integrated Document Management.

Radiological Lifetime Records - None.

Non-Permanent Records - None.

ATTACHMENT 1
ATTACHMENT LOG SHEET

Seq #_____

NOTE

Each use of a copy of an attachment used in the performance of this procedure (except Attachment A-1) requires an Attachment Log Sheet entry to receive its proper sequence number.

PSTP-02 Attachment	Sequence Number*	Number of Pages in Attachment	Initials

PSTP-02 Attachment	Sequence Number*	Number of Pages in Attachment	Initials

* The first time a sequenced attachment is logged, the sequence number shall be one. Thereafter, additional copies of that attachment shall be numbered sequentially.

ATTACHMENT 2
RCS BORON CONCENTRATION vs. TIME

Seq #_____

DATE	TIME	DI WATER FLOW, GPM	BORIC ACID FLOW, GPM	RCS GRAB SAMPLE, PPM	INIT.

ATTACHMENT 3
SPECIAL TEST EXCEPTION VERIFICATION

Seq #_____

Technical Specification SR 3.1.8.1 requires that power level be checked once per hour to verify that the highest reading WRLC is less than 1% power. An independent reviewer is required to initial in the "VER." column.

DATE	TIME	POWER LEVEL IN RANGE?	INIT.	VER.

DATE	TIME	POWER LEVEL IN RANGE?	INIT.	VER.

ATTACHMENT 4
TEST REPEAT DOCUMENTATION

Seq #_____

REPEATED TEST: _____

Reason for Repeat:

_____

_____

_____

_____

Steps to be repeated:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Initiated by: _____ SE

Reviewed by: _____ STC

Reviewed by: _____ Dedicated SRO

ATTACHMENT 5
RESTART DOCUMENTATION

Seq # _____

Page 1 of _____

Restart performed under change number _____

Steps to be performed for the restart:

ATTACHMENT 5
RESTART DOCUMENTATION

Seq #_____

Continuation Sheet Page _____ of _____

ATTACHMENT 6
PROCEDURE IMPROVEMENT SUGGESTIONS

Seq # _____

Signature _____ Date _____

ATTACHMENT 7
ISOTHERMAL TEMPERATURE COEFFICIENT PREDICTION CORRECTION FOR ACTUAL TEST CONDITIONS

Seq #_____

Date: _____

ARO_____ Rodded_____ (check one)

Predicted Boron Concentration = _____ ppm

Average or measured Boron Concentration = _____ ppm

Difference in Boron = Measured - Predicted = _____ ppm - _____ ppm

= _____ ppm

CAUTION:

Pay close attention to engineering units when performing calculations using the ITC Derivative.

Delta ITC = Difference in Boron * ITC Derivative (from Attachment A-1)

$$= \text{\_\_\_\_\_ ppm} * \frac{\text{\_\_\_\_\_ pcm/°F}}{100 \text{ ppm}}$$

= _____ pcm/°F

Corrected Predicted ITC = Delta ITC + Predicted ITC

= _____ pcm/°F + _____ pcm/°F

= _____ pcm/°F

Measured ITC - Corrected Predicted ITC =

= _____ pcm/°F - _____ pcm/°F

= _____ pcm/°F

Prepared by: _____ Reviewed by: _____
SE SE

APPENDIX A
VERIFICATION OF TEST RESULTS

1.0 PURPOSE

The purpose of this appendix is to compare test results with review and acceptance criteria and also to review and resolve results that do not meet review and acceptance criteria.

2.0 APPLICABILITY/SCOPE

2.1 This appendix applies to all tests performed under PSTP-02 and shall be performed for each test for which Review and/or Acceptance Criteria exist (see Attachment A-1).

2.2 The purpose of Acceptance Criteria is to provide a range of values around the predicted value or a limiting value for which results may be deemed acceptable. If the Acceptance Criteria are not met, then a further evaluation shall be performed to determine the accuracy of the measurement and to determine the validity of the physics data input to the Safety Analysis for the cycle.

2.3 The purpose of Review Criteria is to provide a range of values around the predicted value or a limiting value which, if exceeded, may indicate that predictions require updating for actual test conditions, or that additional review of the data or the input may be required. Results may still be acceptable even though Review Criteria are not met.

2.4 If a Regulating CEA Group does not meet acceptance or review criteria, Group C is measured and the Regulating Group CEAs + Group C worth total is compared to acceptance and review criteria.

2.5 If the ARO MTC does not meet the Technical Specifications limit, the MTC will be remeasured with CEAs partially inserted, per step 6.17.B.

3.0 REFERENCES AND DEFINITIONS

3.1 Developmental References

A. Calvert Cliffs Nuclear Power Plant Updated Final Safety Analysis Report, Revision 31, Chapter 13, Section 4, "Post Refueling Startup Testing."

B. EN-1-310, "Requirements for Use of Nuclear Engineering Procedures".

C. Memorandum, L. D. Arnold to Reactor Engineering RCS Flow File, "Review of STP M-509-1, Reactor Protective System Flow and Flow Setpoint Calculation, performed on 8/15/91," NFM 91-474, September 13, 1991.

D. Memorandum, C. B. Fountain to W. J. Lippold, "AIT 2F9100008-001/IR0-000-277/ENERCON 5-7/5-7," NFM 91-602, December 4, 1991.

E. Memorandum, N. P. Cox to K. G. Tietjen, "Response to Technical Adequacy Review of PSTP-2," NFM 92-048, January 28, 1992.

APPENDIX A
VERIFICATION OF TEST RESULTS

3.2 Performance References

A. EN-1-310, "Requirements for Use of Nuclear Engineering Procedures."

B. QL-2-101, "Causal Analysis."

3.3 Definitions

Acceptable Results are test results that either meet Acceptance Criteria **OR** are deemed acceptable by PORC and the Plant General Manager per EN-1-310, Requirements for Use of Nuclear Engineering Procedures.

4.0 PREREQUISITES

4.1 Personnel Skill Levels Required for Key Personnel

See Main Procedure.

4.2 Initial Condition

Results for the specific test are available for comparison with predicted results and review and/or acceptance criteria.

5.0 PRECAUTIONS

None.

6.0 PERFORMANCE

6.1 **RECORD** measured results on Attachment A-1, "Test Predictions and Acceptance/Review Criteria, for the tests completed. "

6.2 **COMPARE** the measured results with the predicted results and **DETERMINE** whether the Review and Acceptance Criteria were met.

A. **IF** Review Criteria were not met, **THEN: [B-3]**

1. **RECORD** "N" in the "RESULTS OK?" column.

2. **PERFORM** an evaluation to determine the applicability of the prediction to the actual plant conditions and **UPDATE** the prediction if necessary.

APPENDIX A
VERIFICATION OF TEST RESULTS

Page 3 of 4

3. **PERFORM** an evaluation to determine the accuracy of the measurements and **REPEAT** the measurement, if required, in accordance with Step 4.2.B of the Main Procedure.

NOTE

Steps 6.2.A.4 of this appendix can be performed at any time prior to Step 6.19.C of the Main Procedure.

4. **PRESENT** the results of low power physics testing to PORC and the Plant General Manager to ensure that Acceptance Criteria are met prior to operation above 5% Rated Thermal Power.

NOTE

For Regulating CEA worths, the results for overall CEA worth may be determined acceptable after Group C worth measurement, so Step 6.2.B may not apply until the Group C worth is taken into account.

B. **IF** Acceptance Criteria were not met, **THEN: [B-3]**

1. **CONTACT** the PE-FOS.

2. **RECORD** "N" in the "RESULTS OK?" column.

3. **PERFORM** an evaluation to determine the validity of physics data input to the Safety Analysis for the cycle.

4. **DETERMINE** the corrective actions necessary.

5. **PRESENT** the test results and the recommended corrective actions to PORC.

6. **IF** the Plant General Manager approves the corrective actions, **THEN PERFORM** the corrective actions.

7. **IF** the Plant General Manager approves alternate corrective actions **THEN PERFORM** the corrective actions recommended.

8. **IF** the test results cannot be reconciled by the Plant General Manager, **THEN FOLLOW** instructions in QL-2-101, Causal Analysis, for reporting and resolving the discrepancy.

C. **IF** the Review and Acceptance Criteria are met, **RECORD** "Y" in the Results OK column.

6.3 **RETURN** to the Main Procedure.

APPENDIX A
VERIFICATION OF TEST RESULTS

7.0 POST PERFORMANCE ACTIVITIES

7.1 **ENSURE** that all RMAS printouts generated during testing are attached to this procedure.

_____
SE

8.0 BASES

[B-3] Calvert Cliffs Nuclear Power Plant Updated Final Safety Analysis Report, Chapter 13, Section 4, "Post-Refueling Startup Testing."

9.0 RECORDS

See Main Procedure.

ATTACHMENT A-1
TEST PREDICTIONS AND ACCEPTANCE/REVIEW CRITERIA

Page 1 of 2

ITEM	PREDICTION	REVIEW LIMITS	ACCEPTANCE LIMITS	MEASURED RESULTS	RESULTS OK? (Y/N)
Critical Boron (ARO)	_____ ppm	± _____ ppm (± 0.50 %Δρ)	± _____ ppm (± 0.75 %Δρ)	_____ ppm	_____
Isothermal Temperature Coefficient (ARO, 532°F)**	_____ pcm/°F	None	MTC less than 7.0 pcm/°F	_____ pcm/°F	_____
Moderator Temperature Coefficient (ARO, 532°F)**	_____ pcm/°F	None	MTC less than 7.0 pcm/°F	_____ pcm/°F	_____
Difference between corrected Predicted ITC and Measured ITC - ARO	None	absolute value less than 3.0 pcm /°F	absolute value less than 3.0 pcm/°F	_____ pcm/°F	_____
Difference between corrected Predicted ITC and Measured ITC - Rodded (if necessary)	None	absolute value less than 3.0 pcm /°F	absolute value less than 3.0 pcm/°F	_____ pcm/°F	_____
Fuel Temperature Coefficient	_____ pcm/°F	None	None	Not measured	

** Predictions are for ARO; measurements may be performed with Group 5 partially inserted.

ATTACHMENT A-1
TEST PREDICTIONS AND ACCEPTANCE/REVIEW CRITERIA

Page 2 of 2

ITEM	PREDICTION	REVIEW LIMITS	ACCEPTANCE LIMITS	MEASURED RESULTS	RESULTS OK?(Y/N)
CEA Group 5 Worth (532°F)	_____ pcm	Greater of ±15% or ±100 pcm	Greater of ±15% or ±100 pcm	_____pcm	_____
CEA Group 4 Worth (532°F)	_____ pcm	Greater of ±15% or ±100 pcm	Greater of ±15% or ±100 pcm	_____pcm	_____
CEA Group 3 Worth (532°F)	_____ pcm	Greater of ±15% or ±100 pcm	Greater of ±15% or ±100 pcm	_____pcm	_____
CEA Group 2 Worth (532°F)	_____ pcm	Greater of ±15% or ±100 pcm	Greater of ±15% or ±100 pcm	_____pcm	_____
CEA Group 1 Worth (532°F)	_____ pcm	Greater of ±15% or ±100 pcm	Greater of ±15% or ±100 pcm	_____pcm	_____
Regulating CEA Group Worth Total (532°F)	_____ pcm	±10%	±10%	_____pcm	_____
EFI Isothermal Temperature Coefficient, (532°F, 5,4,3,2, 1 Full-in)	_____ pcm /°F	None	None	Not measured	
Critical Boron (532°F, 5,4,3,2, 1 Full-in)	_____ ppm	± _____ ppm (± 0.50 %Δρ)	± _____ ppm (± 0.75 %Δρ)	_____ppm	_____
CEA Group C Worth (532°F)	_____ pcm	±15%	±15%	_____pcm*	_____
All CEA Reg Groups+Group C, Total Worth (532°F)	_____ pcm	±10%	±10%	_____pcm*	_____
Differential Boron Worth	_____ pcm/ppm	Information Only		_____ pcm/ppm	
Critical Boron (Grp 5 @ 99")	_____ ppm	± _____ ppm (± 0.50 %Δρ)	± _____ ppm (± 0.75 %Δρ)	_____ ppm	_____
ITC derivative	_____ pcm/°F/100 ppm	Information Only		Not measured	
ARO Corrected Predicted ITC	_____ pcm/°F	Information Only		Not measured	
Rodded Corrected Predicted ITC*	_____ pcm/°F	Information Only		Not measured	

* if necessary

APPENDIX B
"DOUBLING TIME AND ARO CBC" TESTS USING RMAS

Page 1 of 8

The purpose of this appendix is to perform the reactivity computer checkout and the All Rods Out Critical Boron Concentration (ARO CBC) determination using the RMAS system. The reactivity computer checkout calculates the doubling time of the reactor for a given reactivity insertion during the power increase.

1. Initiating the software applications

   a. **IF** necessary, **OPEN** the Physics Test Menu by selecting "Physics Testing" from the "RMAS Runtime Menu" on the engineering workstation.

NOTE

During the performance of this Appendix, it will be necessary to switch between the two RMAS applications opened in the following steps.

   b. Reactimeter Checkout (Doubling Time)

      (1) **OPEN** the Reactimeter Check application by selecting "Reactimeter Check" from the Physics Test Menu on the engineering workstation.

      (2) **SELECT** the appropriate Beta and Lambda set from the available choices and **CLICK** "OK."

      (3) **ENSURE** that the "Enable Wait Time" option under the Analysis menu is enabled.

      (4) **ENSURE** that Group 5 is displayed on one of the y-axes.

      (5) **PRESS** the Data Collection button (see picture below) to initiate data collection and **ACKNOWLEDGE** the dialog box.

NOTE

A suggested span for temperature is 4° F.

NOTE

Scaling the axes may be repeated as necessary throughout this Appendix.

NOTE

Double-click on one of the axes to rescale the plot.

      (6) **IF** necessary, **ADJUST** the y-axes scales.

APPENDIX B
"DOUBLING TIME AND ARO CBC" TESTS USING RMAS

1. Initiating the software applications (continued)

NOTE
The hairline may be activated at any time during this Appendix.

(7) **IF** desired, **THEN ACTIVATE** the hairline from the Edit menu, by clicking the magnifying glass button, or by depressing the F-10 key.

c. ARO CBC

(1) **OPEN** the ARO CBC application by selecting "AROCBC" from the Physics Test Menu on the engineering workstation.

(2) **ENSURE** that Group 5 is displayed on one of the y-axes.

(3) **PRESS** the Data Collection button to initiate data collection and **ACKNOWLEDGE** the dialog box.

(4) **IF** necessary, **ADJUST** the y-axes scales.

(5) **IF** desired, **THEN ACTIVATE** the hairline from the Edit menu, by clicking the magnifying glass button, or by depressing the F-10 key.

(6) **SAVE** the file being created by selecting "Save As" from the File menu. File:_____. A suggested format is C:\RMAS\RESULTS\UxCynnmmyy\AROCBC.WBC, where x is the unit number, nn is the cycle number, mm is the month and yy is the year.

2. **OBTAIN** at least two minutes of steady state data.

NOTE
Step 3 may be performed in parallel with Step 4.

3. Initial state point for ARO CBC

a. **SELECT** "Initial State Point" from the Analysis menu.

b. **CLICK** on the desired start point and **DRAG** the hairline to the desired end point to select the initial data range.

NOTE
The worth of CEA Group 5 between its current position and the UCS may be used in conjunction with the CEA worth measurements performed in Appendix D.

4. **WITHDRAW** Group 5 to the UCS **AND GO TO** the Reactimeter Checkout application. **NOTE** the time that Group 5 was withdrawn to facilitate the use of the measurement during the rod worth portion of this procedure.

Time: _____

APPENDIX B
"DOUBLING TIME AND ARO CBC" TESTS USING RMAS

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5. **ONCE** power has reached at least 10^{-8} amps, **ENABLE** the doubling time measurement by selecting "Measure Doubling Time" from the Analysis menu in the Reactimeter Checkout application.

6. **ALLOW** the doubling time measurement to begin automatically when the wait time goes to zero **OR INITIATE** the measurement manually by clicking the "Start Now" button in the Reactimeter Checkout application.

7. **ONCE** a stable reactor period has been reached, **THEN COLLECT** at least two minutes of data in the ARO CBC application.

8. Final State Point for ARO CBC

   a. **SELECT** "Final State Point" from the Analysis menu.

   b. **CLICK** at the desired start point and **DRAG** the hairline to the desired end point to select the final data range.

NOTE
Step 9 may be performed in parallel with the remaining steps of this Appendix.

9. ARO CBC Analysis

   a. **PRESS** the Data Collection button to halt data collection in the ARO CBC application and **ACKNOWLEDGE** the dialog box.

NOTE
The check boxes next to the boron samples must be selected.

   b. **SELECT** "Boron Concentration" from the Analysis menu, **ENTER** the results of at least two boron samples from Main Procedure Step 6.11.C, and **CLICK** "OK".

   c. **SELECT** "Show Results" from the Analysis menu.

   d. **IF** the results indicate that the test was failed, **THEN:**

      (1) **IF** the results indicate that the state point selection was faulty, **THEN**

         (a) **SELECT** "Show Chart" from the Analysis menu.

         (b) **SELECT** "Delete State Points" from the Analysis menu and **CLICK** "Yes".

         (c) **SELECT** "Initial State Point" from the Analysis menu.

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"DOUBLING TIME AND ARO CBC" TESTS USING RMAS

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9. ARO CBC Analysis (continued)

(d) **CLICK** at the desired start point and **DRAG** the hairline to the desired end point to select the initial data range.

(e) **SELECT** "Final State Point" from the Analysis menu.

(f) **CLICK** at the desired start point and **DRAG** the hairline to the desired end point to select the final data range.

(g) **SELECT** "Show Results" from the Analysis menu.

(h) **IF** the results indicate the test was passed, **THEN GO** to Step 9.e.

(2) **IF** a boron sample(s) was(were) entered incorrectly, **THEN**

(a) **SELECT** "Boron Concentration" from the Analysis menu.

NOTE
The check boxes next to the boron samples must be selected.

(b) **EDIT** the boron sample results and **CLICK** OK.

(c) **IF** the results indicate the test was passed, **THEN GO** to Step 9.e.

(3) **IF** plant conditions that were not accounted for in the test adversely affected reactivity (e.g., if boration was performed), **THEN**

(a) **DETERMINE** the magnitude and sign of the reactivity effect. **IF** desired, **SELECT** "Show Chart" from the Analysis menu to return to the chart.

(b) **SELECT** "Reactivity Adjustment" from the Analysis menu.

(c) **ENTER** the value of the reactivity adjustment and a description and **CLICK** "OK".

(d) **IF** necessary, **SELECT** "Show Results" from the Analysis menu.

(e) **IF** the results indicate the test was passed, **THEN GO** to Step 9.e.

e. **ONCE** satisfactory results are obtained, **THEN PRINT** the results and **ATTACH** them to this procedure.

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"DOUBLING TIME AND ARO CBC" TESTS USING RMAS

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9. ARO CBC (Continued)

   f. **SELECT** "Show Chart" from the Analysis menu.

   g. **PRINT** the chart and **ATTACH** it to this procedure.

   h. **SAVE** the results to the file created in Step1.c.6.

   i. **EXIT** the ARO CBC application.

   _____
   SE

10. **WHEN** at least two doubling times have been measured, **THEN CLICK** the "Stop Now" button to terminate the doubling time measurement.

11. Doubling Time Analysis

   a. **PRESS** the Data Collection button to halt data collection in the Reactimeter Checkout application and **ACKNOWLEDGE** the dialog box.

   b. **REVIEW** the reactivity traces following rod withdrawal for stability. **IF** an abnormality is detected, **THEN TAKE** appropriate corrective actions and **DOCUMENT** the corrective actions in the log. **[B-40]**

   Stability: SAT / UNSAT (circle one)

   _____ Verify: _____
   SE SE

   c. **SELECT** "Show Results" from the Analysis menu.

   d. **VERIFY** that the set of betas and lambdas used by RMAS is correct.

   _____
   SE

   e. **IF** the average deviation is less than 5.0% and "Pass" is indicated, **THEN** the test has been passed.

   f. **IF** the test was not passed, **THEN PERFORM** the following steps.

      (1) **IF** the wrong beta and lambda set was used, **THEN PERFORM** the following:

         (a) **SELECT** "Select Data Set" from the Predicted Data menu.

         (b) **SELECT** the correct beta and lambda set and **CLICK** "OK".

APPENDIX B
"DOUBLING TIME AND ARO CBC" TESTS USING RMAS

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11. Doubling Time Analysis (Continued)

(c) **INDEPENDENTLY VERIFY** that the correct set was selected.

_____
SE

(d) **CLICK** "OK" to use the selected set.

(e) **IF** not already shown, **THEN SELECT** "Show Results" from the Analysis menu.

(f) **IF** the average deviation is less than 5.0% and "Pass" is indicated, **THEN** the test has been passed. **CONTINUE** to Step 11.g.

(2) **IF** one or more of the beta(s) and/or lambda(s) was found to be incorrect, **THEN PERFORM** the following:

(a) **SELECT** "Edit Data Set" from the Predicted Data menu.

(b) **EDIT** the incorrect value(s).

(c) **INDEPENDENTLY VERIFY** the corrected value(s). _____
SE

(d) **CLICK** "OK" to use the corrected value(s).

(e) **IF** not already shown, **THEN SELECT** "Show Results" from the Analysis menu.

(f) **IF** the average deviation is less than 5.0% and "Pass" is indicated, **THEN** the test has been passed. **CONTINUE** to Step 11.g.

(3) **IF** an invalid measurement is the cause of the test failure, **THEN PERFORM** the following to repeat the test:

(a) **INSERT** Group 5 until reactivity is between –20 pcm to –40 pcm and allow power to decrease to approximately 10^{-2}%.

(b) **WITHDRAW** Group 5 to restore reactivity to approximately zero pcm.

(c) **ALLOW** the reactivity trace to stabilize.

(d) **WITHDRAW** Group 5 to the UEL.

(e) **PRESS** the Data Collection button to initiate data collection and **ACKNOWLEDGE** the dialog box.

(f) **IF** desired, **THEN ACTIVATE** the hairline from the "Edit" menu or by clicking the magnifying glass button.

APPENDIX B
"DOUBLING TIME AND ARO CBC" TESTS USING RMAS

11. Doubling Time Analysis (Continued)

NOTE

Double-click on one of the axes to rescale the plot. This may be repeated as necessary to keep the plot on scale.

(g) **IF** desired, **ADJUST** the y-axes scales.

(h) **ONCE** Group 5 is at the UEL and power is at least 10^{-2}% and increasing, **THEN ENABLE** the doubling time measurement by selecting "Measure Doubling Time" from the Analysis menu.

(i) **ALLOW** the doubling time measurement to begin automatically when the wait time goes to zero **OR INITIATE** the measurement manually by clicking the "Start Now" button.

(j) **WHEN** at least two doubling times have been measured, **THEN CLICK** the "Stop Now" button to terminate the doubling time measurement.

(k) **INSERT** Group 5 to stop the power increase and restore reactivity to approximately zero pcm.

(l) **PRESS** the Data Collection button to halt data collection and **ACKNOWLEDGE** the dialog box.

(m) **REVIEW** the reactivity traces following rod withdrawal for stability. **IF** an abnormality is detected, **THEN TAKE** appropriate corrective actions and **DOCUMENT** the corrective actions in the log. **[B-40]**

Stability: SAT / UNSAT (circle one)

_____ Verify: _____
SE SE

(n) **SELECT** "Show Results" from the Analysis menu.

(o) **VERIFY** that the set of betas and lambdas used by RMAS is correct.

_____
SE

(p) **IF** the average deviation is less than 5.0% and "Pass" is indicated, then the test has been passed.

g. **ONCE** satisfactory test results have been obtained, **THEN PRINT** the analysis results.

APPENDIX B
"DOUBLING TIME AND ARO CBC" TESTS USING RMAS

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11. Doubling Time Analysis (Continued)

h. **OBTAIN** a review of the result.

i. **RETURN** to the chart by selecting "Show Chart:" from the Analysis menu.

j **PRINT** a copy of the chart and **ATTACH** the chart and analysis results to this procedure.

k. **SAVE** the results to a file. File:_____.
A suggested format is C:\RMAS\RESULTS\UxCynnmmyy\DOUBLING.RTC, where x is the unit number, nn is the cycle number, mm is the month and yy is the year.

l. **EXIT** the Reactimeter Checkout application.

_____
SE

NOTE

The physics testing range may be adjusted, if necessary, at the discretion of the STC to accommodate a lower than expected POAH.

12. **ESTABLISH** power in the physics testing range of 10^{-8} to 5 x10^{-7} amps. **[B-94] [B-116]**

a. **IF** power is below the physics testing range, **THEN ALLOW** power to increase.

b. **IF** power is above the physics testing range, **THEN INSERT** Group 5 to establish a negative reactivity (the amount of negative reactivity is at the discretion of the SRO and STC).

c. **MONITOR** power level until the desired power level is reached, positioning power within the physics testing range.

d. **POSITION** Group 5 until reactivity is approximately zero pcm.

e. **MAINTAIN** power within the physics testing range.

13. **ENSURE** that the doubling time test results are satisfactory.

NOTE

Performance of Appendix A may be performed in parallel with the rest of the procedure.

14. **PERFORM** Appendix A for the ARO Critical Boron concentration.

_____
SE

15. **RETURN** to Main Procedure step 6.12.D.

APPENDIX C
ITC TEST USING RMAS

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The purpose of this appendix is to perform the Isothermal Temperature Coefficient (ITC) measurement using the RMAS system.

1. Initiating the software application

   a. **IF** necessary, **OPEN** the Physics Test Menu by selecting "Physics Testing" from the "RMAS Runtime Menu" on the engineering workstation.

   b. **OPEN** the Temperature Coefficient application by selecting "Temperature Coeff" from the Physics Test Menu on the engineering workstation.

   c. **PRESS** the Data Collection button (see picture below) to initiate data collection and **ACKNOWLEDGE** the dialog box.

NOTE

Scaling the axes may be repeated as necessary throughout this Appendix.

NOTE

Double-click on one of axes to rescale the plot.

   d. **IF** necessary, **ADJUST** the y-axes scales.

NOTE

The hairline may be activated at any time during this Appendix.

   e. **IF** desired, **THEN ACTIVATE** the hairline from the Edit menu, by clicking the magnifying glass button, or by depressing the F-10 key.

APPENDIX C
ITC TEST USING RMAS

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NOTE

Care should be taken to avoid other, unrelated plant tests during the ITC measurement that could cause changes to parameters that affect core reactivity.

NOTE

Minor borations/dilutions or CEA motion may be performed during the ITC tests to control flux, as long as it is performed between temperature swings.

NOTE

Care should be taken to avoid evolutions that impact the ability to heat up or cool down the plant during the ITC measurement. In the past, steam generator blowdowns have hindered the operators' ability to perform the heatup portion of the ITC measurement.

NOTE

The signoffs designated as "Rodded" may be marked "N/A" if it is determined that a second ITC test will not be performed.

2. **REQUEST** the operators to

   a. **ENSURE** the CVCS ion exchanger is bypassed.

   ARO_____ Rodded_____
   SE SE

   b. **STABILIZE** RCS Temperature.

   ARO _____ °F Rodded_____ °F

   ARO _____ Rodded_____
   SE SE

NOTE

The repositioning of flux prior to the ITC measurement should be kept to a minimum. It is therefore strongly recommended to perform the cooldown first if flux is high in the band, and the heatup first if flux is low in the band.

   c. **ESTABLISH** flux at approximately 20% to 30% of scale if the heatup is performed first, or 70% to 80% if the cooldown is performed first.

   ARO_____ Rodded_____
   SE SE

APPENDIX C
ITC TEST USING RMAS

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3. **RESET** the plant computer to print out the trend block from Step 4.3.D of the main procedure on the incore printer at thirty (30) second intervals.

NOTE
The reactivity scale may need to be adjusted to better identify trends and ensure stability. A rodded ITC measurement (if performed) occurs soon after boration and subsequent CEA withdrawal. Additional boron sampling may be useful in determining boron stability, but should not be relied upon as the sole insurance of stability.

4. **ALLOW** the reactivity trace to generate for approximately five minutes in order to identify any biasing trend.

ARO: Trend: SAT / UNSAT (circle one)

_____ Verify: _____
SE SE

Rodded: Trend: SAT / UNSAT (circle one)

_____ Verify: _____
SE SE

APPENDIX C
ITC TEST USING RMAS

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NOTE
Steps 5 and 6 may be switched; however, the heatup should be performed first, in order to determine that the heatup rate is achievable.

NOTE
Extra Heatup and Cooldown cycles that are not performed shall be marked "N/A."

5. Heatup Cycle

NOTE
To the extent possible, blowdown should be discontinued and all steam drains should be closed to facilitate heatup.

NOTE
T_{cold} shall not intentionally be allowed outside the range of 525 to 535°F while critical at Hot Zero Power (HZP). **[B-66]**

CAUTION
The Moderator Temperature Coefficient (MTC) is predicted to be positive.

CAUTION
Allowing RCS temperature to go above 537°F may cause the secondary safety valves to lift.

a. **START** a stable reactor heatup using the reactor coolant pumps as a heat source, and **RAISE** temperature to approximately 3 - 5°F above the temperature recorded in Step 2.b, or as specified by the SE, using the Turbine Bypass Valves if condenser vacuum has been established or the Atmospheric Dump Valves if condenser vacuum has not been established.

ARO: First Cycle_____ SE Second Cycle (if necessary) _____ SE

Rodded: First Cycle_____ SE Second Cycle (if necessary) _____ SE

b. **ONCE** RCS heatup has been completed, **THEN STOP** the heatup. If necessary to keep power level in the established physics testing range, RCS temperature may be stabilized using the Turbine Bypass Valves if condenser vacuum has been established or the Atmospheric Dump Valves if condenser vacuum has not been established.

ARO: First Cycle_____ SE Second Cycle (if necessary) _____ SE

Rodded: First Cycle_____ SE Second Cycle (if necessary) _____ SE

APPENDIX C
ITC TEST USING RMAS

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5. Heatup Cycle (Continued)

c. Heatup Data Region

NOTE

The data region selected should encompass the entire temperature swing.

(1) **SELECT** "Select Initial State Points" and "State 1" from the Analysis menu.

(2) **POSITION** the cursor and **CLICK** on the desired state point at the beginning of the heatup. A summary of the state point containing the Group 5 position, temperature, and reactivity will appear on the plot.

(3) **SELECT** "Select Final State Points" and "State 2" from the Analysis menu.

(4) **POSITION** the cursor and **CLICK** on the desired state point at the end of the heatup. A summary of the state point containing the Group 5 position, temperature, and reactivity will appear on the plot.

ARO: First Cycle _____ SE Second Cycle (if necessary) _____ SE

Rodded: First Cycle _____ SE Second Cycle (if necessary) _____ SE

APPENDIX C
ITC TEST USING RMAS

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6. Cooldown Cycle

NOTE

T_{cold} shall not intentionally be allowed outside the range of 525 to 535°F while critical at Hot Zero Power (HZP). **[B-66]**

NOTE

Previous experience has shown that a stable RCS cooldown rate can be established by adjusting the flow through the MSIV bypass and upstream drains, or the turbine bypass valve if the MSIVs are open. Feeding of Steam Generators, if done at the beginning of the cooldown, will help to avoid delaying the next heatup. The level in the Steam Generator will shrink when feedwater is introduced.

CAUTION

The MTC is predicted to be positive.

a. **START** a stable RCS cooldown, not to exceed 1°F/minute and **LOWER** temperature to approximately 3-5 °F below the temperature recorded in Step 2.b (if performing a cooldown first), or as specified by the SE.

ARO: First Cycle _____ SE Second Cycle (if necessary) _____ SE

Rodded: First Cycle _____ SE Second Cycle (if necessary) _____ SE

b. **ONCE** RCS cooldown has been completed, **THEN STOP** the cooldown.

ARO: First Cycle _____ SE Second Cycle (if necessary) _____ SE

Rodded: First Cycle _____ SE Second Cycle (if necessary) _____ SE

c. Cooldown Data Region

NOTE

The data region selected should encompass the entire temperature swing.

(1) **SELECT** "Select Initial State Points" and "State 3" from the Analysis menu.

(2) **POSITION** the cursor and **CLICK** on the desired state point at the beginning of the cooldown. A summary of the state point containing the Group 5 position, temperature, and reactivity will appear on the plot.

APPENDIX C
ITC TEST USING RMAS

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6. Cooldown Cycle (continued)

   (3) **SELECT** "Select Final State Points" and "State 4" from the Analysis menu.

   (4) **POSITION** the cursor and **CLICK** on the desired state point at the end of the coodown. A summary of the state point containing the Group 5 position, temperature, and reactivity will appear on the plot.

   ARO: First Cycle _____ SE Second Cycle (if necessary) _____ SE

   Rodded: First Cycle _____ SE Second Cycle (if necessary) _____ SE

7. **ONCE** at least one satisfactory heatup and cooldown cycle has been completed, **THEN PERFORM** the following steps to reduce the data:

   a. **PRESS** the Data Collection button (see picture below) to halt data collection in the Sensible Heat application and **ACKNOWLEDGE** the dialog box.

   

   b. **IF** necessary, **SELECT** "Show Results" from the Analysis menu.

   c. **ENSURE** that the heatup and cooldown ITC values are consistent within 1 pcm/°F. **IF** they are not, **THEN SELECT** "Show Chart" from the Analysis menu **AND GO** to step 8.

   d. **VERIFY** that the results are acceptable.

   e. **PRINT** the results and **ATTACH** to this procedure.

   f. **SELECT** "Show Chart" from the Analysis menu.

   g. **PRINT** the chart and **ATTACH** to this procedure.

   h. **SAVE** the results to a file:

   ARO: _____

   Rodded: _____.

   A suggested name is C:\RMAS\RESULTS\UxCynnmmyy\TEMPCO.WTC, where x is the unit number, nn is the cycle number, mm is the month and yy is the year. Different file names should be used with the .WTC suffix if multiple ITC tests are performed.

   i. **EXIT** the Temperature Coefficient application.

   ARO _____ SE Rodded _____ SE

APPENDIX C
ITC TEST USING RMAS

8. **REPEAT** Steps 5 through 7 at the discretion of the STC, in order to obtain at least one acceptable heatup/cooldown cycle. Mark "N/A" if not performed.

   Second Cycle ARO (if necessary) _____ SE

   Second Cycle Rodded (if necessary) _____ SE

9. **RETURN** RCS temperature to approximately 532°F (530-534) and reactivity to approximately zero pcm.

NOTE

The reactivity scale may need to be adjusted to better identify trends.

10. **ALLOW** the reactivity trace to generate for approximately five minutes in order to identify any biasing trend and **TAKE** corrective action if required.

    ARO: Trend: SAT / UNSAT (circle one)

    _____ SE Verify: _____ SE

    Rodded: Trend: SAT / UNSAT (circle one)

    _____ SE Verify: _____ SE

NOTE

Step 11 may be completed in parallel with the rest of the procedure.

11. **PERFORM** Appendix A for the average ITC and the MTC.

    ARO _____ SE Rodded _____ SE

12. **INFORM** the operator that the CVCS ion exchanger may be returned to service.

    ARO _____ SE Rodded _____ SE

13. **RESET** the trend block from Step 4.3.D to trend at two minute intervals.

    ARO _____ SE Rodded _____ SE

14. **RETURN** to Main Procedure step 6.13.A or 6.17.B.

APPENDIX D
CEA WORTH MEASUREMENTS

Page 1 of 15

1.0 PURPOSE

1.1 The purposes of this appendix are to:

A. Measure the CEA worth using the reactivity computer.

B. Analyze the data generated from the CEA worth measurement.

C. Compare the data to the Acceptance Criteria.

2.0 APPLICABILITY/SCOPE:

2.1 Both a dilution method and a boration method may be used during the performance of this test.

A. Initially, the dilution method is used to measure the non-overlapped group worth of each of the CEA Regulating Groups (5, 4, 3, 2, and 1) during insertion.

B. If the CEA Regulating Group measurements do not fall within the acceptance criteria, the worth of Shutdown Group C is measured using the dilution method.

C. The boration method may then be used to withdraw Group C (if applicable) and the CEA Regulating Groups (1, 2, 3, 4, and 5). If desired, data may be obtained to determine the overlapped CEA worth, but this measurement is for information only.

2.2 Instantaneous dilution/boration rates should be logged on Attachment 2, "RCS Boron Concentration vs. Time," every 15 minutes during CEA worth measurements. Data can be taken from the flow rate meters, if available. This is backup data for recreating the stability of the dilution/boration rate during data reduction.

2.3 Computer readouts/printouts should be used for CEA position indication. A target CEA for each group shall be selected and monitored during CEA worth measurement for that group.

2.4 During CEA Worth Measurements, Regulating CEAs and possibly Group C will be inserted below the insertion limits allowed by Technical Specifications. Therefore, Special Test Exceptions under Technical Specifications 3.1.7.1 and 3.1.8.1 are invoked during measurement of CEA reactivity worth. The Surveillance Requirement SR 3.1.7.1 is satisfied by recording CEA group heights hourly on Attachment D-1 and Surveillance Requirement SR 3.1.7.2 is satisfied by the performance of a trip of CEAs from greater than 50% withdrawn within 7 days prior to reducing Shutdown Margin (or by performance of Surveillance Requirement SR 3.1.4.6). Surveillance Requirement SR 3.1.8.1 is satisfied by ensuring that power remains less than 1% by initialing Attachment 3, "Special Test Exception Verification," hourly.

APPENDIX D
CEA WORTH MEASUREMENTS

2.5 The preferred lineup is for the Boric Acid Storage Tanks (BASTs) to be used as two sources of borated water for CVCS injection for this procedure, and to be operable in accordance with Technical Normal Condition (TNC) 15.1.2. Refer to TRM Figure 15.1.2-1 for the minimum BAST level requirements.

3.0 REFERENCES AND DEFINITIONS

See Main Procedure

4.0 PREREQUISITES

4.1 Personnel Skill Levels Required for Key Personnel

SE's shall be qualified as Shift Engineers for Startup Testing **PER** TR-1-301, "Fuel Services Qualification and Training Program," or an equivalent contractor qualification program.

4.2 Initial Conditions

A. ETP 99-015R, CEDM Performance Testing, has been completed. Surveillance Requirement 3.1.4.6 was met during this test.

_____
SE

NOTE

Initial Conditions 4.2.B through 4.2.G shall be performed once for the ARO condition and once for the EFI condition. Separate placekeeping blocks are provided.

B. Pressurizer spray flow is established by energizing all pressurizer Backup Heater Banks, and lowering the selected PZR PRESS CONTR CHX or CHY, 1(2)-PIC-100X or 1(2)-PIC-100Y, Setpoint to maintain pressure at 2250 psia.

ARO _____ SE EFI _____ SE

C. A CEA Data Log has been demanded, as described in Step 6.6.J of the Main Procedure.

ARO _____ SE EFI _____ SE

APPENDIX D
CEA WORTH MEASUREMENTS

4.2 Initial Conditions (Continued)

D. All CEAs in the groups to be measured have been verified to be within +/- 1.5 inches of the other CEAs in the group.

ARO _____ SE EFI _____ SE

NOTE

Only one BAST should be used during the boration portion of the test, especially if the CEA worth is being measured during withdrawal. The BAST contains 58.8 gallons per inch.

E. A calculated prediction of the anticipated dilution/boration volume required has been made, **PER** OI-2B, CVCS Boration, Dilution and Makeup Operations.

dilution volume = _____ gallons required (ARO only)

ARO _____ SE or OPS Verify: _____ SE

boration volume = _____ gallons required (EFI only)

decrease in BAST level _____ inches (EFI only)

sufficient level exists: YES / NO BAST 11 / 12 / 21 / 22

EFI _____ SE or OPS Verify: _____ SE

F. Flux has been established in the lower half of the testing band.

ARO _____ SE EFI _____ SE

G. All initial conditions of this Appendix have been met.

ARO _____ SE EFI _____ SE

APPENDIX D
CEA WORTH MEASUREMENTS

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5.0 PRECAUTIONS

5.1 Any changes in plant conditions that could produce unplanned changes in RCS temperature, pressure, or boron concentration should be avoided. All plant parameters shall be maintained as constant as possible, except for the particular parameter(s) to be changed during a given step.

5.2 During RCS boration and/or dilutions, while maintaining reactivity approximately zero pcm, boration or dilution should be stopped so as to minimize overshoot of the desired end point. It takes several minutes for the full effect of the inventory between the charging pumps and the RCS to be seen. Pressurizer spray should be used **PER** Step 4.2.B of this Appendix during boron concentration changes to equalize pressurizer boron concentration with loop boron concentration. Pressurizer spray may be returned to normal, **PER** OI-1H, "Pressurizer Pressure Control," unless otherwise stated by this procedure.

5.3 Prior to beginning the measurement, all CEAs in the groups to be measured shall be verified to be within +/-1.5 inches of the other CEAs in the group. During the measurement, CEA alignment of the moving CEA Group (Demand a CEA Log - All CEAs or Group Point) should be periodically checked. The SE should be informed of deviations outside the 1.5 inch range.

5.4 During CEA Worth measurements, CEA Group positions shall be recorded hourly on Attachment D-1, in accordance with SR 3.1.7.1.

5.5 Non-linear reactivity traces may indicate a need to evaluate the base power level to ensure that it is appropriate.

5.6 While performing the CEA worth measurements and evaluating data, the STC and SE should be cognizant of the assumptions utilized in the predictions and their correlation to actual plant conditions. **[B-122]**

6.0 PERFORMANCE

6.1 Dilution Method

A. **INVOKE** Technical Specification Special Test Exception 3.1.7 and **INFORM** the Shift Manager, the Control Room Operators, and the Dedicated SRO.

_____/_____/_____
Date Time SE

B. **BEGIN RECORDING** CEA group heights once per hour on Attachment D-1 and **CONTINUE INITIALING** Attachment 3 once per hour to verify that power is less than 1%.

_____
SE

APPENDIX D
CEA WORTH MEASUREMENTS

6.1 Dilution Method (Continued)

C. **BEGIN LOGGING** dilution/boration flow rates on Attachment 2, "RCS Boron Concentration vs. Time, at 15 minute intervals."

SE

D. **ADVISE** the operators to use Manual Group Mode and CMI Bypass for all CEA movements in this appendix.

SE

NOTE

Step 6.4, RMAS Data Reduction, may be performed in parallel at this time.

NOTE

The CEA Group 5 worth from the pull to the UCS obtained in Appendix B, Step 4 should be incorporated into the rod worth measurements performed in Section 6.1 of this appendix.

E. **IF** the CEA Group 5 worth measurement may be satisfactorily obtained from the pull to the UCS in Step 4 of Appendix B, **THEN RETURN** CEA group 5 to the position recorded in Step 6.12.C of the main procedure. **ALLOW** reactivity to stabilize and **CONTINUE** to Step 6.1.G.

F. **IF NOT**, **THEN WITHDRAW** CEA Group 5 to the Upper Computer Stop (UCS):

NOTE

Reactivity may be re-scaled for the duration of the Group 5 withdrawal, if desired.

1. **IF** the predicted remaining inserted CEA reactivity worth can be measured in a single CEA pull, **THEN PULL** CEA Group 5 out to the UCS. **ALLOW** reactivity to stabilize, **THEN** return the CEAs to their original position.

2. **IF NOT, THEN PERFORM** the following steps:

   a. **WITHDRAW** CEA Group 5, exchanging reactivity with boration until the predicted remaining inserted CEA reactivity worth can be measured in a single CEA pull,

   b. **PULL** CEA Group 5 out to the UCS.

   c. **ALLOW** reactivity to stabilize, **THEN** return the CEAs to the previous position (i.e., before the final pull).

APPENDIX D
CEA WORTH MEASUREMENTS

Page 6 of 15

6.1 Dilution Method (Continued)

NOTE
An optimum dilution rate is 80-88 gpm (2 charging pumps).

G. **START** dilution of the RCS with two charging pumps running.

SE

NOTE
Reactor power should be maintained within the established physics testing power range.

NOTE
It is recommended to allow reactivity to trend in a positive direction as a result of dilution to about +30 pcm to +40 pcm, then insert CEAs to –30 pcm to –40 pcm.

H. **BEGIN** exchange of the CEA Group being measured with RCS boron concentration.

1. **WHEN** reactivity trends in a positive direction due to the effect of the dilution, **THEN INSERT** CEAs in a single continuous motion, until reactivity becomes negative.

2. **STOP** CEA insertion.

3. **REPEAT** Steps 1 and 2 above, until the entire CEA group is fully inserted.

I. **ONCE** the CEA Group being measured has reached the full-in position, **THEN ALLOW** the dilution to re-establish a well-defined reactivity trace prior to inserting the next CEA group.

NOTE
A non-linear dilution trace may indicate that power is either too high or too low.

J. **REVIEW** the dilution trace for linearity.

K. **PERFORM** the CEA group worth measurements for the remaining CEA groups by repeating Steps 6.1.H through 6.1.J as appropriate.

APPENDIX D
CEA WORTH MEASUREMENTS

6.1 Dilution Method (Continued)

NOTE

Any overshoot or undershoot at the end of the measurement should be controlled by using either CEA Group C (overshoot) or CEA Group 1 (undershoot).

L. **STOP** RCS dilution when CEA Group 1 is essentially fully inserted.

SE

M. **IF NECESSARY, MEASURE** the remaining CEA worth.

1. **INSERT** CEA Group 1 to the full in position.

2. **ALLOW** reactivity to stabilize.

3. **WITHDRAW** CEA Group 1 to the previous position.

SE

N. **SECURE** from logging data on Attachment 2.

SE

NOTE

Step 6.1.O may be completed concurrently with the remainder of Step 6.1 in this appendix.

O. **CALCULATE** CEA Worth in accordance with Step 6.4 of this appendix.

SE

P. **IF** the SE determines it to be necessary, **THEN PRINT** a CEA Data Log, as described in Main Procedure Step 6.6.J.

SE

NOTE

Performance of Appendix A may be performed in parallel with the remainder of the procedure.

Q. **PERFORM** Appendix A for the CEA Worth Measurement.

SE

R. **CONTINUE** hourly CEA position verification on Attachment D-1 and hourly power verification on Attachment 3, and **RETURN** to Step 6.14.A of the Main Procedure.

SE

APPENDIX D
CEA WORTH MEASUREMENTS

NOTE

If the Regulating CEA Group worth measurements performed in Section 6.1 were within the Acceptance Criteria of Attachment A-1, then the steps of Section 6.2 shall be marked "N/A."

6.2 Determination of Shutdown Group C Worth.

A. **BEGIN LOGGING** dilution/boration flow rates on Attachment 2 at 15 minute intervals.

_____
SE

B. **CALCULATE** the prediction of the anticipated dilution volume required, **PER** OI-2B, "CVCS Boration, Dilution and Makeup Operations."

dilution volume = _____ gallons required

_____ _____
SE or OPS Verify: SE

C. **ADVISE** the operators to use Manual Group Mode and CMI Bypass for all CEA movements in this appendix.

_____
SE

NOTE

An optimum dilution rate is 80-88 gpm (2 charging pumps).

D. **START** dilution of the RCS with two charging pumps running.

_____
SE

APPENDIX D
CEA WORTH MEASUREMENTS

6.2 Group C Worth (Continued)

NOTE

Reactor power should be maintained within the established physics testing power range.

NOTE

It is recommended to allow reactivity to trend in a positive direction as a result of dilution to about +30 pcm to +40 pcm, then insert CEAs to –30 pcm to –40 pcm.

E. **BEGIN** exchange of CEA Group C with RCS boron concentration.

1. **WHEN** reactivity trends in a positive direction due to the effect of the dilution, **THEN INSERT** CEAs in a single continuous motion, until reactivity becomes negative.

2. **STOP** CEA insertion.

3. **REPEAT** Steps 1 and 2 above until CEA Group C is within approximately 50 pcm of the full-in position.

F. **WHEN** CEA Group C is within approximately 50 pcm of the full-in position, **THEN ALLOW** the dilution to re-establish a well-defined reactivity trace and **STOP** RCS dilution.

_____
SE

NOTE

Any overshoot or undershoot at the end of the measurement should be controlled by using either CEA Group B (overshoot) or CEA Group C (undershoot).

G. **IF** determined to be necessary by the SE, **THEN MEASURE** the remaining CEA worth using the following steps.

1. **INSERT** CEA Group C to the full in position.

2. **ALLOW** reactivity to stabilize.

3. **WITHDRAW** CEA Group C to the previous position.

H. **SECURE** from logging data on Attachment 2.

_____
SE

I. **CALCULATE** CEA Worth in accordance with Step 6.4 of this appendix.

_____
SE

APPENDIX D
CEA WORTH MEASUREMENTS

6.2 Group C Worth (Continued)

J. **IF** the SE determines it to be necessary, **THEN PRINT** a CEA Data Log, as described in Main Procedure Step 6.6.J.

NOTE

Appendix A may be performed in parallel with the remainder of the procedure.

K. **PERFORM** Appendix A for the Group C CEA Worth. _____ SE

L. **CONTINUE** hourly CEA position verification on Attachment D-1 and power verification on Attachment 3 and **RETURN** to Step 6.16 of the Main Procedure.

_____ SE

6.3 Boration Method.

A. **VERIFY** that the EFI initial conditions of Appendix D have been met. _____ SE

NOTE

The data logged on Attachment 2 is not required for this portion of PSTP-02. If started, data logging on Attachment 2 may be secured at any time at the discretion of the SE.

B. **IF** determined to be necessary by the SE, **THEN BEGIN LOGGING** dilution/boration flow rates on Attachment 2 at 15 minute intervals.

_____ SE

C. **ADVISE** the operators to use CMI Bypass for all CEA movements in this appendix.

_____ SE

NOTE

If CEA worth measurements are being taken, the suggested boration rate is 10-14 gpm. If no measurements are being taken, the suggested boration rate is up to 26 gpm. These rates are suggestions only. The boration rate is at the discretion of the SRO and is dependent upon the operator's ability to control the evolution.

D. **START** boration of the RCS.

_____ SE

APPENDIX D
CEA WORTH MEASUREMENTS

Page 11 of 15

6.3 Boration Method (Continued)

NOTE
Group C, if inserted, should be withdrawn in Manual Group Mode and shall be fully withdrawn before commencing Regulating CEA withdrawal.

NOTE
Reactor power should be maintained within the established physics testing power range.

NOTE
It is recommended to allow reactivity to trend in a negative direction as a result of boration to about -30 pcm to -40 pcm, then withdraw CEAs to +30 pcm to +40 pcm.

NOTE
Regulating CEA withdrawal may be done in either Manual Sequential or Manual Group Mode. If Manual Sequential is used, the rate of reactivity insertion will change noticeably when a second CEA group starts to withdraw (when lead group is at approximately 90 inches).

E. Exchange the CEA Groups with RCS boron concentration.

1. **WHEN** reactivity trends in a negative direction due to the effect of the boration, **THEN WITHDRAW** CEAs in a single continuous motion, until reactivity becomes positive.

2. **STOP** CEA withdrawal.

NOTE
A non-linear boration trace may indicate that power is either too high or too low.

3. **REVIEW** the boration trace for each CEA Group for linearity.

4. **ENSURE** that the CEAs are withdrawn in proper sequence.

5. **IF** CEAs are withdrawn to PDIL, **THEN DISCONTINUE** Special Test Exception 3.1.7 and **INFORM** the Shift Manager, the Control Room Operator and the dedicated SRO. Hourly CEA position verification, per Attachment D-1, may be discontinued once the Special Test Exception has been discontinued.

_____/_____/_____
Date Time SE

APPENDIX D
CEA WORTH MEASUREMENTS

6.3 Boration Method (Continued)

NOTE

If no rodded ITC measurement is required, a CEA position of Group 5 at 72 inches is suggested.

6. **REPEAT** Steps 1 through 5 above until the selected CEA Group reaches the Upper Computer Stop or the CEAs are in the configuration specified by the SE.

   Suggested CEA configuration:_____

NOTE

At the discretion of the SE, boration may be temporarily suspended to withdraw a group to its UEL, then recommenced once the UEL is reached.

7. **WHEN** a CEA group reaches the Upper Computer Stop, **THEN WITHDRAW** each individual CEA to the UEL in Manual Individual and **ENSURE** that the UEL Light illuminates as each CEA reaches its UEL.

8. **REPEAT** steps 1-7 for the remaining CEA Group withdrawals, until the CEAs are in the configuration specified by the SE.

F. **STOP** RCS boration when CEAs are at the configuration specified by the SE. Group 5 may be adjusted to restore reactivity to zero pcm.

_____
SE

G. **IF** data is being logged on Attachment 2, **THEN SECURE** from logging data on Attachment 2; **OTHERWISE, MARK** this step "N/A."

_____
SE

H. **IF** desired, **THEN PRINT** a CEA Data Log, as described in Main Procedure Step 6.6.J.

_____
SE

I. For CEA Groups that are at the UEL, **ENSURE** that the primary indication on the Plant Computer shows their position to be 135 inches.

_____
SE

J. **RETURN** to Step 6.17.A of the main procedure.

_____
SE

APPENDIX D
CEA WORTH MEASUREMENTS

Page 13 of 15

NOTE

Data Reduction may be performed concurrently with the remainder of the test.

6.4 RMAS Data Reduction.

A. **OPEN** the Rod Worth application by selecting "Rod Worth" from the Physics Test Menu on the engineering workstation.

B. **SELECT** "Start Rod Worth" if necessary.

C. **SELECT** "Rod Group Selection."

D. **ENSURE** that the desired CEA Group is selected to the green pen and that the appropriate boron swap method is selected and **CLICK** Done.

E. **IF** necessary, **USE** the navigation buttons to move to the first CEA insertion.

NOTE

Because of the repetitive nature of Steps 6.4.F through 6.4.U, no placekeepers are provided.

F. **SELECT** "Boron Swap."

G. **SELECT** "New Insertion."

H. **SELECT** "Select Initial Region."

NOTE

"Start from Previous Insertion" will not work for the first insertion of a Group.

NOTE

On some computers, the blue and red hairlines may appear gray.

I. **CLICK** and **DRAG** the blue hairlines to define the initial region **OR SELECT** "Start from Previous Insertion". The initial region shall be prior to the CEA insertion.

J. **CLICK** "Accept Initial Region."

K. **SELECT** "Select Final Region."

L. **CLICK** and **DRAG** the red hairlines to define the final region. The final region shall be after the CEA insertion.

M. **CLICK** "Accept Final Region."

APPENDIX D
CEA WORTH MEASUREMENTS

Page 14 of 15

6.4 RMAS Data Reduction (Continued)

N. **SELECT** "Calculate Insertion."

O. **CLICK** and **DRAG** the white hairline to define the insertion point.

P. **SELECT** "Show Curve Fit" and **REVIEW** the curve fit results. Ideally, the blue lines should be close to parallel.

Q. **SELECT** "Close!" to exit the curve fit screen.

R. **IF** the insertion point was acceptable, **SELECT** "Accept Calculation." **OTHERWISE, SELECT** "Cancel" and return to Step 6.4.N.

S. **IF** the results of the insertion are acceptable, **SELECT** "Done with Insertion". **OTHERWISE, SELECT** "Cancel" and return to Step 6.4.H.

T. **IF** more insertions remain for the current CEA Group, **THEN GO TO** Step 6.4.G.

U. **IF** another CEA Group is next, **THEN PERFORM** Steps 1 through 3 below.

1. **SELECT** "Return to RW Menu."

2. **SELECT** "Rod Group Selection."

3. **CHANGE** the green pen designation to the next CEA Group and **CLICK** Done.

4. **GO TO** Step 6.4.F.

V. **IF** all the Regulating Group CEA insertions have been processed, **THEN SELECT** "Boron Swap Insertion List."

W. **COMPARE** the worths of the individual CEA groups **AND** the Total Measured CEA Group worth to the predicted worth and **DETERMINE** if the result is within the acceptance criteria listed on Attachment A-1. (THIS IS FOR DILUTIONS ONLY.)

X. **PRINT** the CEA worth results and **ATTACH** to this procedure.

Y. **SELECT** "Close" to exit the Boron Swap Insertion List.

Z. **SELECT** "Return to RW Menu" to exit the Boron Swap application.

NOTE:

If the EFI CBC calculation has not yet been performed, stay in the Rod Worth application.

AA. **SELECT** "End Rod Worth" to exit the Rod Worth application.

APPENDIX D
CEA WORTH MEASUREMENTS

6.4 RMAS Data Reduction (Continued)

AB. **SELECT** "Physics Testing Menu" to return to the Physics Testing application.

SE

AC. **IF** the data being reduced is from the dilution of the regulating groups, **RETURN** to Step 6.1.O. **IF** the data being reduced is from the dilution of shutdown Group C, **RETURN** to Step 6.2.I.

7.0 POST PERFORMANCE ACTIVITIES

7.1 **REVIEW** the Attachments used and **VERIFY** that all Acceptance Criteria of Appendix A for CEA Worths have been met.

STC

8.0 BASES

See Main Procedure.

9.0 RECORDS

See Main Procedure.

ATTACHMENT D-1
CEA POSITION VERIFICATION

Seq #_____

Record the lowest CEA in each Group in the Table below

	CEA GROUP								
Date/Time	**A**	**B**	**C**	**1**	**2**	**3**	**4**	**5**	**Verify/ Initials**

Note: VERIFY that all CEAs are within 1.5" of the Group Height at least once per hour.

VERIFY that Groups A, B, and C are at or above 129" once per hour (exception: Group C may have to be inserted to control overshoot when Group 1 reaches full insertion or for measurement of Group C).

APPENDIX E
CEA RECOVERY

Page 1 of 3

The purpose of this appendix is to provide instructions for withdrawing a dropped CEA(s) and is applicable only during performance of PSTP-02. This appendix addresses the unique situation of dropping a single CEA during this procedure, potentially at a very low power, or multiple CEA drops in MODE 3, and may be used in lieu of AOP-1B, CEA Malfunctions.

NOTE

Step 1 may be repeated for multiple CEAs.

1. **IF** the dilution to criticality had not been started at the time of the CEA drop, **THEN ATTEMPT** to realign the CEA by performing the following:

   a. **SELECT** the desired group.

   b. **SELECT** the desired CEA.

   c. **SELECT** the Manual Individual CEA control mode.

   d. **IF** CMI is in effect, **THEN OVERRIDE** CMI as follows:

      (1) **DEPRESS** the Group Inhibit Bypass pushbutton.

      (2) **DEPRESS** and **HOLD** the Motion Inhibit Bypass pushbutton for at least 5 seconds before AND after CEA motion.

   e. **IF** realigning a Shutdown CEA, **THEN WITHDRAW** the CEA using the "Pull and Wait" method (pull 3.75 inches, wait 10 seconds).

   f. **IF** realigning a Regulating CEA, **THEN WITHDRAW** the CEA using the "Pull and Wait" method (pull 5.25 inches, wait 15 seconds).

   g. **IF** necessary, **THEN REPEAT** steps a through f above for additional dropped CEAs.

2. **IF** the dilution to criticality was in progress at the time of the CEA drop, **THEN**

   a. **SECURE** dilution.

   b. **RECORD** the results of the grab sample taken after the CEA drop, from Attachment 2.

      Last Grab Sample: _____ ppm

APPENDIX E
CEA RECOVERY

2. Dilution in progress (Continued)

   c. **IF** in MODE 2, **THEN BORATE** the RCS to a boron concentration greater than 100 ppm above the predicted CBC.

   d. **OBTAIN** concurrence of the STC, DSRO, and Shift Manager prior to recovering the CEA.

   e. **ATTEMPT** to realign the CEA by performing the following:

      (1) **SELECT** the desired group.

      (2) **SELECT** the desired CEA.

      (3) **SELECT** the Manual Individual CEA control mode.

      (4) **IF** CMI is in effect, **THEN OVERRIDE** CMI as follows:

         (a) **DEPRESS** the Group Inhibit Bypass pushbutton.

         (b) **DEPRESS** and **HOLD** the Motion Inhibit Bypass pushbutton for at least 5 seconds before AND after CEA motion.

      (5) **IF** realigning a Shutdown CEA, **THEN WITHDRAW** the CEA using the "Pull and Wait" method (pull 3.75 inches, wait 10 seconds).

      (6) **IF** realigning a Regulating CEA, **THEN WITHDRAW** the CEA using the "Pull and Wait" method (pull 5.25 inches, wait 15 seconds).

3. **IF** the reactor was critical at the time of the CEA drop, **THEN**:

   a. **DETERMINE**, using the reactivity trace from the Reactivity Computer, whether the reactor remains (or will remain) critical or became (or will become) subcritical as a result of the CEA drop.

   b. **IF** the reactor became (or will become) subcritical, **THEN IMPLEMENT** AOP-1B, CEA Malfunctions.

   c. **IF** the reactor remains (or will remain) critical, **THEN**

      (1) **OBTAIN** concurrence of the STC, DSRO, and Shift Manager prior to recovering the CEA.

APPENDIX E
CEA RECOVERY

Page 3 of 3

3. Reactor Critical (Continued)

NOTE
Power shall not be allowed to increase above the power level at the time of the CEA drop. Boration may be necessary to ensure that the power limit will not be violated. The time for realignment is one hour.

(2) **ATTEMPT** to realign the CEA by performing the following:

(a) **SELECT** the desired group.

(b) **SELECT** the desired CEA.

(c) **SELECT** to the Manual Individual CEA control mode.

(d) **IF** CMI is in effect, **THEN OVERRIDE** CMI as follows:

(i) **DEPRESS** the Group Inhibit Bypass pushbutton.

(ii) **DEPRESS** and **HOLD** the Motion Inhibit Bypass pushbutton for at least 5 seconds before AND after CEA motion.

(e) **IF** realigning a Shutdown CEA, **THEN WITHDRAW** the CEA using the "Pull and Wait" method (pull 10 seconds, wait 10 seconds).

(f) **IF** realigning a Regulating CEA, **THEN WITHDRAW** the CEA using the "Pull and Wait" method (pull 10 seconds, wait 15 seconds).

(3) **IF** the CEA cannot be realigned within one hour, **THEN PLACE** the unit in Hot Standby within 6 hours.

4. **IF** a dropped CEA requires troubleshooting or testing, **THEN**:

a. **DEVELOP** a Troubleshooting Control Form in accordance with MN-1-110.

b. **CONSIDER** the following:

(1) **IF** the unit is in Mode 3, 4, or 5, **THEN** none of the CEA alignment Technical Specifications are applicable.

(2) **IF** a CEA group must be withdrawn and has not been demonstrated trippable, **THEN** the shutdown boron concentration can not take credit for that group.

(3) **IF** a CEA group must be withdrawn and has been demonstrated trippable, **THEN** the shutdown boron curves in NEOP-13 (23) may be used. **IF** the ability of one rod to be inserted is in question, **THEN** use the "most reactive rod stuck out" curve (Figure 1[2]-II.A.4).

APPENDIX F
TEST RESTART

Page 1 of 4

1.0 PURPOSE

1.1 The purpose of this appendix is to restart PSTP-02, following criticality using OP-2, and complete PSTP-2 Physics Testing.

2.0 APPLICABILITY/SCOPE

2.1 This appendix is only to be used to resume PSTP-02 testing following a test interruption.

3.0 REFERENCES AND DEFINITIONS – See Main Procedure

4.0 PREREQUISITES

4.1 Initial Conditions

A. Trend blocks originally started in step 4.3.D have been restarted, if necessary.

_____
SE

B. Chemistry has been notified to take boron samples every fifteen minutes. RCS Boron sample results are being logged on Attachment 2, RCS Boron Concentration vs. Time.

_____
SE

C. Chemistry has been notified to keep the NSSS sink lined up for recirculation to the RCS hot leg sample point for the duration of PSTP-02 for Chemistry Boron sampling concerns.

_____
SE

D. A pre-test briefing of the initial shift personnel involved in PSTP-02 testing has been conducted prior to the beginning of testing and documented. The briefing covered the topics below. **[B-37]**

- Test objectives, prerequisites, and precautions.
- Expected indications, plant performance, and sequence of events.
- Personnel duties and responsibilities.
- Risks involved and potential problems.
- Previous events and significant incidents resulting from similar activities.
- Actions to be taken if unexpected or abnormal conditions occur.

Ops Section _____ _____
SE

APPENDIX F
TEST RESTART

Page 2 of 4

4.1 Initial Conditions (Continued):

E. The reactor coolant waste receiver tanks have sufficient volume available to accommodate a discharge of up to 36,000 gallons of water from the dilution to critical. OI-17C-2 contains data for level vs. volume.

_____
Ops or SE

F. The wide range power recorder on 1CO5 (2C05) is operating satisfactorily on at least one WR Log Channel.

_____
Ops or SE

G. The Shift Manager has noted the start of this test in his log.

_____
SM or SE

H. All prerequisites listed above have been met.

_____/_____/_____
Date Time STC

5.0 PRECAUTIONS – See Main Procedure and Appendix D

6.0 PERFORMANCE

6.1 Stabilizing Reactor Conditions

A. **VERIFY** pressurizer pressure is nominally 2250 psia (2225 - 2275 psia).

_____
SE

B. **VERIFY** RCS temperature is nominally 532°F (530 - 534°F).

_____
SE

C. **ESTABLISH** reactor power within the testing band, between 1E-8 amps and 2E-7 amps, using CEAs.

_____
SE

APPENDIX F
TEST RESTART

Page 3 of 4

NOTE:

Steps 6.2.A through 6.2.I may be performed in any order.

6.2 Restarting CEA Worth Testing

A. **ENSURE** Pressurizer spray flow is established by energizing all pressurizer Backup Heater Banks, and lowering the selected PZR PRESS CONTR CHX or CHY, 1(2)-PIC-100X or 1(2)-PIC-100Y, Setpoint to maintain pressure at 2250 psia.

_____
SE

B. **DEMAND** a CEA Data Log, as described in Step 6.6.J of the Main Procedure.

_____
SE

C. **ENSURE** that all CEAs in the groups to be measured have been verified to be within +/- 1.5 inches of the other CEAs in the group.

_____
SE

NOTE

Only one BAST should be used during the boration portion of the test, especially if the CEA worth is being measured during withdrawal. The BAST contains 58.8 gallons per inch.

D. **PERFORM** a calculated prediction of the anticipated dilution/boration volume required, **PER** OI-2B, CVCS Boration, Dilution and Makeup Operations.

dilution volume = _____ gallons required

_____ Verify: _____
SE or OPS SE or OPS

E. **ENSURE** flux has been established in the lower half of the testing band.

_____
SE

APPENDIX F
TEST RESTART

Page 4 of 4

6.2 Restarting CEA Worth Testing (continued)

F. **INVOKE** Technical Specification Special Test Exception 3.1.7 and **INFORM** the Shift Manager, the Control Room Operators, and the Dedicated SRO.

_____/_____/_____
Date Time SE

G. **BEGIN RECORDING** CEA group heights once per hour on Attachment D-1 and **CONTINUE INITIALING** Attachment 3 once per hour to verify that power is less than 1%.

_____
SE

H. **BEGIN LOGGING** dilution/boration flow rates on Attachment 2, "RCS Boron Concentration vs. Time, at 15 minute intervals."

_____
SE

I. **ADVISE** the operators to use Manual Group Mode and CMI Bypass for all CEA movements in this appendix.

_____
SE

NOTE

Appendix D, Step 6.4, RMAS Data Reduction, may be performed in parallel at this time.

NOTE

An optimum dilution rate is 80-88 gpm (2 charging pumps). Dilution should be added in a single batch, in order to avoid having to stop the dilution before the test is completed.

J. **START** dilution of the RCS with two charging pumps.

_____
SE

K. **GO TO** APPENDIX D, Step 6.1.H.

_____
SE

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

Unit 1 and Unit 2

PSTP-3

ESCALATION TO POWER TEST PROCEDURE

Revision 30

CONTINUOUS USE

Effective Date: 4/4/06

Safety Related: X

Non-Safety Related: _____

Writer: John W. Singleton

Sponsor: Principal Engineer – Fuel Operations Support Unit

Approved: [signature] Date: 4/4/06

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1	30/0	33	30/0	65	30/0
2	30/0	34	30/0	66	30/0
3	30/0	35	30/0	67	30/0
4	30/0	36	30/0	68	30/0
5	30/0	37	30/0	69	30/0
6	30/0	38	30/0	70	30/0
7	30/0	39	30/0	71	30/0
8	30/0	40	30/0	72	30/0
9	30/0	41	30/0	73	30/0
10	30/0	42	30/0	74	30/0
11	30/0	43	30/0	75	30/0
12	30/0	44	30/0	76	30/0
13	30/0	45	30/0	77	30/0
14	30/0	46	30/0	78	30/0
15	30/0	47	30/0	79	30/0
16	30/0	48	30/0	80	30/0
17	30/0	49	30/0	81	30/0
18	30/0	50	30/0	82	30/0
19	30/0	51	30/0	83	30/0
20	30/0	52	30/0	84	30/0
21	30/0	53	30/0	85	30/0
22	30/0	54	30/0	86	30/0
23	30/0	55	30/0	87	30/0
24	30/0	56	30/0	88	30/0
25	30/0	57	30/0	89	30/0
26	30/0	58	30/0	90	30/0
27	30/0	59	30/0	91	30/0
28	30/0	60	30/0	92	30/0
29	30/0	61	30/0	93	30/0
30	30/0	62	30/0	94	30/0
31	30/0	63	30/0		
32	30/0	64	30/0		

1.0 PURPOSE

The purpose of this test is to provide an organized method, by augmenting Operating Procedures and Instructions, to attain full power at Beginning-of-Cycle (BOC) and verify the following, during operation from 0% to approximately 100% power:

- Core characteristics as compared to predictions
- RCS Low Flow Trip Setpoints
- CECOR Library
- Shape Annealing Factors
- Core calorimetric calculations

2.0 APPLICABILITY/SCOPE

2.1 The results of this test will verify proper design of the core and adherence with assumptions made in the safety analysis. These results will be acceptable when the acceptance criteria of Appendix A and the limits of Appendix D are met or the results have been reviewed by PORC and approved by the Plant General Manager.

2.2 Plant computer trend blocks should be set up at times that minimize interference with hourly printouts. Points may be added and/or deleted to the Special Trend Blocks of Attachment PSTP-3-2, 15 Minute Trend Data, or Attachment PSTP-3-3, 1 Hour Trend Data, as needed if the Shift Engineer (SE) or Shift Test Coordinator (STC) deems necessary.

2.3 PSTP-3 is designed to supplement startups following a core reload by adding constraints such that the SE can obtain data to evaluate the new core's performance and is identified as an infrequent test or evolution per NO-1-117, Integrated Risk Management. **[B-37]**

2.4 The page check performed in step 4.6.A of this procedure will require a check to ensure that each page associated with PSTP-3 including Attachments and Appendices is present. This original page check (step 4.6.A) verifies that one copy of each attachment is present.

2.5 The page check referred to in step 7.11 of this procedure will require a page check similar to the original page check, but will also require that each attachment be checked against the number of copies logged on Attachment PSTP-3-1, Attachment Log Sheet. Performance of PSTP-3 will generate multiple copies of several attachments. Multiple attachments and other documents (printouts, etc.) generated during performance shall be sequentially numbered and recorded on Attachment PSTP-3-1, Attachment Log Sheet. A separate Attachment PSTP-3-1 may be generated for each attachment or document used.

2.6 This procedure shall be considered PHYSICS TESTS and certain SPECIAL TEST EXCEPTIONS of Technical Specification 3.1.8 may apply as follows:

- If measured MODERATOR TEMPERATURE COEFFICIENT (MTC) and/or the Peaking Factors F_r^T and F_{xy}^T do not meet the limits of Technical Specifications 3.1.3, 3.2.2 and 3.2.3 early in cycle life, SPECIAL TEST EXCEPTION 3.1.8 may be invoked below 85% Rated Thermal Power (RTP).

- Thermal Power shall be restricted to less than 85% Rated Thermal Power per Technical Specification Surveillance Applicability 3.1.8. **[B-14]**

- Technical Specification Surveillance Requirement 3.1.8.1 is satisfied by recording Thermal Power at least once per hour, ensuring that power remains less than or equal to the test power plateau.

2.7 All parameters should be maintained as constant as possible except for the particular parameters to be varied for a given test.

2.8 A reasonable effort should be made to gain the nominal value, as required by the procedure, of a parameter at the start of a test, but, during the test, the initial value should be maintained as close as possible. The value should be considered nominal within the range of $\pm$ 1°F for T_{avg} and $\pm$ 1% Rated Thermal Power for power indications.

2.9 This procedure is written to apply to both Unit 1 and Unit 2. In cases where a reference or designation differs between Unit 1 and Unit 2, the Unit 2 reference will appear in parentheses following the Unit 1 reference.

2.10 CEA positions are referenced to Plant Computer readouts unless otherwise specified.

2.11 Prior to commencing a specific test, no CEA deviation alarms shall exist.

2.12 When a CEA configuration is established by this procedure, the CEAs shall not be moved, except to avoid a potential emergency, until directed by the procedure. Reactivity changes due to xenon shall be compensated by RCS boration/dilution unless otherwise specified.

2.13 All communications between the Control Room and plant personnel involving control of plant equipment shall be clear, concise and specific, using proper terminology. The recipient of such communications shall repeat the order back using three way communications in sufficient detail so as to allow the originator to ensure that the order was understood. **[B-15] [B-58]**

2.14 If there will be a significant delay in testing, the data logging on Attachments PSTP-3-4, Power Monitor Log, and PSTP-3-5, Hourly Data Log, may be suspended until testing is restarted. This decision will be noted in the Shift Log. However, logging shall not be suspended if being used to document any surveillances per step 2.6.

2.15 All plant manipulations shall be performed per the appropriate OP or OI, unless designated otherwise in this procedure.

2.16 Shift Logs shall be maintained to document identified problems, actions taken and decisions made during the performance of this procedure. Entries should be initialed by the person performing the entry. Entries may be made by non-FOS personnel with approval of the SE. These entries shall identify the author, in the event follow-up is necessary.

2.17 Portions of a specific test may be repeated provided that the test has not yet been exited. This will ensure that the conditions required for the test still exist. Test repeats shall be documented on Attachment PSTP-3-6, Test Repeat Documentation. Documentation shall include a reason for the repeat and a listing of the steps to be repeated, as they appear in the procedure, and the appropriate signatures. Reprinted procedure pages are an acceptable listing of the steps to be repeated. If testing is suspended and conditions can not be re-established via normal operating procedures (OPs and OIs), then a procedure change shall be made to PSTP-3 to establish the necessary test conditions. The restart shall be documented on Attachment PSTP 3-7, Restart Documentation.

2.18 Any deficiencies, suggestions or positive comments concerning the performance of this procedure shall be documented on Attachment PSTP-3-8, Procedure Improvement Suggestions. These items will be considered during subsequent revisions to this procedure. The signature of the individual completing an Attachment PSTP-3-8 will aid in clarifying any future questions concerning the comment.

2.19 Instructions to the Reactor Operators shall be directed through the Dedicated SRO as required by the Dedicated SRO. **[B-58]**

2.20 Performance of various STP's below 100% RTP are for the support of PSTP-3 and as such the results do not need to be applied to the acceptance criteria.

2.21 This procedure contains steps that are Reactivity Management sensitive. Pre-job briefs shall contain discussions on the Reactivity Management elements of this procedure. **[B-45]**

2.22 For the purposes of data trending only on Attachments PSTP-3-4 and PSTP-3-5, PI may be used to obtain Plant Computer information. PI may not be used for data to be used in parameter measurement or testing purposes.

3.0 REFERENCES AND DEFINITIONS

3.1 Developmental References

A. Calvert Cliffs Nuclear Power Plant Unit 1 and 2 Technical Specifications, License No. DPR-53 and No. DPR-69.

B. Technical Requirements Manual.

C. PSTP-4, Variable T_{avg} Testing Procedure

D. NO-1-117, Integrated Risk Management

E. PR-3-100, Records Management

3.1 (Continued)

F. EN-1-310, Requirements For Use of Nuclear Engineering Procedures

G. NO-2, Reactivity Management

H. NO-2-100, Reactivity Management

I. TR-1-301, Fuel Services Qualification and Training Program

J. ES199800345-000, Revision 1 "Analysis and Justification for Reducing ICI's and CET's from 45 to 35."

K. STP-M-513-1(2), Initial Calibration of Power Range Nuclear Instrumentation By Comparison With Incore Nuclear Instrumentation After Refueling.

L. Memorandum, P. I. Wengloski to P. E. Katz, "Close Out of MS 03 and 06 from PD200100007," November 14, 2001.

M. ES200300136-000, Revision 0000.

N. ES200300137-000, Revision 0000.

3.2 Performance References

A. PSTP-2, Initial Approach to Criticality and Low Power Physics Testing Procedure

B. PSTP-4, Variable T_{avg} Testing Procedure

C. PSTP-2/PSTP-3 Shift Log

D. REP-05, Core Monitoring Software Library Qualification

E. REP-11(21), Reactor Engineering Surveillance Procedure (U-1(2))

F. NEOP-301, Operator Surveillance Procedure (U-1 and U-2)

G. NFMSP-38, Creating Reports on the Plant Computer, Transferring Files to the Network, and Updating Databases.

H. OP-03, Normal Power Operation

I. OI-30, Nuclear Instrumentation

J. OI-43A, Main Turbine & Generator/Exciter Operation

K. STP-M-213-1(2), Calibration of Power Range Nuclear Instrumentation by Comparison With Incore Nuclear Instrumentation

L. STP-M-512-1(2), Incore Instrumentation Calibration

M. Calvert Cliffs Nuclear Power Plant Unit 1 and 2 Technical Specifications, License No. DPR-53 and No. DPR-69.

N. OI-50A, Plant Computer

3.2 (Continued)

O. NO-1-117, Integrated Risk Management

P. EN-1-310, Requirements For Use of Nuclear Engineering Procedures

Q. STP-0-006-1(2), RPS Startup Test

R. EN-1-100, Engineering Service Process Overview

S. PSTP-301, RCS Flow Measurement Procedure

T. NFMSP-18, CECOR vs. ROCS Program User's Guide

U. TR-1-301, Fuel Services Qualification and Training Program

V. AOP-01B, CEA Malfunctions

W. OP-02, Plant Startup From Hot Standby to Minimum Load

X. STP-M-513-1(2), Initial Calibration of Power Range Nuclear Instrumentation by Comparison With Incore Nuclear Instrumentation After Refueling

Y. NFMSP-37, ICI Failure Guidance.

Z. RL00198, "Engineering Evaluation of Damaged Annular Axial Blanket Pellet", February 14, 2006.

3.3 Definitions

NOTE

The STC may modify the conditions for XENON EQUILIBRIUM in accordance with satisfactory conditions for testing. The new XENON EQUILIBRIUM conditions will be recorded in the Shift Log.

A. **XENON EQUILIBRIUM** has been established when:

- RCS boron concentration is steady, as determined by RCS grab samples at one hour intervals over a three hour period is within 10 ppm of the average.
- A steady makeup blend to the VCT is established.
- The change in ASI over a four hour period is less than 0.005 ASI units.

B. **STEADY-STATE** conditions, as required in Steps 6.4, 6.6, 6.8 and 6.11 refers to operation at the applicable power plateau with a steady indiscernible trend in count rates and power indication as communicated by the DSRO.

4.0 PREREQUISITES

4.1 Specifications/Surveillances

None

4.2 Personnel Skill Levels/Duties

A. PSTP-3 is written to be performed by Reactor Engineering and Nuclear Fuel Services personnel. At least one person on each shift shall be qualified as a shift engineer for startup testing (SE) per TR-1-301.

B. The SE is responsible for the correct performance of PSTP-3. It is the responsibility of the SE to:

- Ensure that all initial conditions are met prior to beginning the test.
- Ensure the appropriate Operations personnel are informed of the impact of the test on plant operations.
- Brief each person on the shift whose watch station is affected by the test.
- Brief the oncoming shift if necessary.
- Ensure that all on-shift Operations personnel fully understand the reason for any plant manipulation requested in support of PSTP-3.

C. One SE per shift is designated as Shift Test Coordinator (STC). Qualification as STC indicates the individual is also qualified as a SE. The STC is responsible for the overall coordination and performance of PSTP-3. It is the responsibility of the STC to:

- Function as the Designated Lead Point of Contact (DLPC) per NO-1-117, Integrated Risk Management. **[B-37]**
- Coordinate Power Escalation testing per PSTP-3.
- Ensure that plant conditions which may affect testing results are identified and the impact minimized.
- Ensure that Acceptance Criteria are met for all testing done under this procedure, where applicable.
- Decide when further testing is necessary and perform retests in accordance with Step 2.17.
- Assist the SE in completion of testing.
- Ensure all data sheets and calculations have been reviewed.
- Determine acceptability of preliminary test results and assess the need for final data reduction.
- Ensure that any special training necessary for individuals involved in testing has been completed.
- Coordinate activities with Outage Management.

4.2 (Continued)

D. On-shift Operations personnel are responsible for the safe operation of the plant at all times during the test. Operations personnel should:

- Discuss any plant manipulations which could affect test results with the SE and STC to ensure performance of the test is not affected.
- Ensure full understanding of plant manipulations requested by the SE.
- Suspend testing in the event personnel feel safe operation is being compromised.
- Provide a Dedicated SRO. **[B-37]**

E. The Dedicated SRO (DSRO) provides the interface between Shift Engineers (SEs) and Operations. DSRO coverage may be suspended with the concurrence of the Shift Manager and the STC during periods when no testing is in progress and the plant is being operated per existing OPs and OIs.

F. The SE maintains the authority to stop power escalation if the data evaluation indicates a problem.

G The Director, Nuclear Fuel Services, the Principal Engineer, Fuel Operations Support, the Principal Engineer, Nuclear Fuel Management, or the Principal Engineer, Primary Systems Engineering shall function as the Responsible Group Supervisor (RGS) per NO-1-117, Integrated Risk Management.

H. All issues shall be evaluated by the Responsible Group Supervisor (RGS), the Designated Lead Point of Contact (DLPC) and the Shift Manager to determine if testing can continue prior to correction and resolution of the issue. If the issue will have a significant impact on testing or a potential impact on the margin of safety of the plant, testing shall be suspended until the issue is resolved.

4.3 Special Tools and Equipment Required

None

4.4 Spare Parts Required

None

4.5 Documentation and Support

None

4.6 Initial Conditions

NOTE

Initial Conditions 4.6.A through 4.6.Q may be performed in any order.

A. All pages of this procedure as shown on the List of Effective Pages are attached.

_____
SE

B. PSTP-2, Initial Approach to Criticality and Low Power Physics Testing Procedure, has been completed through Section 6.0, preliminary results meet Review/Acceptance Criteria or have been reviewed by PORC and approved by the Plant General Manager, and the Shift Manager has been informed of the completion of PSTP-2 testing.

_____
SE

C. RCS Temperature and Pressure, Pressurizer Level and Steam Generator Level are being maintained in normal operating bands per applicable OIs and OPs.

_____
SE or Ops

D. The Special Trend Block of Attachment PSTP-3-2, 15 Minute Trend Data, has been set up and is trending at 15 minute intervals in accordance with Step 2.2.

_____
SE

E. The Special Trend Block of Attachment PSTP-3-3, 1 Hour Trend Data, has been set up and is trending at 1 hour intervals in accordance with Step 2.2.

_____
SE

F. Plant Computer Incore Detector Alarm Setpoints have been entered for the current unit and cycle and documented per REP-11(21) with the appropriate reference below.

Reference:_____

_____
SE

G. STP-M-512-1(2) has been completed for the current unit and cycle.

_____
CMU or SE

4.6 Initial Conditions (Continued)

NOTE

A review of the constants used to calculate PA911 may be obtained from the Plant Computer under the Plant Performance Section - Steam Generator Output.

H. All PA911 constants have been entered correctly as determined by comparing values with setpoint file in the Control Room for System 94, Plant Computer Constants.

_____
SE

I. CEA insertion accounting has been initialized on the Plant Computer for the current unit and cycle:

From the CEA INSERTION ACCOUNTING Menu:

- Select INITIALIZE EFPD
- Select INITIALIZE YEAR

From the POINT PROCESSING Menu:

- set CIEFPDSD = 0.0
- set CIEFPDED = 30.0

_____
SE

J. All incore detector constants for the current unit and cycle have been entered per REP-05, Core Monitoring Software Library Qualification.

_____
SE

K. If predicted to decalibrate by greater than 5% power, the Power Range Safety Nuclear Instruments have been adjusted to compensate for relative flux change. **[B-16]**
Reference:_____

_____
Sys Eng or SE

4.6 Initial Conditions (Continued)

L. On-shift Fuel Services personnel have read and understand the guidance provided in Appendix C regarding power level indications and have signed below. **[B-16]**

_____ Signature	_____ Signature	_____ Signature
_____ Signature	_____ Signature	_____ Signature
_____ Signature	_____ Signature	_____ Signature

M. A pre-test briefing of the initial shift personnel involved in PSTP-3 has been conducted prior to the start of testing. **[B-37]** The briefing covered the topics below:

- Test objectives, prerequisites, and precautions.
- Expected indications, plant performance, and sequence of events.
- Personnel duties and responsibilities.
- Risks involved and potential problems.
- Previous events and significant incidents resulting from similar activities.
- Actions to be taken if unexpected or abnormal conditions occur.
- Reactivity Management concerns.

OPS Section _____

_____
SE

4.6 Initial Conditions (Continued)

N. A management briefing of the initial shift personnel involved in PSTP-3 has been conducted prior to the start of testing per NO-1-117 and a NO-1-117 Attachment 15, Management Briefing for Infrequent Tests or Evolutions and Infrequent Maintenance Activities, was completed for the briefing. **[B-37]** The briefing covered the topics below:

- The need for exercising caution and conservatism during the test or evolution, especially when uncertainties are encountered.
- Emphasis on maintaining the highest margins of safety and placing the proper perspective on any prevailing sense of urgency.
- Assigned responsibilities for the activity and any deviation from normal shift duties and accountabilities.
- The need for open communications.
- The application of lessons learned from pertinent in-house and industry operating experience to assist operations and other involved personnel in internalizing these lessons.
- The need to stop the activity, stop power escalation, decrease power, or trip the reactor when unexpected or abnormal conditions arise or unexpected plant behavior is experienced.

OPS Section _____

_____
SE

O. Dedicated SROs have been assigned. **[B-37]**

_____
SE

P. A maintenance order has been created to perform a full power alignment of the Wide Range Nuclear Instrumentation and a corresponding setpoint change has been written to enter the new offset voltage into the setpoint file. **[B-20]**

Maintenance Order # _____

_____
Sys Eng or SE

4.6 Initial Conditions (Continued)

Q. If required for MTC concerns, the RCS Boron Concentration is less than the RCS Boron Limit listed below. This step may be marked N/A if no boron limit is necessary to maintain MTC within Technical Specification limits.

RCS Boron Limit:_____ ppm

Reference:_____

_____
SE

R. All Initial Conditions of Section 4.6 listed above have been met.

_____
STC

S. The Shift Manager has given permission to start PSTP-3.

_____
SM or SE

T. PSTP-3 has been identified as an infrequent test or evolution per NO-1-117, Integrated Risk Management, and will be performed in accordance with NO-1-117. **[B-37]**

U. Each oncoming shift after the first shift shall be briefed on the same items as the initial brief covered in step 4.6.M and 4.6.N , unless the shift has already been briefed. Briefings shall also be held after any significant changes in plant conditions, or at the beginning of a test. These briefings shall be documented. **[B-37]**

5.0 PRECAUTIONS

5.1 Precautions pertaining to a specific test are listed in the specific procedure step or Appendix describing the test.

5.2 Power Escalation Rates will be in accordance with the following: **[B-17]**

A. INITIAL POWER INCREASES shall be made in accordance with the following:

- All CEAs positioned as specified by the procedure.
- At a rate, that if continued, would result in a power increase of less than or equal to 10% per hour from 0% to 50% RTP.
- At a rate, that if continued, would result in a power increase of less than or equal to 3% per hour from 50% to 100% RTP.
- With boration/dilution for control of reactivity.

B. IF additional operating margin is desired (e.g., to mitigate concerns of potentially pre-existing fuel pellet damage), THEN INITIAL POWER INCREASES shall be made in accordance with the following: **[B-124]**

- All CEAs positioned as specified by the procedure.
- At a rate, that if continued, would result in a power increase of less than or equal to 10% per hour from 0% to 50% RTP.
- At a rate, that if continued, would result in a power increase of less than or equal to 3% per hour from 50% to 80% RTP.
- At a rate, that if continued, would result in a power increase of less than or equal to 2% per hour from 80% to 90% RTP.
- At a rate, that if continued, would result in a power increase of less than or equal to 1% per hour from 90% to 100% RTP.
- With boration/dilution for control of reactivity.

C. Power increases to a power which has been continuously maintained or exceeded for greater than 3 hours in the last 8 days may be made in accordance with the following:

- All CEAs positioned as specified by the procedure
- At a rate less than or equal to 1% per minute
- At a rate that, if continued, would result in a power increase of less than or equal to 20% per hour.

D. The above conditions A and B do not apply for Turbine start up and paralleling operations below 30% RTP.

5.3 Prior to restarting, repeating or resuming a test following a reactor trip or delay in testing during which a change in plant conditions takes place which could affect the results of the test, reestablish applicable initial conditions per the directions of the SE. This shall be done by a procedure change in accordance with PR-1-100. Per NO-1-117, Integrated Risk Management, restart of testing that was suspended due to an identified issue requires the concurrence of the Responsible Group Supervisor and the Shift Manager. If concurrence can not be reached, the RGS shall escalate resolution to the next higher level of management. **[B-37]**

5.4 Should testing stop for any reason and the reactor be at a power level greater than 20% RTP and CECOR has been declared operable, record CECOR values on Attachment PSTP-3-5 as directed by the STC until satisfactory trends are observed.

5.5 NEOP-301 may be used as a reference for actions to be taken if an Incore Detector Alarm is received.

5.6 The following guidelines shall be used if it becomes necessary during this procedure to reduce power or move CEAs:

- This shall be done in accordance with OIs and OPs.
- Notify the STC or PE-FOSU.
- When possible, return the plant to the highest power level achieved during testing using the guidelines of step 5.2.

5.7 If any abnormal conditions develop during this procedure which could or do adversely affect core reactivity or increase power in excess of that allowed by the test conditions, the reactor operator should immediately reduce power, or, if necessary, trip the reactor and maintain the plant in the Hot Standby/Shutdown condition. The Shift Manager shall invoke the necessary procedures to return the plant to a safe condition and resolve the problem or postpone testing until a resolution is reached.

5.8 If unexpected conditions occur, then stop the test and **IMMEDIATELY** notify the Shift Manager. The Shift Manager shall evaluate the situation and determine the course of action. **[B-37]**

5.9 Deviations from specified conditions, or any unusual or unexpected behavior of the plant, shall be brought to the attention of the SE.

5.10 Due to changes in plant configuration during the outage (e.g., S/G tube plugging), RCS Flow Pre-trips are possible, but are considered unlikely. Should a single RCS Flow Pre-Trip signal be received, the power increase shall be stopped, and the cause of the pre-trip signal evaluated. A setpoint change may result from the evaluation. Should multiple pre-trip signals be received, the power increase shall be stopped and reactor power reduced to a level where the pre-trip clears. The cause of the pre-trips shall be evaluated and a setpoint change made, if necessary. If there is any indication of a loss of an RCP, the appropriate alarm manual shall be referenced for the appropriate actions.

5.11 If, during the performance of this test, a dropped CEA is encountered, implement AOP-1B, CEA Malfunctions, as needed. After recovery using AOP-1B, power can be

returned to the highest power achieved during testing using existing OIs and OPs and the guidelines of step 5.2.

5.12 If required, the RCS Boron Limit established in Step 4.6.Q ensures that the Moderator Temperature Coefficient remains below the Technical Specification Limit of $+0.7 \times 10^{-4}$ $\Delta\rho/°F$.

5.13 The periodic CECOR execution frequency may occasionally be reset by the Plant Computer after midnight and need to be reset.

6.0 PERFORMANCE

NOTE

Limiting power levels, where specified, shall be governed by the highest reading valid power indication.

6.1 Preparations for Power Escalation

A. **RECORD** the date and time Section 6.0 is started.

DATE:_____
TIME:_____

B. **RECORD** Unit and Cycle to which this test applies.

UNIT:_____
CYCLE:_____

C. **PRIOR** to entering MODE 1 (5% RTP), **ENSURE** Operator Logs Acceptance Criteria for RCS Flow are acceptable for MODE 1 operation.

_____
SE

D. **PRIOR** to entering MODE 1, **ENSURE** overall core reactivity balance is **PERFORMED AND DOCUMENTED PER** REP-11(21) in accordance with SR 3.1.2.1, using data from the ARO Critical Boron concentration performed in PSTP-2.

_____
SE

E. **PRIOR** to entering MODE 1, **ENSURE** that CCNPP-IT has verified that the plant computer is operable.

_____
CCNPP-IT or SE

F. **PRIOR** to entering MODE 1, **ENSURE** the incore detector system is OPERABLE for monitoring Linear Heat Rate per REP-11 (REP-21).

_____
SE

NOTE

If the ITC is positive while paralleling the turbine, stability can be improved and CEA motion minimized by maintaining a small load on the Turbine Bypass Valves. When the plant response indicates the ITC to be negative, the Turbine Bypass Valves may be closed.

NOTE

All CEAs should be fully withdrawn by the time 20% RTP is obtained, unless insertion is required to maintain boron concentration below the limit specified in step 4.6.Q.

6.2 Begin Initial Power Increase

A. **INITIATE** reactor power increase **AND** Turbine/Generator startup in accordance with OP-2, OP-3 and OI-43A.

_____
SE or Ops

NOTE

When comparing power indications, consideration should be given to other indicators such as Generator Megawatts and feedwater flow. Although these may not be specific indicators of thermal power, these values should be checked for consistency with other power indications. Use PA911 in the comparison after it begins calculating at approximately 15% to 20% RTP. Use X816 only after the unit is paralleled to the grid. See Appendix C for more information.

B. **RECORD** data as it becomes available on Attachment PSTP-3-4, using guidance in Step 2.14 at 5% power increments beginning at 5% RTP **AND CONTINUING** to 95% RTP **AND PERFORM** the following at each power level: **[B-16]**

- **REVIEW** the thermal power indications on Attachment PSTP-3-4, **DETERMINE** whether the indications agree within 5% RTP of each other, **AND INDICATE** by initialing Attachment PSTP-3-4.
- **IF** one or more of the power indications fall outside of the 5% RTP band, **THEN**
  - **IF** the discrepancy is in an indication other than MW_e, **THEN NOTIFY** the Shift Manager, PE-FOSU, Director – Nuclear Fuel Services (D-NFS), Assistant Operations Manager, and Manager – Nuclear Operations (M-NO) of the discrepancy.
  - **DETERMINE** with the Dedicated Senior Reactor Operator (DSRO) which indications are correct using the information of Appendix C **BEFORE** proceeding with the power escalation.
  - **IF** the discrepancy is in an indication other than MW_e, **THEN INVOLVE** the D-NFS and M-NO in the resolution of the discrepancy. **[B-96]**

C. **BETWEEN** 5% RTP and 20% RTP, **ENSURE** ASI remains within appropriate tent curve limits by **MONITORING** Plant Computer Point EC933.

NOTE

All CEAs should be fully withdrawn by the time 20% RTP is obtained, unless insertion is required to maintain boron concentration below the limit specified in step 4.6.Q.

6.3 Initial Power Increase to 30% RTP (30% RTP LIMITING)

A. **PRIOR** to increasing power above 15% RTP, **PERFORM** the following:

- **ENSURE** computer point CETIP is zero.
- **PERFORM** a "BGE Security Snapshot" **PER** reference 3.2.G **AND DOCUMENT PER** REP-11(21).
- **ENSURE** the CECOR and BASSS libraries have been installed for the current cycle per REP-5.

_____
SE

B. **RECORD** data on Attachment PSTP-3-5, using guidance in Step 2.14, as it becomes available at approximately 20% RTP at one hour intervals using the Plant Computer and Plant Performance Report #10, CECOR/BASSS Values.

C. **INCREASE** load to 30% RTP **PER** OP-3 observing limits of **PRECAUTION 5.2**.

D. **ENSURE** all CEAs are fully withdrawn PRIOR to reaching 30% RTP, unless insertion is required to maintain boron concentration below the limit specified in step 4.6.Q.

_____
SE

NOTE

Step 6.4.A may be performed in parallel with Step 6.4.B

NOTE

If turbine testing is to be performed (i.e., overspeed testing), there may be more than one power plateau at 30% RTP. The first plateau would provide the necessary "soak" for the turbine, while the second plateau would occur after turbine testing. If possible, perform STP-M-513-1(2) of Step 6.4.A.1 during the first plateau.

6.4 After reaching steady-state operation at 30% RTP (30% RTP LIMITING)

A. **PREPARE** for Shape Annealing Factor (SAF) and bias data collection per Appendix D, Shape Annealing Factor Test: **[B-18] [B-19] [B-26]**

1. **PERFORM** STP-M-513-1(2).

_____
SE

2. **BEGIN PERFORMING** Appendix D.

6.4 30% RTP (Continued)

B. **PERFORM** a power distribution measurement in accordance with Appendix B, Sections 1.0 through 5.0 and 6.1.

SE

NOTE

Step 6.4.C may be performed at any time prior to exceeding 30%.

C. **PRIOR** to exceeding 30%, **ENSURE** that the incore detector system is OPERABLE for detecting core misloading per Appendix E **OR** that an evaluation has been performed and appropriate actions taken per E.2.d of TNC 15.3.3.

SE

CAUTION

Per PRECAUTION 5.2.A, the rate of initial power escalation is limited to no more than 3% RTP/hour above 50% RTP.

6.5 Power increase to 60% RTP (60% RTP LIMITING)

A. **COMMENCE** power increase to 60% RTP observing limits of PRECAUTION 5.2 **AND CONTINUE** to monitor the power increase by recording values on Attachment PSTP-3-5 hourly and Attachment PSTP-3-4 **PER** Step 6.2.B.

SE

B. **PRIOR** to exceeding 50% RTP (50% RTP LIMITING), **VERIFY** that Azimuthal Power Tilt (Tq) is less than 0.03.

NOTE

Substeps 6.6.A and 6.6.B may be performed in any order.

6.6 After reaching steady-state operating conditions at 60% RTP

A. **PERFORM** a power distribution measurement in accordance with Appendix B, step 6.2.

_____
SE

B. **DIRECT** Operations to perform channel calibration per section 6.2 and 6.3 of OI-30.

_____
SE

C. **VERIFY** Delta T Pot Settings are satisfactory for operation beyond 65% RTP **PER** the Operator's Log Sheets.

_____
SE

D. **PRIOR** TO EXCEEDING 60% RTP, **ENSURE** all Review Criteria have been met **OR** reviewed by PORC and approved by the Plant General Manager. **[B-23]**

PORC Meeting Number (if applicable): _____

_____
SE

6.7 Power increase to 85% RTP (85% RTP NOMINAL, 90% RTP LIMITING)

A. **COMMENCE** power increase to 85% RTP observing limits of PRECAUTION 5.2 **AND CONTINUE** to monitor the power increase by recording values on Attachment PSTP-3-5 hourly and Attachment PSTP-3-4 **PER** Step 6.2.B.

B. **PRIOR** to exceeding 70% RTP, **VERIFY** that the corrected predicted HFP MTC is less than the most positive value allowed at 100% RTP per Technical Specification 3.1.3 and T.S. Figure 3.1.3-1 **OR ESTABLISH** a maximum boron concentration to ensure compliance **AND RECORD** reference below. **MARK** the MAXIUMUM BORON CONCENTRATION "N/A", **IF** such a restriction is not required.

MAXIMUM BORON CONCENTRATION (if required): _____ ppm

Reference: _____

_____
SE

C. **PRIOR** to exceeding 70% RTP, **VERIFY** F_r^T , F_{xy}^T, and T_q are within their Technical Specification limits. **[B-25]**

_____
SE

NOTE
Steps 6.8.A through 6.8.E may be performed in any order.

6.8 After reaching steady-state operating conditions at 85% RTP (85% RTP NOMINAL, 90% RTP LIMITING)

A. **DIRECT** Operations to perform OI-30 calibration.

_____
SE

B. **PERFORM** a power distribution measurement in accordance with Appendix B, step 6.3.

_____
SE

C. **VERIFY** per the Operator's Log Sheets that **DELTA T POT SETTINGS** are satisfactory for operation above 90% RTP.

_____
SE

6.8 85% RTP (Continued)

D. **PRIOR** TO EXCEEDING 85% RTP, **ENSURE** all Review Criteria have been met **OR** reviewed by PORC and approved by the Plant General Manager. **[B-23]**

PORC Meeting Number (if applicable): _____

_____
SE

NOTE
Step 6.8.E.1 may require the performance of STP-M-212-1(2).

E. **PERFORM** the following:

1. **ENSURE** Appendix D is complete and appropriate SAF and bias values are installed in the RPS.

_____
Sys Eng or SE

2. **ENSURE** the installed SAF and Bias terms have been implemented on the plant computer (ECK4001X, ECK4002X, ECK4003X, ECK4004X, ECK5001X, ECK5002X, ECK5003X, and ECK5004X).

_____
Sys Eng or SE

NOTE
STP-M-213-1(2), Calibration of Excore Detectors to Incore Detectors for ASI Monitoring, of step 6.8.E.3 must be completed prior to exceeding 90% RTP **PER** T.S. 3.3.1.3.

3. **PERFORM** STP-M-213-1(2). **[B-18], [B-19]**

_____
SE

6.9 Power increase to 100% RTP (100% RTP LIMITING)

COMMENCE power increase to 100% RTP observing limits of PRECAUTION 5.2 **AND CONTINUE** to monitor the power increase by recording values on Attachment PSTP-3-5 hourly and Attachment PSTP-3-4 **PER** Step 6.2.B.

_____
SE

6.10 Operation at 100% RTP (100% RTP LIMITING)

DIRECT Operations to perform channel calibration per section 6.2 and 6.3 of OI-30.

_____
SE

6.11 After reaching steady-state operation at 100% RTP ARO condition

A. **PERFORM** power distribution measurement in accordance with Appendix B, step 6.4.

_____
SE

B. **IF** F_r^T, F_{xy}^T, and T_q are within their Technical Specification limits, **THEN DISCONTINUE** data logging on Attachment PSTP-3-5.

_____
SE

6.12 XENON EQUILIBRIUM at 100% RTP (100% RTP LIMITING)

A. **VERIFY** XENON EQUILIBRIUM **PER** DEFINITION 3.3.A has been established.

_____
SE

B. **PERFORM** PSTP-4, Variable T_{avg} Testing Procedure.

_____
SE

C. **ENSURE** all Review Criteria have been met **OR** reviewed by PORC and approved by the Plant General Manager.

PORC Meeting Number (if applicable): _____

_____
SE

6.13 Restoration from PSTP-4

NOTE
CEAs should be moved with caution to minimize flux oscillations.

A. **NOTIFY** Operations to establish Group 5 CEA position, reactor power and T_{cold} as specified by the Shift Manager (SM).

_____
SE

B. **NOTIFY** CRS and SM that testing is complete.

_____
SE

C. **BRIEF** the SM on preliminary test results.

_____
SE

D. **INCREASE** power to 100% RTP, if necessary, observing limits of PRECAUTION 5.2.

_____
SE

E. **ENSURE** that F_r^T is less than the limitation imposed in the fuel misloading analysis referenced below. **IF** the F_r^T peaking factor exceeds this limit, **THEN CONTACT** the Fuel Operations Support Unit.

F_r^T Limit: _____

Reference: _____

_____
SE

7.0 POST PERFORMANCE ACTIVITIES

NOTE
The steps in section 7.0 may be performed in any order.

7.1 **RESTORE** trend blocks set up in steps 4.6.D and 4.6.E to frequency and configuration for normal steady-state power operations.

_____
SE

7.2 **COLLECT** the following into a test data package:

- Data record sheets from Appendices and Attachments
- Miscellaneous computer printouts and applicable shift logs.

_____
SE

7.3 **VERIFY** that the POST PERFORMANCE section of each appendix, if applicable, is complete.

_____
SE

7.4 **VERIFY AND DOCUMENT** on Attachment A-1 the comparison of PSTP-4 results with the following Review and Acceptance Criteria:

- Review Criteria
  ITC - Calculated within $\pm$ 0.3 x 10^{-4} $\Delta\rho$/°F of Predicted
  PC - Calculated within $\pm$ 0.2 x 10^{-4} $\Delta\rho$/% RTP of Predicted

- Acceptance Criteria
  MTC - Calculated within limits of Technical Specification 3.1.3
  PC - Calculated within $\pm$ 0.3 x 10^{-4} $\Delta\rho$/% RTP of Predicted

_____
SE

7.5 **VERIFY** that the appropriate sections of REP-11(21) have been updated to reflect the results of this procedure:

A. MTC Measurement

_____
SE

B. Linear Heat Rate - Excore Monitoring

_____
SE

C. Linear Heat Rate - Incore Monitoring

_____
SE

D. F_{xy}^{T} Determination

_____
SE

E. F_{xy}^{T} Determination Using Excore Detector System, if necessary

_____
SE

F. F_{r}^{T} Determination

_____
SE

G. Incore Detector Channel Check

_____
SE

7.6 **ENSURE** Appendix A is complete.

_____
SE

7.7 **VERIFY** that the test data and results have been reviewed and compared with acceptance criteria of Appendix A and are satisfactory, **OR** have been reviewed by PORC and approved by the Plant General Manager.

_____
PE-FOSU

7.8 **VERIFY** that the Full Power Alignment of the Wide Range Nuclear Instrumentation System (WRNIS) has been completed. **[B-20]**

_____
SyS Eng or SE

7.9 **VERIFY** that Requests for Procedure Activity (RPAs) or an Engineering Package have been submitted to change the setpoints in STP-0-6-1(2) based on the results of the full power alignment of the WRNIS of step 7.8. **[B-22]**

_____
SE

7.10 **VERIFY** that the SCYFILE for the current unit and cycle has been updated per REP-05, Core Monitoring Software Library Qualification.

_____
SE

7.11 **VERIFY** that all pages of this procedure are attached.

_____
SE

Category 1 Procedure Performance Block

Completed by: _____ Date: _____

8.0 BASES

[B-3] Required per UFSAR 13.4, "Post-Refueling Startup Testing".

[B-14] Quality Assurance Audit Report, Technical Specifications Audit #91-19, January 17, 1992

[B-15] LER 90-16, "Repeat Backs in All FH's and PSTP's"

[B-16] SER 8-90, Rev. 1, "Non-Conservative Nuclear Instrumentation and Reactor Trip Setpoints During Plant Startup With a New Low Leakage Core"

[B-17] Combustion Engineering Operating Guidelines on Fuel Preconditioning

[B-18] INSR 90-25/25-02/02, Page 9

[B-19] LER 90-26, "Tilted Excore Detectors Caused by Inadequate Procedural Guidance", 10/23/90

[B-20] POSRC OI-91-144-01

[B-22] NFM 93-454, "Memorandum, Maria Miller to Todd Kibler, 'PSTP-3', September 27, 1993," November 3, 1993

8.0 BASES (CONTINUED)

[B-23] Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Updated Final Safety Analysis Report, Section 13.4.6, Action and Review Plan

[B-25] Technical Specifications 3.2.2.1 and 3.2.3.1

[B-26] BG&E Calculation Number I-94-086, "Uncertainty Calculation for the RPS Analog Calculators for BG&E Calvert Cliffs Units 1 and 2"

[B-37] SOER 91-01, Conduct of Infrequent Tests or Evolutions

[B-45] NO-2-100, Reactivity Management

[B-58] SOER 96-02, Recommendation 4

[B-96] IR3-073-756. Include all RPS channels in power comparison and involve GS-TSES and S-NO in resolution of power indication discrepancies.

[B-112] SOER 03-02, Recommendation 1a

[B-124] RL00198, "Engineering Evaluation of Damaged Annular Axial Blanket Pellet", February 14, 2006.

9.0 RECORDS

Lifetime Records

All Records generated by this are to be lifetime and shall be retained for the life of the plant unless specifically exempted in this procedure. The Procedure Sponsor shall be responsible for these records per PR-3-100, Records Management, until they are transferred to Integrated Document Management. Legibility and completeness of the records shall be verified by the Procedure Sponsor prior to transferal.

Radiological Lifetime Records

None

Non-Permanent Records

None

Attachment PSTP-3-1, Attachment Log Sheet

Sequence #_____

PSTP-3 ATTACHMENT	SEQUENCE NO.	NO. OF PAGES	INITIALS	DATE

Attachment PSTP-3-2, 15 Minute Trend Data
(Page 1 of 2)

GROUP POINT NUMBER(S) _____

Trend Block Number(s) _____

Reactor Power Based on Delta T Power	PEXC901
Reactor Thermal Output	PEXC902
16 minute Average Reactor Thermal Output	PA912
2 minute Average Reactor Thermal Output	PA911
Generator Megawatt Output	X816
Core Average ASI	CEASI
A External Axial Shape Index	ECYE1
B External Axial Shape Index	ECYE2
C External Axial Shape Index	ECYE3
D External Axial Shape Index	ECYE4
Ch. A Internal ASI	ECYI1
Ch. B Internal ASI	ECYI2
Ch. C Internal ASI	ECYI3
Ch. D Internal ASI	ECYI4
Pwr Rng Safety Ch. A Upper Detector	NRX05A
Pwr Rng Safety Ch. A Lower Detector	NRY05A
Pwr Rng Safety Ch. B Upper Detector	NRX06B
Pwr Rng Safety Ch. B Lower Detector	NRY06B
Pwr Rng Safety Ch. C Upper Detector	NRX07C
Pwr Rng Safety Ch. C Lower Detector	NRY07C
Pwr Rng Safety Ch. D Upper Detector	NRX08D

Attachment PSTP-3-2, 15 Minute Trend Data
(Page 2 of 2)

Pwr Rng Safety Ch. D Lower Detector	NRY08D
T_{avg} Reactor Reg System 1	T191
T_{avg} Reactor Reg System 2	T192
Loop 11(21) T_{hot}	T111X
Loop 11(21)A T_{cold}	T111Y
Loop 12(22) T_{hot}	T121X
Loop 12(22)A T_{cold}	T121Y
S/G 11(21) Outlet Press.	P3991
S/G 12(22) Outlet Press.	P4008
S/G 11(21) FW Inlet Temp.	T4516
S/G 12(22) FW Inlet Temp.	T4517
FW Flow to S/G 11(21)	F1111%
FW Flow to S/G 12(22)	F1121%
S/G Blowdown 11(21)	PAK0012
S/G Blowdown 12(22)	PAK0013
CECOR I-Sub-P RPS Ch. A	CEISUBPA
CECOR I-Sub-P RPS Ch. B	CEISUBPB
CECOR I-Sub-P RPS Ch. C	CEISUBPC
CECOR I-Sub-P RPS Ch. D	CEISUBPD

Attachment PSTP-3-3, 1 Hour Trend Data

GROUP POINT NUMBER(S) _____

Trend Block Number(s) _____

2 minute Average RCP 11(21)A Diff. Press.	P123A#A
2 minute Average RCP 11(21)B Diff. Press.	P123B#A
2 minute Average RCP 12(22)A Diff. Press.	P122A#A
2 minute Average RCP 12(22)B Diff. Press.	P122B#A
2 Minute Average Reactor Vessel Diff. Press.	P124#A
RCS Loop 11(21) Flow Channel A (%)	F111A
RCS Loop 12(22) Flow Channel A (%)	F121A
Total Flow (%)	F131A
T_{avg} Reactor Reg Channel 1	T191
T_{avg} Reactor Reg Channel 2	T192
10 minute Average T_{avg} Reactor Reg Channel 1	T191#B
10 minute Average T_{avg} Reactor Reg Channel 2	T192#B
RCS Loop 11(21)A T_{cold} Channel A	T112CA
RCS Loop 11(21) T_{hot} Channel A	T112HA
RCS Loop 12(22)A T_{cold} Channel A	T122CA
RCS Loop 12(22) T_{hot} Channel A	T122HA
Reg Group 5, CEA01	CR01
Turbine 1st Stage Pressure	PBFSPU
_____	_____
_____	_____
_____	_____

Attachment PSTP-3-4, Power Monitor Log [B-96]

Sequence #_____

Date	Nuclear Power Ch A (%)	Nuclear Power Ch B (%)	Nuclear Power) Ch C (%)	Nuclear Power) Ch D (%)	ΔT Power Ch A (%)	ΔT Power Ch B (%)	ΔT Power Ch C (%)	ΔT Power) Ch D (%)

	Primary ΔT Power (PEXC901)		Secondary Calorimeric (PA911)		Generator Output (X816)		Turbine 1st Stage Pressure (PBFSPU)		Recorded by	5% Check by
	MWth	%	MWth	%	MWe	%	psia	%	Initial	Initial*

Date	Nuclear Power Ch A (%)	Nuclear Power Ch B (%)	Nuclear Power) Ch C (%)	Nuclear Power) Ch D (%)	ΔT Power Ch A (%)	ΔT Power Ch B (%)	ΔT Power Ch C (%)	ΔT Power) Ch D (%)

	Primary ΔT Power (PEXC901)		Secondary Calorimeric (PA911)		Generator Output (X816)		Turbine 1st Stage Pressure (PBFSPU)		Recorded by	5% Check by
	MWth	%	MWth	%	MW_e	%	psia	%	Initial	Initial*

Date	Nuclear Power Ch A (%)	Nuclear Power Ch B (%)	Nuclear Power) Ch C (%)	Nuclear Power) Ch D (%)	ΔT Power Ch A (%)	ΔT Power Ch B (%)	ΔT Power Ch C (%)	ΔT Power) Ch D (%)

	Primary ΔT Power (PEXC901)		Secondary Calorimeric (PA911)		Generator Output (X816)		Turbine 1st Stage Pressure (PBFSPU)		Recorded by	5% Check by
	MWth	%	MWth	%	MWe	%	psia	%	Initial	Initial*

* **NOTE:** Initials indicate values are acceptable to continue Power Escalation.

Attachment PSTP-3-5, Hourly Data Log

Sequence #_____

DATE	TIME	CEA POSITION CR01	EXCORE ASI EC933	PA912 MW_{th}	CECOR F_{xy}^T	CECOR F_r^T	CECOR T_q		CECOR ASI	INITIAL
							UPPER	LOWER		

Attachment PSTP-3-6, Test Repeat Documentation
Page 1 of _____

Sequence #_____

REPEATED TEST: _____

Reason for Repeat:

_____

_____

_____

_____

_____

Steps to be Repeated:

_____

_____

_____

_____

_____

_____

_____

_____

Initiated by: _____
SE

Reviewed by: _____
SE

Reviewed by: _____
Dedicated SRO

Attachment PSTP-3-6, Test Repeat Documentation
Page _____ of _____

Steps to be Repeated (continued):

Attachment PSTP-3-7, Restart Documentation
Page 1 of _____

Sequence #_____

Restart performed under change number _____

Steps to be performed for restart:

Attachment PSTP-3-7, Restart Documentation
Page _____ of _____

Attachment PSTP-3-8, Procedure Improvement Suggestions

Sequence #_____

Signature:_____ Date:_____

Appendix A, Comparison of Results With Review/Acceptance Criteria
Page 1 of 3

1.0 PURPOSE

The purpose of this appendix is to summarize all the applicable Review and Acceptance Criteria and provide documentation of any preliminary examination and evaluation of test data and its comparison to Review or Acceptance Criteria.

2.0 APPLICABILITY/SCOPE

This appendix is applicable to all tests referenced in PSTP-3. Appendix D, Attachment D-2, may be used to document the comparison of results with Review/Acceptance Criteria for the Shape Annealing Factor Test.

3.0 REFERENCES AND DEFINITIONS

3.1 Developmental References

None

3.2 Performance References

None

3.3 Definitions

None

4.0 PREREQUISITES

4.1 Specifications/Surveillances

None

4.2 Personnel Skill Levels/Duties

See Step 4.2 of Main Procedure.

4.3 Special Tools and Equipment

None

4.4 Spare Parts Required

None

4.5 Documentation and Support

None

Appendix A, Comparison of Results With Review/Acceptance Criteria
Page 2 of 3

4.6 Initial Conditions

None

5.0 PRECAUTIONS

None

6.0 PERFORMANCE

6.1 COMPARE AND DOCUMENT on Attachment A-1 the measured results with the Review and Acceptance Criteria for those tests indicated.

_____
SE

6.2 DOCUMENT any notes, additional information, hand calculations or additional reviews as necessary on Attachment A-2. This step may be marked N/A if not performed or required.

_____
SE

6.3 RESOLVE AND DOCUMENT any discrepancies on Attachment A-1.

_____
SE

Appendix A, Comparison of Results With Review/Acceptance Criteria
Page 3 of 3

6.4 **IF** any **REVIEW CRITERIA** are exceeded, **THEN EVALUATE AND DETERMINE** the applicability of the prediction to the conditions under which the measurement was made **AND** the accuracy of the measurement. As a result of this evaluation, the measurement may be repeated. **[B-23]**

6.5 **IF** any **ACCEPTANCE CRITERIA** are exceeded, **THEN PERFORM** all of the following actions.

A. **NOTIFY** the Reload Project Manager to evaluate testing results for potentially required Simulator Model changes. **[B-112]**

A. In addition to the actions in step 6.4, **EVALUATE AND DETERMINE** the validity of the physics data input to the Safety Analysis for the entire cycle. Additional measurements may be made to support this evaluation. **[B-3]**

B. **IF** it can be demonstrated that the measured value of the particular parameter does **NOT** increase the severity or consequences of any accidents or anticipated operational transients, **THEN** the test results shall be deemed acceptable.

C. **IF** the combination of safety parameters are determined to fall outside of the range used to support the proposed operation of the plant, **THEN** the plant operating limits shall be adjusted to prevent conditions which could result in exceeding the Specified Acceptable Fuel Design Limits.

D. For either condition above, the actions taken **MUST** be reviewed by PORC **AND** approved by the Plant General Manager.
PORC Meeting Number (if applicable): _____

6.6 **DOCUMENT** any reviews performed in Step 6.4 or 6.5 on Attachment A-2.

_____
SE

ATTACHMENT A-1

TEST RECORD AND ACCEPTANCE/REVIEW CRITERIA

Page 1 of 3

30%PowerPlateau

Parameter	Measured Value	Review Criteria	Acceptance Criteria	Results OK? (Y/N)
FxyT	_____	NA	≤ _____ (TS 3.2.2)	_____
FrT	_____	NA	≤ _____ (TS 3.2.3)	_____
Assembly Box Power	See CRPROJ Output	within the greater of + 15% or 0.15 RPD units	NA	_____
Symmetric ICI Box Power	See CRPROJ Output	within ± 10% of group average	NA	_____
TqUpper	_____	≤ 0.030	NA	_____
TqLower	_____	≤ 0.030	NA	_____

60%PowerPlateau

Parameter	Measured Value	Review Criteria	Acceptance Criteria	Results OK? (Y/N)
FxyT	_____	NA	≤ _____ (TS 3.2.2)	_____
FrT	_____	NA	≤ _____ (TS 3.2.3)	_____
Assembly Box Power	See CRPROJ Output	within the greater of + 10% or 0.10 RPD units	NA	_____
Symmetric ICI Box Power	See CRPROJ Output	within ± 10% of group average	NA	_____
TqUpper	_____	≤ 0.020	≤ 0.030	_____
TqLower	_____	≤ 0.020	≤ 0.030	_____

	Extrapolated Value to 85 %RTP	TS Value at 85%	Results OK? (Y/N)
F_{xy}^T (Extrapolated to 85%)	_____	≤ _____ (TS 3.2.2)	_____
F_r^T (Extrapolated to 85%)	_____	≤ _____ (TS 3.2.3)	_____

ATTACHMENT A-1

TEST RECORD AND ACCEPTANCE/REVIEW CRITERIA

Page 2 of 3

85%PowerPlateau

Parameter	Measured Value	Review Criteria	Acceptance Criteria	Results OK? (Y/N)
FxyT	_____	NA	≤ _____ (TS 3.2.2)	_____
FrT	_____	NA	≤ _____ (TS 3.2.3)	_____
Assembly Box Power	See CRPROJ Output	within the greater of + 10% or 0.10 RPD units	NA	_____
Symmetric ICI Box Power	See CRPROJ Output	within ± 10% of group average	NA	_____
TqUpper	_____	≤ 0.020	≤ 0.030	_____
TqLower	_____	≤ 0.020	≤ 0.030	_____

	Extrapolated Value to 100 %RTP	TS Value at 100%	Results OK? (Y/N)
F_{xy}^{T} (Extrapolated to 100%)	_____	≤ _____ (TS 3.2.2)	_____
F_{r}^{T} (Extrapolated to 100%)	_____	≤ _____ (TS 3.2.3)	_____

100%PowerPlateau

Parameter	Measured Value	Review Criteria	Acceptance Criteria	Results OK? (Y/N)
FxyT	_____	NA	≤ _____ (TS 3.2.2)	_____
FrT	_____	NA	≤ _____ (TS 3.2.3)	_____
Assembly Box Power	See CRPROJ Output	within the greater of + 10% or 0.10 RPD units	NA	_____
Symmetric ICI Box Power	See CRPROJ Output	within ± 10% of group average	NA	_____
TqUpper	_____	≤ 0.020	≤ 0.030	_____
TqLower	_____	≤ 0.020	≤ 0.030	_____

ATTACHMENT A-1

TEST RECORD AND ACCEPTANCE/REVIEW CRITERIA

Page 3 of 3

PSTP-04 Results

Parameter	Measured Value	Review Criteria	Acceptance Criteria	Results OK? (Y/N)
ITC	_____	$\pm$ 0.3 x 10^{-4} $\Delta\rho$/°F of Predicted	NA	_____
PC	_____	$\pm$ 0.2 x 10^{-4} $\Delta\rho$/%RTP of Predicted	$\pm$ 0.3 x 10^{-4} $\Delta\rho$/%RTP of Predicted	_____
MTC	_____	NA	TS 3.1.3	_____

Attachment A-2, Review and Evaluation Record

Sequence #_____

TEST: _____

STEP NUMBER: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature:_____ Date:_____

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 1 of 12

1.0 PURPOSE

The purpose of this appendix is to ensure that the CECOR libraries have been qualified and that an incore detector channel check has been completed. This appendix also measures core power distributions at various conditions.

2.0 APPLICABILITY/SCOPE

This appendix applies **ONLY** to the qualification of CECOR libraries, incore detector channel checks and core power distribution measurements performed for PSTP-3.

3.0 REFERENCES AND DEFINITIONS

3.1 Developmental References

None

3.2 Performance References

A. REP-05, Core Monitoring Software Library Qualification

B. REP-11(21), Reactor Engineering Surveillance Procedure (U-1(2))

C. NFMSP-18, CECOR vs. ROCS Program User's Guide

D. NFMSP-37, ICI Failure Guidance

3.3 Definitions

None

4.0 PREREQUISITES

4.1 Specifications/Surveillances

None

4.2 Personnel Skill Levels/Duties

See Step 4.2 of Main Procedure.

4.3 Special Tools and Equipment

None

4.4 Spare Parts Required

None

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 2 of 12

4.5 Documentation and Support

None

4.6 Initial Conditions

A. The CECOR library for the current cycle has been installed in accordance with REP-5.

_____
SE

B. The following plant computer point IDs are set as shown:

- CR10, CR11, CR12, CR13, CR14, CR15, CR16 and CR17 are set to 135" and offscan.
- CEBLOCK, CEDEMAND and CEPERIOD are set to zero (0)
- CECYCLE is set to the current fuel cycle

_____
SE

C. CHANNEL CHECK of the incore detectors has been performed in accordance with REP-11(21). NFMSP-37 may be referenced for guidance.

_____
SE

D. CECOR is operable.

_____
SE

5.0 PRECAUTIONS

None

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 3 of 12

6.0 PERFORMANCE

6.1 30% Power Plateau

A. **VERIFY** that the Initial Conditions of this Appendix have been completed.

_____
SE

B. **BLOCK** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor".
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to 1 (one).

_____
SE

NOTE

Step 6.1.C may be repeated as necessary.

C. **OBTAIN** a corefollow CECOR, option 1.

CECOR Printout Date/Time _____/_____

_____
SE

D. **PERFORM** a power distribution comparison per APPENDIX F.

_____
SE

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 4 of 12

6.1 (Continued)

NOTE
Step 6.1.E and 6.1.F may be performed concurrently.

E. **COMPARE** F_{xy}^T **AND** F_r^T from step 6.1.C with the following acceptance criteria **AND DOCUMENT** on Attachment A-1 and below.

MEASURED	ACCEPTANCE CRITERIA (TS Value - current power level)
F_{xy}^T _____	≤ _____ (TS 3.2.2)
F_r^T _____	≤ _____ (TS 3.2.3)

_____
SE

F. **COMPARE** the following parameters from steps 6.1.C and 6.1.D with the review criteria **AND DOCUMENT** on Attachment A-1.

	REVIEW CRITERIA
Assembly Box Powers	within ± 15% of predicted or ±0.15 RPD units, whichever is greater **[B-90]**
Symmetric ICI Box Powers	within ± 10% of group average
T_q Upper	≤ 0.030
T_q Lower	≤ 0.030

_____
SE

G. **IF** the current value of either F_r^T or F_{xy}^T is larger than the full power limit, **THEN NOTIFY** the PE-FOSU. **[B-91]**

_____
SE

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 5 of 12

6.1 (Continued)

H. **RESTORE** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor."
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to zero (0).

_____
SE

I. **RETURN** to main procedure, step 6.4.B.

6.2 60% Power Plateau

A. **BLOCK** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor."
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to 1 (one).

_____
SE

NOTE

Step 6.2.B may be repeated as necessary.

B. **OBTAIN** a corefollow CECOR, option 1.

CECOR Printout Date/Time _____/_____

_____
SE

C. **PERFORM** a power distribution comparison per APPENDIX F.

_____
SE

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 6 of 12

6.2 (Continued)

NOTE
Steps 6.2.D through 6.2.G may be performed concurrently.

D. **PERFORM** the surveillance requirements for F_r^T and F_{xy}^T determination in accordance with REP-11(21) **PRIOR** to exceeding 70% RTP.

_____
SE

E. **COMPARE** F_r^T, F_{xy}^T, and T_q from step 6.2.B with the following acceptance criteria **AND DOCUMENT** on Attachment A-1 and below.

	MEASURED	ACCEPTANCE CRITERIA (TS Value - current pwr level)
F_{xy}^T	_____	$\leq$ _____ (TS 3.2.2)
F_r^T	_____	$\leq$ _____ (TS 3.2.3)
T_q Upper	_____	$\leq$ 0.030 (TS 3.2.4)
T_q Lower	_____	$\leq$ 0.030 (TS 3.2.4)

_____
SE

F. **COMPARE** the following parameters from steps 6.2.B and 6.2.C with the review criteria **AND DOCUMENT** on Attachment A-1.

	REVIEW CRITERIA
Assembly Box Powers	within ± 10% of predicted or ±0.10 RPD units, whichever is greater **[B-90]**
Symmetric ICI Box Powers	within ± 10% of group average
T_q Upper	$\leq$ 0.020
T_q Lower	$\leq$ 0.020

_____
SE

G. **PERFORM** the surveillance requirement for incore monitoring of Linear Heat Rate, Monitoring on the Plant Computer in accordance with REP-11(21).

_____
SE

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 7 of 12

6.2 (Continued)

H. **IF** the current value of either F_r^T or F_{xy}^T is larger than the full power limit, **THEN NOTIFY** the PE-FOSU. **[B-91]**

_____
SE

I. Based upon a linear extrapolation of data between the 30% and 60% power plateaus, **PREDICT** the F_r^T and F_{xy}^T values at 85% power and **DOCUMENT** the extrapolated values and a comparison to Technical Specification limits on Attachment A-1 and below. **IF** either extrapolated value is larger than the Technical Specification limit at 85%, **THEN NOTIFY** the PE-FOSU. **[B-91]**

	Extrapolated to 85% RTP	(TS Value - 85% RTP)
F_{xy}^T	_____	≤ _____ (TS 3.2.2)
F_r^T	_____	≤ _____ (TS 3.2.3)

_____
SE

J. **RESTORE** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor."
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to zero (0).

_____
SE

K. **RETURN** to main procedure, step 6.6.A.

Appendix B, CECOR Library Qualification and Power Distribution Measurement
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6.3 85% Power Plateau

A. **BLOCK** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor."
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to 1 (one).

_____
SE

NOTE

Step 6.3.B may be repeated as necessary.

B. **OBTAIN** a corefollow CECOR, option 1.

CECOR Printout Date/Time _____/_____

_____
SE

C. **PERFORM** a power distribution comparison per APPENDIX F.

_____
SE

NOTE

Step 6.3.D through 6.3.F may be performed concurrently.

D. **COMPARE** F_r^T, F_{xy}^T, and T_q from step 6.3.B with the following acceptance criteria **AND DOCUMENT** on Attachment A-1 and below.

	MEASURED	ACCEPTANCE CRITERIA (TS Value - current pwr level)
F_{xy}^T	_____	≤ _____ (TS 3.2.2)
F_r^T	_____	≤ _____ (TS 3.2.3)
T_q Upper	_____	≤ 0.030 (TS 3.2.4)
T_q Lower	_____	≤ 0.030 (TS 3.2.4)

_____
SE

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 9 of 12

6.3 (Continued)

E. **COMPARE** the following parameters from steps 6.3.B and 6.3.C with the review criteria **AND DOCUMENT** on Attachment A-1.

	REVIEW CRITERIA
Assembly Box Powers	within ± 10% of predicted or ±0.10 RPD units, whichever is greater **[B-90]**
Symmetric ICI Box Powers	within ± 10% of group average
T_q Upper	≤ 0.020
T_q Lower	≤ 0.020

_____
SE

F. **PERFORM** the surveillance requirement for incore monitoring of Linear Heat Rate, Monitoring on Plant Computer **AND** Monitoring on Data Acquisition System (DAS), in accordance with REP-11(21).

_____
SE

G. **IF** the current value of either F_r^T or F_{xy}^T is larger than the full power limit, **THEN NOTIFY** the PE-FOSU. **[B-91]**

_____
SE

H. Based upon a linear extrapolation of data between the 60% and 85% power plateaus, **PREDICT** the F_r^T and F_{xy}^T values at 100% power and **DOCUMENT** the extrapolated values and a comparison to Technical Specification limits on Attachment A-1 and below. **IF** either extrapolated value is larger than the Technical Specification limit at 100%, **THEN NOTIFY** the PE-FOSU. **[B-91]**

	Extrapolated to 100% RTP	(TS Value - 100% RTP)
F_{xy}^T	_____	≤ _____ (TS 3.2.2)
F_r^T	_____	≤ _____ (TS 3.2.3)

_____
SE

Appendix B, CECOR Library Qualification and Power Distribution Measurement
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6.3 (Continued)

I. **RESTORE** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor."
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to zero (0).

_____
SE

J. **RETURN** to main procedure, step 6.8.B.

6.4 100% Power Plateau

A. **BLOCK** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor."
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to 1 (one).

_____
SE

NOTE

Step 6.4.B may be repeated as necessary.

B. **OBTAIN** a corefollow CECOR, option 1.

CECOR Printout Date/Time _____/_____

_____
SE

C. **PERFORM** a power distribution comparison per APPENDIX F.

_____
SE

Appendix B, CECOR Library Qualification and Power Distribution Measurement
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6.4 (Continued)

NOTE

Steps 6.4.D and 6.4.E may be performed concurrently.

D. **COMPARE** F_{xy}^T, F_r^T and T_q from step 6.4.B with the following acceptance criteria **AND DOCUMENT** on Attachment A-1 and below.

	MEASURED	ACCEPTANCE CRITERIA (TS Value - current pwr level)
F_{xy}^T	_____	≤ _____ (TS 3.2.2)
F_r^T	_____	≤ _____ (TS 3.2.3)
T_q Upper	_____	≤ 0.030 (TS 3.2.4)
T_q Lower	_____	≤ 0.030 (TS 3.2.4)

_____
SE

E. **COMPARE** the following parameters from steps 6.4.B and 6.4.C with the review criteria **AND DOCUMENT** on Attachment A-1.

	REVIEW CRITERIA
Assembly Box Powers	within ± 10% of predicted or ±0.10 RPD units, whichever is greater **[B-90]**
Symmetric ICI Box Powers	within ± 10% of group average
T_q Upper	≤ 0.020
T_q Lower	≤ 0.020

_____
SE

Appendix B, CECOR Library Qualification and Power Distribution Measurement
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6.4 (Continued)

F. **RESTORE** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor."
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to zero (0).

_____
SE

G. **RETURN** to Main Procedure, step 6.11.A.

7.0 POST PERFORMANCE ACTIVITIES

None

8.0 BASES

[B-90] ES200100901-000, Revision 0000 Revised Review Criteria for power distribution.

[B-91] IR3-057-023, F_{xy}^{T} exceeded predicted values during Unit 2 Cycle 14 startup (PD200100007).

9.0 RECORDS

Records of this appendix will be maintained with PSTP-3 in accordance with Section 9.0 of the main procedure.

Appendix C, Guidelines for Power Indications
Page 1 of 4

1.0 PURPOSE

The purpose of this appendix is to provide information to the Shift Engineer (SE) on the use of various power indications available in the Control Room which may be used to accurately determine the actual reactor thermal power. It is required that all SEs read and understand this appendix.

2.0 GUIDELINES FOR POWER INDICATIONS

During the initial power ascension following a core reload, it is essential that reactor thermal power is accurately known and inferred from available indications. Throughout this phase of operation, it is the shared responsibility of Operations, SEs and various system engineers to ensure that thermal power is accurately known or that any inherent inaccuracies are thoroughly understood. The main procedure of PSTP-3 requires that agreement be reached between the Dedicated SRO (DSRO) and the SE concerning the available indications of thermal power (step 6.2.B). Until other indications of thermal power are verified, Nuclear Power from the excore detectors and Delta T Power should be considered the most reliable power indication. Delta T Power is independent of core design or other factors that affect neutron flux. The most conservative (i.e., highest) of these two indications should be used as the best-estimate thermal power until other indications are reliable.

2.1 Nuclear Power

The Nuclear Power indications measure neutron leakage from the core with the excore detectors. This neutron leakage is calibrated to indicate thermal power. This indication is extremely important, not only from an indication standpoint, but also because this signal is used by the Reactor Protection System (RPS) as one source of reactor power to compare to various setpoints in maintaining the licensed Limiting Safety System Settings and safety analysis. Since this indication is dependent on neutron flux on the periphery of the core, anything that affects this flux can decalibrate the Nuclear Power indication. One large factor in the actual calibration of Nuclear Power is the design of the core itself. The fuel loading on the core periphery can severely alter the neutron flux escaping the core. To mitigate the effects of core loading on the initial power escalation, Main Procedure Initial Condition 4.6.K requires that the Nuclear Instrumentation System is adjusted conservatively to account for this change.

Appendix C, Guidelines for Power Indications
Page 2 of 4

2.1 (Continued)

Other plant conditions or parameters that can affect the performance of the excore detectors include:

- physical modifications to structures in the vicinity of the excore detectors
- changes in cold leg temperature
- changes in Reactor Coolant System (RCS) soluble boron concentration
- CEA insertions
- detector condition.

Any alterations or modifications near the excore detectors could affect the distance or the material that neutrons must travel through in order to reach the detectors. Any changes in cold leg temperature affect attenuation near the detectors. CEA insertions alter the flux distribution in the core and may cause a change in core peripheral flux while actual core power may stay the same or increase. Finally, failed or bad detectors could provide erroneous power indications.

2.2 Delta T Power

Delta T Power is determined in the RPS by an algorithm using hot leg and cold leg temperatures. At Hot Zero Power (HZP) conditions, Delta T should indicate 0.0°F. At Hot Full Power (HFP) conditions, hot leg temperature should be 596°F and cold leg temperature should be 548°F. This provides a Delta T of 48°F. The relationship of Delta T as a function of power level is a linear function between HZP and HFP.

Delta T Power is the second source of power signal for the RPS and is therefore an important indication of power. Delta T Power is auctioneered with Nuclear Power to provide the highest power signal to the RPS. This requires that the SE ensure Delta T Power is indicating consistently. Delta T Power is less dependent on core design or other factors that affect neutron flux. A bad or failing temperature indicator or a miscalibration in the Delta T Power potentiometers are the two most likely sources of error in Delta T Power. It is essential that the Delta T Power potentiometer settings are compared to the appropriate setpoint file to ensure accurate indications as required by OI-30.

2.3 Core Calorimetric (PA912)

The Core Calorimetric calculation is one of the most accurate indications of reactor thermal power when this indication is available and has been verified. Above 30%, it is the primary determination of reactor thermal power. The core calorimetric, PA911 on the plant computer, determines primary thermal power by performing a secondary side heat balance. Computer point PA912 continuously averages the previous eight two-minute values from PA911. Note that PA911 and, therefore, PA912 are not available below approximately 15% RTP.

The main inputs to PA911 are feedwater flow and temperature, steam generator pressure and blowdown flow. The blowdown flow is an entered value in computer points PAK0012 and PAK0013. The flow in gpm is measured at the blowdown tank and procedure OI-8A is used to determine the value to enter into the plant computer. The figures used in OI-8A were generated using measured data up to 215 gpm. For flows significantly greater than 215 gpm, these figures may not be accurate. Other sources of error in blowdown flow could be calculational errors or out of calibration blowdown flow meters.

The feedwater and steam generator inputs used in the calculation of PA911 can be verified by obtaining a Steam Generator Output Report from the plant computer. A comparison of the report to actual Control Room indications should reveal differences of less than 2% of the full power values. The exception may be feedwater flow, which tends to have a more noisy signal and can vary by as much as 10% of full power values. Since this is especially true at lower power levels, it is essential that PA911 be compared to other power indicators up to approximately 30% RTP to verify proper operation of PA911.

2.4 Thermal Power Computer Points PEXC901 and PEXC902

Computer points PEXC901 and PEXC902 are based on primary calorimetric calculations and are used mainly for information purposes only. While not as accurate as PA911, they do provide good comparison for power escalation. PEXC901 is based on the product of indicated delta T and an assumed value of 55.53 $MW_t/°F$. This assumed value is consistent with a 48°F delta T at HFP conditions. This simple calculation should compare well with PEXC902 and RPS Delta T Power. PEXC902 is based on the product of RCS flow and the enthalpy difference between the average hot leg and cold leg temperatures for each loop. The enthalpies of the hot leg and cold leg are determined from the average hot leg and cold leg temperatures and the average pressurizer pressure. Any temperature or pressure whose quality is not good on the plant computer is automatically eliminated from the calculation. PEXC901 and RPS Delta T Power should show good agreement since both are determined from RPS temperature indications. The most likely source of error in PEXC902 would be a problem with RPS flow indication and/or calibration.

Appendix C, Guidelines for Power Indications
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2.5 Reactor Protection System

A simple crude method for checking Delta T Power, PEXC901 and PEXC902 is a hand calculation based on the linear relationship between power and delta T. The calculation can be performed by using a selected RPS channel delta T indication and dividing this delta T by 0.48°F / %. The result is in percent full power assuming the plant is running on the correct programmed T_c. This calculation should provide a simple, consistent method for checking other power indications.

2.6 Diverse Power Indications

There are other diverse power indications that, while not a precise indication of power, can be monitored to confirm that other indications are providing reasonable values for power. Examples of these diverse indications include Turbine First Stage Pressure and Generator Output in MW_e.

Appendix D, Shape Annealing Factor Test
Page 1 of 5

1.0 PURPOSE

The purpose of this appendix is to validate the installed Shape Annealing Factor (SAF) and Bias, used to determine Axial Shape Index (ASI), for each RPS channel.

2.0 APPLICABILITY/SCOPE

2.1 This appendix applies ONLY to the SAF and Bias measurement performed for PSTP-3.

2.2 The Review/Acceptance Criteria comparison for this appendix is documented on Attachment D-2, SAF Data Reduction.

3.0 REFERENCES AND DEFINITIONS

3.1 Developmental References

A. ES199900665-013.

B. B-92-099, "Power Ascension Shape Annealing Factor Test," J. E. Baum to W. J. Lippold, June 17, 1992

3.2 Performance References

A. EN-1-100, Engineering Service Process Overview

B. B-92-099, "Power Ascension Shape Annealing Factor Test," J. E. Baum to W. J. Lippold, June 17, 1992

C. ES199900665-013.

D. PR-1-100, Preparation and Control of Calvert Cliffs Procedures

3.3 Definitions

None

4.0 PREREQUISITES

4.1 Specifications/Surveillances

None

4.2 Personnel Skill Levels/Duties

A. See Step 4.2 of Main Procedure.

B. The Regression analysis of the collected data assumes a knowledge of personal computers and standard data analysis software packages such as EXCEL or AXUM.

4.3 Special Tools and Equipment

None

4.4 Spare Parts Required

None

4.5 Documentation and Support

None

4.6 Initial Conditions

A. The Upper and Lower SAF Limits for each RPS channel and the appropriate reference have been recorded on Attachment D-2.

_____
SE

5.0 PRECAUTIONS

5.1 Calibration of the excore instrumentation via STP-M-213-1(2) or STP-M-513-1(2) should not occur during data collection for this appendix. Any such calibrations should occur prior to commencing this appendix or after completion of this appendix. **[B-44]**

5.2 Data collection for this appendix will normally occur at 15 minute intervals. **[B-44]**

5.3 Data collection may be halted after the second data set taken at any power hold plateau and should be resumed just prior (within two normal data collection intervals) to the resumption of power escalation. **[B-44]**

Appendix D, Shape Annealing Factor Test
Page 3 of 5

6.0 PERFORMANCE

6.1 **RECORD** the currently installed SAF and bias for each RPS channel from the setpoint file below:

CHANNEL	SAF	Bias
A		
B		
C		
D		

SE

6.2 **ENSURE** the plant computer values (see table for Point IDs) match the installed SAF and bias for each RPS channel recorded in Step 6.1.

CHANNEL	SAF	Bias
A	ECK4001X	ECK5001X
B	ECK4002X	ECK5002X
C	ECK4003X	ECK5003X
D	ECK4004X	ECK5004X

SE

Note
Occasionally, the Periodic Scheduler will reset after midnight. Step 6.3 of this Appendix may be used to re-established the required frequency for the Shape Annealing Factor Test.

6.3. **SET** the periodic CECOR execution frequency to 15 minutes by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Periodic Scheduler Assignment."
3. **SELECT** Task 14 (CECR00).
4. **PRESS** XMIT.
5. **PRESS** XMIT.
6. **ENTER** the desired start time.
7. **ENTER** 15 minutes for the Activation Interval.

SE

Appendix D, Shape Annealing Factor Test
Page 4 of 5

NOTE

Data collection from the sources below shall occur as simultaneously as possible.

Data collection may be halted after the second data set taken at any power hold plateau and should be resumed just prior (within two normal data collection intervals) to the resumption of power escalation.

6.4 **COLLECT AND RECORD** the required data on Attachment D-1, SAF Data Log, from the following data sources, as needed, at approximately 15 minute intervals.

- CECOR Option 4 from Plant Computer or CECOR Periodic
- Performance Report #7 from Demand Performance Report Menu
- RPS ASI (Y_e) for each channel
- Plant Computer Points ASIA, ASIB, ASIC and ASID
- Trend Blocks

6.5 **CONTINUE** data collection during power escalation as described in Step 5.2 and 5.3 above until reaching the 85% RTP power plateau.

6.6 **PERFORM** a least squares line fit, using standard data analysis software per Step 4.2.B, of I_p vs. $Y_{e,adjusted}$ for each RPS channel, adjusting each measured Y_e value as shown below:

$$Y_{e,adjusted} = Y_{e,measured} + [bias/SAF]$$

where the bias and SAF are the installed bias and SAF from Step 6.1.

6.7 **RECORD** the results of the least squares line fit on Attachment D-2, SAF Data Reduction.

6.8 **VERIFY** for each RPS Channel that the Measured SAF and Regression Coefficient (R^2) are within the limits specified on Attachment D-2, SAF Data Reduction. **IF** any parameter exceeds its limit, **THEN** contact FOSU and Westinghouse to review the SAF and Bias data.

_____
SE

6.9 **IF**, following a review of the data in Step 6.8, any Measured SAF is outside the respective limits **THEN CONTACT** FOSU and **INITIATE** an ESP to implement the measured SAF value for the affected channel(s).

_____
SE

Appendix D, Shape Annealing Factor Test
Page 5 of 5

6.10. **SET** the periodic CECOR execution frequency to 30 minutes by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Periodic Scheduler Assignment."
3. **SELECT** Task 14 (CECR00).
4. **PRESS** XMIT.
5. **PRESS** XMIT.
6. **ENTER** the desired start time (normally 10 or 40 minutes after the hour).
7. **ENTER** 30 minutes for the Activation Interval.

_____
SE

7.0 POST PERFORMANCE ACTIVITIES

None

8.0 BASES

[B-44] B-92-099, "Power Ascension Shape Annealing Factor Test, "J. E. Baum to W. J. Lippold, June 17, 1992

9.0 RECORDS

Records of this appendix will be maintained with PSTP-3 in accordance to Section 9.0 of the main procedure.

Attachment D-1, SAF Data Log

Sequence #_____

DATE TIME INITIAL	CECOR I_{bar}	CECOR I_p A	B	C	D	X	Y	PA911	RPS Y_e A	B	C	D

Attachment D-2, SAF Data Reduction

Sequence #_____

CHANNEL	SAF (SLOPE)	BIAS (INTERCEPT)	REGRESSION COEFFICIENT (R^2)
A	_____	_____	_____
B	_____	_____	_____
C	_____	_____	_____
D	_____	_____	_____

Measured SAF Limits

The Measured SAF values are bounded by the following limits:

Channel	A	B	C	D
Upper Limit				
Lower Limit				

These limits are from: _____

The Regression Coefficient (R^2) is greater than 0.98. [B-44]

NOTE: Unless otherwise specified by the STC, the installed SAF values for channels X and Y shall be equal to those for Channels A and B and shall be subject to the corresponding limits stated in the immediately foregoing table.

Calculated by: _____
SE

Checked by: _____
SE

Appendix E, Core Misloading Criteria Validation
Page 1 of 4

1.0 PURPOSE

The purpose of this appendix is to verify that the incore detector system is capable of detecting a core misloading during the initial power ascension following refueling.

2.0 APPLICABILITY/SCOPE

2.1 This appendix applies only during the initial power ascension following refueling.

2.2 This appendix may be performed at any time, and in parallel with the remainder of PSTP-3, while power is less than 30%, but is required to be performed before increasing power above 30%.

2.3 Should an incore detector be declared INOPERABLE after completion of this appendix and before increasing power above 30%, this appendix must be reperformed to ensure the incore detector system remains OPERABLE for detecting a core misloading. Reperformance shall be documented on Attachment PSTP-3-6, Test Repeat Documentation.

2.4 Since full strings of platinum detectors are installed in the reactor and platinum ICIs are INOPERABLE when using CECOR, Criterion I of TVR 15.3.3.E.2 cannot be met.

3.0 REFERENCES AND DEFINITIONS

3.1 Developmental References

A. Technical Requirements Manual, Revision 5, Section 15.3.3, "Incore Detector System."

B. ES199800345-000, Revision 0 "Analysis and Justification for Reducing ICI's and CET's from 45 to 35" (U-2).

C. ES199800345-000, Revision 1, "Analysis and Justification for Reducing ICI's and CET's from 45 to 35" (U-1).

D. REP-11 (REP-21), Reactor Engineering Surveillance Procedure.

3.2 Performance References

A. REP-11 (REP-21), Reactor Engineering Surveillance Procedure.

3.3 Definitions

None

4.0 PREREQUISITES

4.1 Specifications/Surveillances

None

Appendix E, Core Misloading Criteria Validation
Page 2 of 4

4.2 Personnel Skill Levels/Duties

See Step 4.2 of Main Procedure.

4.3 Special Tools and Equipment

None

4.4 Spare Parts Required

None

4.5 Documentation and Support

None

4.6 Initial Conditions

A. Power level is sufficient to determine whether incore detectors are functioning.

_____
SE

5.0 PRECAUTIONS

None.

6.0 PERFORMANCE

6.1 ICI System Base Operability

A. **DETERMINE** whether the incore detector system is OPERABLE per REP-11 (REP-21) for linear heat rate, peaking factor, and azimuthal power tilt monitoring and calibration of the excore detectors.

B. **IF** the incore detector system is OPERABLE for all of the monitoring listed above, **THEN** Criterion E.1 of TNC 15.3.3 is met.

C. **IF** the incore detector system is not OPERABLE for any of the monitoring listed above, **THEN CONTACT** the PE-FOSU to perform an evaluation of the incore detector system in accordance with TNC 15.3.3.E.2.d.1

Appendix E, Core Misloading Criteria Validation
Page 3 of 4

6.2 Quadrant Operability

A. RECORD the number of INOPERABLE incore detectors recorded on REP-11 Attachment 11-9 (REP-21 Attachment 21-9): _____

B. For each INOPERABLE incore detector recorded on REP-11 Attachment 11-9 (REP-21 Attachment 21-9), **PERFORM** the following steps:

1. On Attachment E-1, **PLACE** an "X" (or similarly mark-out) in the box corresponding to the failed incore detector.

2. **IF** a string has all four detectors INOPERABLE, **THEN** on Attachment E-1, **CROSS OUT** the largest unmarked number for the available strings in the quadrant of the failed detector.

C. **DETERMINE** whether the following criteria are met:

Northeast Quadrant: at least 6 strings have at least one detector OPERABLE.	Y/N _____
Southeast Quadrant: at least 7 strings have at least one detector OPERABLE.	Y/N _____
Northwest Quadrant: at least 7 strings have at least one detector OPERABLE.	Y/N _____
Southwest Quadrant: at least 7 strings have at least one detector OPERABLE.	Y/N _____

D. **IF** the above criteria are met, **THEN** E.2.b.1 of TNC 15.3.3 is met.

E. **IF** the above criteria are not met, **THEN CONTACT** the PE-FOSU to perform an evaluation of the incore detector system in accordance with TNC 15.3.3.E.2.d.1

6.3 5 x 5 Array Operability

NOTE

Attachment E-2 may be used as a reference for determining the 5x5 array(s) each detector is found in.

A. For each INOPERABLE incore detector recorded on REP-11 Attachment 11-9 (REP-21 Attachment 21-9), **PLACE** an "X" (or similarly mark-out) through the INOPERABLE detector identifier for each 5x5 array the detector is found in on Attachment E-3.

B. For each 5x5 array listed on Attachment E-3, **DETERMINE** whether at least one detector is OPERABLE in the array and **COMPLETE** the "At Least 1 Operable?" column as appropriate.

Appendix E, Core Misloading Criteria Validation
Page 4 of 4

6.3 5 x 5 Array Operability (Continued)

C. **IF** each 5x5 array listed on Attachment E-3 has at least one OPERABLE detector, **THEN** E.2.b.2 of TNC 15.3.3 is met.

D. **IF** the above criteria are not met, **THEN CONTACT** the PE-FOSU to perform an evaluation of the incore detector system in accordance with TNC 15.3.3.E.2.d.1

6.4 ICI System Operability for Core Misloading

A. **IF** the operability requirements of TNC 15.3.3 E.1, E.2.b.1 and E.2.b.2 are all met, **THEN** the incore detector system is OPERABLE for detecting core misloading.

OPERABLE: YES / NO

B. **IF** the incore detector system is NOT OPERABLE for detecting core misloading, **THEN** power is limited to no more than 30% power until an evaluation is performed per E.2.d.1 of TNC 15.3.3.

C. **IF** TNC 15.3.3 E.1 and E.2 are met, **THEN** power ascension may continue above 30% power.

ES # _____

Approval Date: _____

D. **RETURN** to Step 6.4.C of the Main Procedure.

7.0 POST PERFORMANCE ACTIVITIES

None

8.0 BASES

None

9.0 RECORDS

Records of this appendix will be maintained with PSTP-3 in accordance to Section 9.0 of the main procedure.

Attachment E-1, Quadrant String Availability
Page 1 of 2

Unit 1

NE QUADRANT

Computer String No.	LEVEL 1	2	3	4
02				
10				
13				
15				
17				
34				
35				
36				

Quadrant Available Strings			
	1	4	7
	2	5	8
	3	6	

SE QUADRANT

Computer String No.	LEVEL 1	2	3	4
03				
05				
18				
19				
20				
21				
23				
37				
38				

Quadrant Available Strings			
	1	4	7
	2	5	8
	3	6	9

NW QUADRANT

Computer String No.	LEVEL 1	2	3	4
01				
12				
28				
29				
30				
31				
32				
44				
45				

Quadrant Available Strings			
	1	4	7
	2	5	8
	3	6	9

SW QUADRANT

Computer String No.	LEVEL 1	2	3	4
07				
08				
24				
26				
27				
40				
41				
42				
43				

Quadrant Available Strings			
	1	4	7
	2	5	8
	3	6	9

Attachment E-1, Quadrant String Availability
Page 2 of 2

Unit 2

NE QUADRANT

Computer String No.	LEVEL 1	2	3	4
02				
10				
13				
15				
32				
34				
35				
36				

Quadrant Available Strings			
	1	4	7
	2	5	8
	3	6	

SE QUADRANT

Computer String No.	LEVEL 1	2	3	4
03				
05				
17				
18				
19				
20				
21				
37				
38				

Quadrant Available Strings			
	1	4	7
	2	5	8
	3	6	9

NW QUADRANT

Computer String No.	LEVEL 1	2	3	4
01				
08				
12				
28				
29				
30				
31				
44				
45				

Quadrant Available Strings			
	1	4	7
	2	5	8
	3	6	9

SW QUADRANT

Computer String No.	LEVEL 1	2	3	4
07				
23				
24				
26				
27				
40				
41				
42				
43				

Quadrant Available Strings			
	1	4	7
	2	5	8
	3	6	9

Attachment E-2, ICI to 5x5 Array Matrix

String	Arrays Found In
1	24, 25, 26, 27, 28, 35, 36, 37, 38, 39, 46, 47, 48, 49, 50, 57, 58, 59, 60, 61, 68, 69, 70, 71, 72
2	6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 24, 25, 26, 27, 28, 35, 36, 37, 38, 39, 46, 47, 48, 49, 50
3	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 36, 37, 38, 39, 40
5	28, 29, 30, 31, 32, 39, 40, 41, 42, 43, 50, 51, 52, 53, 54, 61, 62, 63, 64, 65, 72, 73, 74, 75, 76
7	48, 49, 50, 51, 52, 59, 60, 61, 62, 63, 70, 71, 72, 73, 74, 80, 81, 82, 83, 84, 88, 89, 90, 91, 92
8	58, 59, 60, 61, 62, 69, 70, 71, 72, 73, 79, 80, 81, 82, 83, 87, 88, 89, 90, 91, 93, 94, 95, 96, 97
10	22, 23, 24, 25, 26, 33, 34, 35, 36, 37, 44, 45, 46, 47, 48, 55, 56, 57, 58, 59, 66, 67, 68, 69, 70
12	22, 23, 24, 33, 34, 35, 44, 45, 46, 55, 56, 57, 66, 67, 68
13	6, 13, 14, 22, 23, 24, 33, 34, 35, 44, 45, 46
15	1, 6, 7, 13, 14, 15, 22, 23, 24, 25
17	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19
18	3, 4, 5, 9, 10, 11, 12, 17, 18, 19, 20, 21
19	5, 11, 12, 19, 20, 21, 29, 30, 31, 32
20	21, 31, 32, 42, 43
21	32, 43, 54
23	30, 31, 32, 41, 42, 43, 52, 53, 54, 63, 64, 65, 74, 75, 76
24	52, 53, 54, 63, 64, 65, 74, 75, 76, 84, 85, 92
26	73, 74, 75, 76, 83, 84, 85, 91, 92, 97
27	79, 80, 81, 82, 83, 87, 88, 89, 90, 91, 93, 94, 95, 96, 97
28	77, 78, 79, 80, 81, 86, 87, 88, 89, 93, 94, 95
29	66, 67, 68, 69, 77, 78, 79, 86, 87, 93
30	55, 56, 66, 67, 77
31	44, 55, 66
32	22, 33, 44, 55, 66
34	22
35	6
36	1, 2, 6, 7, 8
37	5
38	21
40	54, 65, 76
41	76
42	92
43	90, 91, 92, 96, 97
44	93
45	77

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
1	E2 to L6	031 153 361	032 154 362	033 171 363	034 172 364	151 173	152 174	
2	F2 to N6	031 173	032 174	033 361	034 362	171 363	172 364	
3	G2 to R6	031 173	032 174	033 181	034 182	171 183	172 184	
4	J2 to S6	031 173	032 174	033 181	034 182	171 183	172 184	
5	L2 to T6	031 173 191 373	032 174 192 374	033 181 193	034 182 194	171 183 371	172 184 372	
6	D3 to J7	021 133 351 363	022 134 352 364	023 151 353	024 152 354	131 153 361	132 154 362	
7	E3 to L7	021 033 171 363	022 034 172 364	023 151 173	024 152 174	031 153 361	032 154 362	
8	F3 to N7	021 033 361	022 034 362	023 171 363	024 172 364	031 173	032 174	
9	G3 to R7	021 033 181	022 034 182	023 171 183	024 172 184	031 173	032 174	
10	J3 to S7	021 033 181	022 034 182	023 171 183	024 172 184	031 173	032 174	

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
11	L3 to T7	031 173 191	032 174 192	033 181 193	034 182 194	171 183	172 184	
12	N3 to V7	181 193	182 194	183	184	191	192	
13	C4 to G9	131 153	132 154	133	134	151	152	
14	D4 to J9	021 133	022 134	023 151	024 152	131 153	132 154	
15	E4 to L9	021 033 171	022 034 172	023 151 173	024 152 174	031 153	032 154	
16	F4 to N9	021 033	022 034	023 171	024 172	031 173	032 174	
17	G4 to R9	021 033 181	022 034 182	023 171 183	024 172 184	031 173	032 174	
18	J4 to S9	021 033 181	022 034 182	023 171 183	024 172 184	031 173	032 174	
19	L4 to T9	031 173 191	032 174 192	033 181 193	034 182 194	171 183	172 184	
20	N4 to V9	181 193	182 194	183	184	191	192	

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
21	R4	181	182	183	184	191	192	
	to	193	194	201	202	203	204	
	W9	381	382	383	384			
22	B5	101	102	103	104	121	122	
	to	123	124	131	132	133	134	
	F11	151	152	153	154	321	322	
		323	324	341	342	343	344	
23	C5	101	102	103	104	121	122	
	to	123	124	131	132	133	134	
	G11	151	152	153	154			
24	D5	011	012	013	014	021	022	
	to	023	024	101	102	103	104	
	J11	121	122	123	124	131	132	
		133	134	151	152	153	154	
25	E5	011	012	013	014	021	022	
	to	023	024	031	032	033	034	
	L11	101	102	103	104	151	152	
		153	154					
26	F5	011	012	013	014	021	022	
	to	023	024	031	032	033	034	
	N11	101	102	103	104			
27	G5	011	012	013	014	021	022	
	to	023	024	031	032	033	034	
	R11							
28	J5	011	012	013	014	021	022	
	to	023	024	031	032	033	034	
	S11	051	052	053	054			
29	L5	031	032	033	034	051	052	
	to	053	054	191	192	193	194	
	T11							
30	N5	051	052	053	054	191	192	
	to	193	194	231	232	233	234	
	V11							

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
31	R5 to W11	051 193 231	052 194 232	053 201 233	054 202 234	191 203	192 204	
32	S5 to X11	051 193 211 233	052 194 212 234	053 201 213	054 202 214	191 203 231	192 204 232	
33	B6 to F13	101 123 321	102 124 322	103 131 323	104 132 324	121 133	122 134	
34	C6 to G13	101 123	102 124	103 131	104 132	121 133	122 134	
35	D6 to J13	011 023 121 133	012 024 122 134	013 101 123	014 102 124	021 103 131	022 104 132	
36	E6 to L13	011 023 101	012 024 102	013 031 103	014 032 104	021 033	022 034	
37	F6 to N13	011 023 101	012 024 102	013 031 103	014 032 104	021 033	022 034	
38	G6 to R13	011 023	012 024	013 031	014 032	021 033	022 034	
39	J6 to S13	011 023 051	012 024 052	013 031 053	014 032 054	021 033	022 034	
40	L6 to T13	031 053	032 054	033	034	051	052	

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
41	N6 to V13	051 233	052 234	053	054	231	232	
42	R6 to W13	051 203	052 204	053 231	054 232	201 233	202 234	
43	S6 to X13	051 203 231	052 204 232	053 211 233	054 212 234	201 213	202 214	
44	B7 to F15	101 123 311 323	102 124 312 324	103 131 313	104 132 314	121 133 321	122 134 322	
45	C7 to G15	101 123	102 124	103 131	104 132	121 133	122 134	
46	D7 to J15	011 023 121 133	012 024 122 134	013 101 123	014 102 124	021 103 131	022 104 132	
47	E7 to L15	011 023	012 024	013 101	014 102	021 103	022 104	
48	F7 to N15	011 023 101	012 024 102	013 071 103	014 072 104	021 073	022 074	
49	G7 to R15	011 023	012 024	013 071	014 072	021 073	022 074	
50	J7 to S15	011 023 071	012 024 072	013 051 073	014 052 074	021 053	022 054	

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
51	L7 to T15	051 073	052 074	053	054	071	072	
52	N7 to V15	051 073 241	052 074 242	053 231 243	054 232 244	071 233	072 234	
53	R7 to W15	051 233	052 234	053 241	054 242	231 243	232 244	
54	S7 to X15	051 213 241 403	052 214 242 404	053 231 243	054 232 244	211 233 401	212 234 402	
55	B9 to F16	101 123 311 323	102 124 312 324	103 301 313	104 302 314	121 303 321	122 304 322	
56	C9 to G16	101 123	102 124	103 301	104 302	121 303	122 304	
57	D9 to J16	011 103	012 104	013 121	014 122	101 123	102 124	
58	E9 to L16	011 083	012 084	013 101	014 102	081 103	082 104	
59	F9 to N16	011 073 101	012 074 102	013 081 103	014 082 104	071 083	072 084	
60	G9 to R16	011 073	012 074	013 081	014 082	071 083	072 084	

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
61	J9	011	012	013	014	051	052	
	to	053	054	071	072	073	074	
	S16	081	082	083	084			
62	L9	051	052	053	054	071	072	
	to	073	074	081	082	083	084	
	T16							
63	N9	051	052	053	054	071	072	
	to	073	074	231	232	233	234	
	V16	241	242	243	244			
64	R9	051	052	053	054	231	232	
	to	233	234	241	242	243	244	
	W16							
65	S9	051	052	053	054	231	232	
	to	233	234	241	242	243	244	
	X16	401	402	403	404			
66	B11	101	102	103	104	121	122	
	to	123	124	291	292	293	294	
		301	302	303	304	311	312	
	F17	313	314	321	322	323	324	
67	C11	101	102	103	104	121	122	
	to	123	124	291	292	293	294	
	G17	301	302	303	304			
68	D11	011	012	013	014	101	102	
	to	103	104	121	122	123	124	
	J17	291	292	293	294			
69	E11	011	012	013	014	081	082	
	to	083	084	101	102	103	104	
	L17	291	292	293	294			
70	F11	011	012	013	014	071	072	
	to	073	074	081	082	083	084	
	N17	101	102	103	104			

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
71	G11 to R17	011 073	012 074	013 081	014 082	071 083	072 084	
72	J11 to S17	011 053 081	012 054 082	013 071 083	014 072 084	051 073	052 074	
73	L11 to T17	051 073 261	052 074 262	053 081 263	054 082 264	071 083	072 084	
74	N11 to V17	051 073 241 263	052 074 242 264	053 231 243	054 232 244	071 233 261	072 234 262	
75	R11 to W17	051 233 261	052 234 262	053 241 263	054 242 264	231 243	232 244	
76	S11 to X17	051 233 261 403	052 234 262 404	053 241 263 411	054 242 264 412	231 243 401 413	232 244 402 414	
77	C13 to G18	281 293 451	282 294 452	283 301 453	284 302 454	291 303	292 304	
78	D13 to J18	281 293	282 294	283	284	291	292	
79	E13 to L18	081 273 291	082 274 292	083 281 293	084 282 294	271 283	272 284	
80	F13 to N18	071 083 281	072 084 282	073 271 283	074 272 284	081 273	082 274	

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
81	G13 to R18	071 083 281	072 084 282	073 271 283	074 272 284	081 273	082 274	
82	J13 to S18	071 083	072 084	073 271	074 272	081 273	082 274	
83	L13 to T18	071 083 271	072 084 272	073 261 273	074 262 274	081 263	082 264	
84	N13 to V18	071 243	072 244	073 261	074 262	241 263	242 264	
85	R13 to W18	241 263	242 264	243	244	261	262	
86	D15 to J19	281 293	282 294	283	284	291	292	
87	E15 to L19	081 273 291	082 274 292	083 281 293	084 282 294	271 283	272 284	
88	F15 to N19	071 083 281	072 084 282	073 271 283	074 272 284	081 273	082 274	
89	G15 to R19	071 083 281	072 084 282	073 271 283	074 272 284	081 273	082 274	
90	J15 to S19	071 083 431	072 084 432	073 271 433	074 272 434	081 273	082 274	

Attachment E-3, 5x5 Array Operability
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NOTE

The coordinates listed in the Table are for Unit 2 and are for orientation purposes.

Box	Coords	ICIs in Box						At Least 1 Operable?
91	L15 to T19	071 083 271 433	072 084 272 434	073 261 273	074 262 274	081 263 431	082 264 432	
92	N15 to V19	071 243 421 433	072 244 422 434	073 261 423	074 262 424	241 263 431	242 264 432	
93	E16 to L20	081 273 291 443	082 274 292 444	083 281 293	084 282 294	271 283 441	272 284 442	
94	F16 to N20	081 273	082 274	083 281	084 282	271 283	272 284	
95	G16 to R20	081 273	082 274	083 281	084 282	271 283	272 284	
96	J16 to S20	081 273	082 274	083 431	084 432	271 433	272 434	
97	L16 to T20	081 263 431	082 264 432	083 271 433	084 272 434	261 273	262 274	

Appendix F, Core CRPROJ Guide for Power Distribution Comparison
Page 1 of 3

1.0 PURPOSE

The purpose of this appendix is to provide instruction for using the CRPROJ program on the plant computer for performing power distribution comparisons. This program compares the assembly relative power density between CECOR and ROCS or between CECOR and a ROCS Summary File created by ANC.

2.0 APPLICABILITY/SCOPE

2.1 This appendix applies during the initial power ascension following refueling during the performance of the enveloping procedure, PSTP-3.

2.2 This appendix may be performed at any time during prescribed power plateaus of PSTP-3 under conditions for which a ROCS Summary File has been generated.

2.3 This appendix is written to be performed in the 72' Computer Room using the computer equipment contained therein.

3.0 REFERENCES AND DEFINITIONS

3.1 Developmental References

A. NFMSP-18, Revision 0, "CECOR vs. ROCS Program User's Guide".

3.2 Performance References

None

3.3 Definitions

None

4.0 PREREQUISITES

4.1 Specifications/Surveillances

None

4.2 Personnel Skill Levels/Duties

A. It is assumed that the person performing actions on the plant computer and programmer's console is familiar with the operating procedures thereof.

B. If the person performing actions on the plant computer and the programmer's console is NOT familiar with the operating procedures thereof, it is assumed that personnel with requisite expertise are available for assistance.

Appendix F, Core CRPROJ Guide for Power Distribution Comparison
Page 2 of 3

4.3 Special Tools and Equipment

None

4.4 Spare Parts Required

None

4.5 Documentation and Support

None

4.6 Initial Conditions

A. Power level is steady and current conditions are represented by a ROCS Summary File installed in the appropriate directory under the direction of REP-05.

_____
SE

5.0 PRECAUTIONS

None.

6.0 PERFORMANCE

A. **SIGN ONTO** the plant computer using one of the operator console CRTs.

1. At prompt "RING IN FOR SERVICE", hit CTRL-E.

2. At prompt "ENTER YOUR OWNERNAME", enter GUEST1

B. **CHANGE** directories as necessary to ensure that work is being performed in the same directory that the ROCS Summary Files were installed during performance of REP-05 (i.e., CECROCS). The LS command can be entered at the user prompt to verify presence of the appropriate files in the directory.

CD CECROCS

C. **COPY** the CECOR summary file to be used entering the following typed commands at the user command prompt:

1. VOLMGR

2. COPY @DISC2B(DFTDIR)CECOR3.MASTR01.E <new file name>

3. X

Appendix F, Core CRPROJ Guide for Power Distribution Comparison
Page 3 of 3

D. **RUN** the CEPROJ Program

1. **ENSURE** that the printer in the 72' computer room is set to 8 lines per inch.

2. **RUN** the program by entering the following command at the user command prompt.

   CRPROJ.RUN

3. **WHEN** prompted, **PROVIDE** the renamed CECOR file <new file name> from step C.2 above.

4. **WHEN** prompted, **ENTER** the desired ROCS Summary File name.

5. **ENTER** the power level in terms of percent power.

E. **SIGN OFF** the Plant Computer by typing 'X' at the user command prompt.

F. **PICKUP** the CRPROJ printout from the 72' computer room printer for the applicable unit.

G. **REPEAT** Steps A through F of Section 6.0 as necessary at each power plateau.

7.0 POST PERFORMANCE ACTIVITIES

None

8.0 BASES

None

9.0 RECORDS

Records of this appendix will be maintained with PSTP-3 in accordance to Section 9.0 of the main procedure.