A12&3
Δ

NATURAL CIRCULATION DEMONSTRATION PROGRAM

PROCEDURE 2LP-333-02, REVISION 0 1/27/82

QUALITY CLASS II

SAN ONOFRE NUCLEAR GENERATING STATION

UNIT 2

REVIEW AND COMMENT
NOT FOR CONSTRUCTION

TITLE	SIGNATURE	DATE
AUTHOR		1-27-1982
T.P. Prep. Supervisor		27 Jan 82

APPROVAL SIGNATURES

TWG Chairman JMZM		
TWG Members		
SCE SU QA Supervisor		

RESULTS APPROVAL

Results Reviewed CSE		
SCE SU T.O. Supervisor		
TWG Chairman		
TWG Members		
SCE SU QA Supervisor *		

* Review of Documentation Only

TCN'S INCLUDED

TEST EXCEPTION REPORTS INCLUDED

T/P NO. 2LP-333-02
REV. NO. 0

MISSING INFORMATION DATA SHEET

SECTION NO.	INFORMATION NOT AVAILABLE	WHEN EXPECTED	SOURCE	CLEARED INITIAL/DATE

TEST EXCEPTION REPORT LOG

1.	2. JOB NO.	3. UNIT NO.	4. SHEET
SAN ONOFRE NUCLEAR GENERATING STATION SOUTHERN CALIFORNIA EDISON CO.		2	1 OF

5. PROCEDURE TITLE	6. PROCEDURE NUMBER/REVISION
Natural Circulation Demonstration Program	2LP-333-02, Revision 0

7. TER NUMBER	8. PREPARED BY/DATE	9. ENTERED BY/DATE	10. DESCRIPTION/REMARKS

TEST CHANGE NOTICE LOG

1. SAN ONOFRE NUCLEAR GENERATING STATION/ SOUTHERN CALIFORNIA EDISON CO.	2. JOB NO.	3. UNIT NO.	4. SHEET
		2	1 OF

5. PROCEDURE TITLE	6. PROCEDURE NUMBER/REVISION
Natural Circulation Demonstration Program	2LP-333-02, Revision 0

7. TCN NUMBER	8. PREPARED BY/DATE	9. ENTERED BY/DATE	10. DESCRIPTION/REMARKS

NATURAL CIRCULATION DEMONSTRATION PROGRAM

PROCEDURE 2LP-333-02, REVISION 0

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

SECTION PAGE

1.0 OBJECTIVE

1.1 To provide a safe method for conducting Natural Circulation demonstrations at low power (<5% power).

NOTE

This demonstration is conducted to meet the Low Power Natural Circulation Testing requirements of Section I.G. 1 of Supplement 1 of the SER. FSAR requirements pertaining to natural circulation are fulfilled by 2PA-215-01

2.0 ACCEPTANCE CRITERIA

2.1 Section: 8.3

Criteria: All operators listed in Attachment 7 have witnessed the initiation, maintenance, and recovery from natural circulation.

Source: Reference 3.5

3.0 REFERENCES

3.1. SONGS 2 & 3 FSAR Technical Specifications, License No. NPF-10, Appendix A.

3.2 Operating Instructions

3.2.1 S023-II-9.258, Plant Protection System Bistable Card and Variable Setpoint Card Calibration, Rev. 1

3.2.2 S023-3-2.31, Natural Circulation Guidelines, Rev. 0

3.2.3 S023-3-2-2, Makeup Operations, Rev. 1

3.2.4 S023-2-10, Auxiliary Boiler Operation, Rev. 1

3.2.5 S023-3-2.13, Core Protection/CEA Calculator Operation, Rev. 1

3.2.6 S023-III-1.6, Primary System Chemical Limits, Rev. 1

3.2.7 S023-III-1.13, Primary System Local and Central Sample Points, Rev. 0

3.2.8 S023-3-2.18, Steam Bypass System Operation, Rev. 2

3.2.9 S023-3-1.7, RCP Operation, Rev. 2

Verified By:
Initial/Date

3.3 Test Procedures

3.3.1 2LP-333-01, Low Power Physics Test Program, Rev. 1

3.3.2 2PA-102-01, Piping Thermal Expansion Test, Rev. 0

3.3.3 2PA-313-01, COLSS Power/Flow Verification, Rev. 0

3.3.4 2PA-344-03, CPC/COLSS Verification, Rev. 0

3.3.5 2ST-344-08, RCS T Power Determination, Rev. 1

3.3.6 2ST-344-09, Nuclear and Thermal Power Calibration, Rev. 0

3.3.7 2ST-344-17, Power Ascension Data Record, Rev. 1

3.3.8 2ST-344-19, NSSS Hand Calorimetric, Rev. 0

3.4 USNRC Regulatory Guide 1.68, Rev. 0, November 1968

3.5 NUREG-0712, Safety Evaluation Report related to the operation of SONGS, Units 2 and 3, Supplement No.1, February 1981.

3.6 Natural Circulation Test Program SONGS 2&3 Safety Evaluation, March 1982 (Preliminary Draft)

4.0 PREREQUISITES

4.1 A pretest indoctrination meeting has been held to familiarize test and operations personnel with this test per TI-8 (Conduct of Testing). _____/_____

4.2 Low Power Physics Testing has been completed per 2LP-333-01, Low Power Physics Test Program. _____/_____

4.3 The linear power trip setpoint for natural circulation has been supplied by CE and is recorded below:

Linear Power Trip Setpoint _____ _____/_____

4.4 RCS Heat Loss values determined in 2HB-213-06 (RCS Heat Loss) are available. _____/_____

4.5 The reactivity computer is still set up and operational. _____/_____

4.6 The trend blocks specified in Attachment 9 have been set up. _____/_____

Verified By:
Initial/Date

4.7 The 10^{-4}% Bistables have been raised to 10% per Attachment 5.

4.7.1 Channel A _____/_____

4.7.2 Channel B _____/_____

4.7.3 Channel C _____/_____

4.7.4 Channel D _____/_____

5.0 LIMITS AND PRECAUTIONS

5.1 The equipment or systems to be in service to support the performance of this test shall be operated in accordance with appropriate Station Operating Instructions except where deviations are required by Section 8.0 of this procedure or by existing plant conditions.

5.2 The procedure will generate large quantities of raw data. Each piece of paper with data on it should be identified with procedure number and procedure step number, date, time and name or initials of the data taker. In the case of test recorders being used to monitor various plant parameters, each chart being used should be identified with procedure number and procedure step number, date, time, chart speed, plant conditions and initialed by the data taker. Furthermore, each channel should be identified by the parameter recorded, the parametric range, as required for adequate trace interpretation. If any of these are changed, the new information should be identified on the chart.

5.3 Prior to restarting, repeating or resuming a test or demonstration following a reactor trip or delay in testing, reestablish applicable initial conditions as per direction of the SCE Power Ascension Test Operations Supervisor or his designated alternate.

5.4 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 shall immediately reduce power, or if necessary, trip the reactor and maintain the plant in the HOT STANDBY condition.

5.5 Do not start a RCP while in natural circulation without first tripping the reactor.

5.6 Prior to commencing a specific test or demonstration all CEAs in a group should be within $\pm$1.5" of the group average as determined by computer position readout unless a test condition specifies that a CEA is at other than the group height.

5.7 If the reactor trips or is tripped other than under specified testing, determine and correct the cause before returning the reactor to criticality. Record in the Log the reasons why the trip occured and the respective corrective actions taken.

5.8 Feedwater flow should be maintained continuously to both steam generators to minimize feedwater nozzle temperature transients, unless otherwise specified.

5.9 Use of the Reactor Regulating System (RRS) in controlling the CEDMCS in the Auto Sequential Mode or Manual Individual Mode is not allowed following RCP trip.

5.10 Unless otherwise specified, all power levels used in this procedure are core thermal power and are expressed in % of RATED THERMAL POWER. Specified power levels should be maintained within $\pm$ 0.5% of RATED THERMAL POWER unless impractical or specified otherwise.

5.11 After the RCP trip, maintain the CEDM control system in the "OFF" mode except as required to position CEA's.

5.12 Borations and dilutions performed during this procedure are to be in accordance with SO23-3-2.2 ("Makeup Operations") except during the initial increase to approximately 3% power or as directed by the procedure. During escalation to approximately 3% power or whenever direct injection is called for, the following exceptions are applicable:

5.12.1 The system will preferably be lined up to inject to the suction of the charging pumps.

Verified By:
Initial/Date

5.12.2 Preferably three charging pumps will be in operation.

5.13 During primary coolant system borations and/or dilutions, while maintaining criticality, stop the boration and/or dilution prior to reaching the desired endpoint to minimize overshoot. Provide maximum practical pressurizer spray during boron concentration changes to minimize loop to pressurizer boron concentration differences. Use additional backup heaters to maintain RCS pressure.

5.14 Throughout this procedure, the abbreviation ARO (All Rods Out) is used for all CEAs at their UELs (Upper Electrical Limit) and EARO (Essentially All Rods Out) for all CEAs at their UELs except Group 6 which is $\geq$ 130" withdrawn.

5.15 Ensure that sufficient recorder/chart paper is available on all recorders to be used prior to the start of each test.

5.16 The Watch Engineer, who is a licensed SRO, shall be responsible for the safe and proper operation of the facility. He shall, therefore, take whatever action is necessary to assure plant safety including, but not limited to, stopping any test and placing plant equipment in a safe condition.

Verified By:
Initial/Date

6.0 TEST EQUIPMENT

6.1 SCE Startup Computer

Startup Number	Next Calibration Due Date	Verified By: Initial/Date
_____	_____	_____/_____

6.2 Four Frequency Voltage Converters (Gould Model 13-4618-20 or equivalent).

Startup Number	Next Calibration Due Date	Verified By: Initial/Date
_____	_____	_____/_____
_____	_____	_____/_____
_____	_____	_____/_____
_____	_____	_____/_____

6.3 Reactivity computer

Serial Number	Next Calibration Due Date	Verified By: Initial/Date
CE-493-0177	N/A	_____/_____

6.4 Digital voltmeter, Hewlett-Packard 3460B or equivalent.

Startup Number	Next Calibration Due Date	Verified By: Initial/Date
_____	_____	_____/_____

6.5 Digital multimeter Fluke 8600A or equivalent.

Startup Number	Next Calibration Due Date	Verified By: Initial/Date
_____	_____	_____/_____

Verified By:
Initial/Date

7.0 INITIAL CONDITIONS

NOTE

Where applicable the parameter computer I.D. to be used for obtaining the required value is noted in parenthesis at the end of the step.

7.1 The reactor is critical with the CEDMCS in either Manual Group (MG) or Manual Sequential (MS) Control Mode. All CEA groups are full out with the exception of Group 6 which is being used for control purposes. _____/_____

7.2 Power level is approximately 10^{-2}% as seen by the Log Power Safety Channels. _____/_____

7.3 All four (4) RCP's are in operation. _____/_____

7.4 Pressure control is in AUTOMATIC, maintaining RCS pressure at approximately 2250 psia (I.D. P100X). _____/_____

7.5 Pressurizer level control is in AUTOMATIC, maintaining level at approximately 33% (preferably ±2%) (I.D. L110X). _____/_____

7.6 RCS temperature is being maintained at approximately 545°F using the SBCS or atmospheric steam dumps (I.D. T111Y). _____/_____

7.7 Blank

7.8 The steam generators are being fed by the AFWS and their water level maintained at approximately 69%. _____/_____

7.9 Steam generator pressure is being maintained at approximately 1000 psia (I.D.'s P1013A and P1023A). _____/_____

7.10 All four PPS channels are in operation. _____/_____

7.11 The Boron Management System and the Gaseous Radioactive Waste System are prepared to receive large quantities of liquid and gaseous waste due to borations and dilutions. _____/_____

7.12 The auxiliary boiler is in operation per S023-2-10. _____/_____

Verified By:
Initial/Date

7.13 The High Linear Power trip setpoints are set to the the value recorded in step 4.3 on all four PPS channels.

7.13.1 Channel A _____/_____

7.13.2 Channel B _____/_____

7.13.3 Channel C _____/_____

7.13.4 Channel D _____/_____

7.14 At least One (1) charging pump is in operation and the remaining are in standby. _____/_____

7.15 The plant computer is available and operational. _____/_____

7.16 No other testing which may interfere with this demonstration is in progress. _____/_____

7.17 Blank.

Verified By:
Initial/Date

7.18 The High Log Power trip setpoints have been raised to 100% power on all four PPS channels per S023-II-9.258.

7.18.1 Channel A _____/_____

7.18.2 Channel B _____/_____

7.18.3 Channel C _____/_____

7.18.4 Channel D _____/_____

8.0 PROCEDURE AND DATA COLLECTION

8.1 Initial Data Collection

8.1.1 This step intentionally left blank.

8.1.2 Place the following parameters on a trend recorder:

a) RCS Temperature T_C (T111Y)

b) Log power level (J007) _____/_____

8.2 Initial Increase to 3% Power

NOTE

Any time a boron concentration is required, a chemical analysis shall be obtained by the station chemist per S023-III-1.6 ("Primary System Chemical Limits") and S023-III-1.13 ("Primary System Local and Central Sample Points").

8.2.1 Perform the following:

8.2.1.1 2PA-102-01 ("Piping Thermal Expansion Test"). _____/_____

Verified By:
Initial/Date

8.2.1.2 2PA-344-03 ("CPC/COLSS Verification"). _____/_____

8.2.1.3 2PA-313-01 ("COLSS Power/Flow Verification"). _____/_____

8.2.1.4 2ST-344-08 ("RCS ΔT Power Determination"), Section 8.1 only. _____/_____

8.2.1.5 2ST-344-16 ("Adjustment of COLSS Secondary Pressure Loss Terms"). _____/_____

8.2.2 Begin trending the dedicated Trend Block of 2ST-344-17 at approximately four (4) hour intervals. _____/_____

8.2.3 Initiate the transient data collection required by 2ST-344-17 ("Power Ascension Data Record") approximately one hour before initiating the power increase. _____/_____

8.2.4 Increase reactor power to ~1.5% (at $\leq$ 5% per hour) by slowly withdrawing CEA Group 6. If ARO conditions are attained, continue the power increase using small batch dilutions as necessary per Precaution 5.12. The requirements of Attachment 8 ("Special Procedure for Initial Power Increase") shall be adhered to during the increase. _____/_____

NOTE

Maintain steam generator pressure at approximately 1000 psia by operation of the SBCS in accordance with S023-3-2.18 ("Steam Bypass System Operation"), with T_c at approximately 545°F.

8.2.5 Blank.

8.2.6 Blank.

8.2.7 Stabilize plant conditions at ~1.5%. Maintain power constant by means of RCS boration/dilution. Perform the following:

Verified By:
Initial/Date

8.2.7.1 This step intentionally left blank.

8.2.7.2 2ST-344-19 ("NSSS Hand Calorimetric"). _____/_____

8.2.7.3 2ST-344-08 ("RCS ΔT Power Determination"), section 8.2 only. _____/_____

8.2.7.4 Complete the applicable parts of Attachment 10 ("Base Power Level Determination"). _____/_____

8.2.8 Increase reactor power to ~3% (at $\leq$ 5%/hour) by slowly withdrawing CEA Group 6. If ARO conditions were attained in step 8.2.4 or are attained during this power increase, continue the power increase using small batch dilutions as necessary per Precaution 5.12. The requirements of Attachment 8 ("Special Procedure for Initial Power Increase") shall be adhered to during the increase. _____/_____

NOTE

Maintain steam generator pressure at approximately 1000 psia by operation of the SBCS in accordance with S023-3-2.18 ("Steam Bypass System Operation"), with T_c at approximately 545°F.

8.2.9 Blank.

8.2.10 Blank.

8.2.11 Stabilize plant conditions at ~3%. Maintain power level by means of RCS boration/dilution. Perform the following:

Verified By:
Initial/Date

8.2.11.1 2ST-344-19 ("NSSS Hand Calorimetric"). _____/_____

8.2.11.2 2ST-344-08 ("RCS ΔT Power Determination"), section 8.3 only. _____/_____

8.2.11.3 Complete the remainder of Attachment 10 ("Base Power Level Determination"). _____/_____

CAUTION

THE EXTRAPOLATED KEITHLEY PICOAMMETER READING FOR 5% REACTOR POWER MUST AT NO TIME BE EXCEEDED TO ASSURE REACTOR POWER DOES NOT EXCEED THE LOW POWER TEST LIMIT.

8.2.12 Stabilize reactor power at approximately 3% (as per the Keithley picoammeter readings of Attachment 10), and maintain power by means of RCS boration/dilution. _____/_____

8.2.13 Place the CPC's in bypass per S023-3-2.13 ("Core Protection/CEA Calculator Operation").

8.2.13.1 Channel A _____/_____

8.2.13.2 Channel B _____/_____

8.2.13.3 Channel C _____/_____

8.2.13.4 Channel D _____/_____

Verified By:
Initial/Date

8.2.14 Lower the Low RCS Flow trips setpoints for each PPS Channel to allow zero flow per S023-II-9.258.

8.2.14.1 Channel A _____/_____

8.2.14.2 Channel B _____/_____

8.2.14.3 Channel C _____/_____

8.2.14.4 Channel D _____/_____

CAUTION

IF DURING THE PERFORMANCE OF SECTION 8.2.15 THE REACTOR TRIPS, THE DEMONSTRATION IN PROGRESS WILL BE TERMINATED.

8.2.15 When plant conditions are stable, perform:

NOTE

Following the completion of an Attachment, all data sheets collected during the performance of that Attachment are to be incorporated into the Attachment per TI-2.

8.2.15.1 Attachment 1 ("Natural Circulation Demonstration"). _____/_____

NOTE

Completion of Attachment 1 establishes the Initial Conditions for the performance of Attachment 2 ("Demonstration of Natural Circulation at Reduced Pressures"), Attachment 3 ("Demonstration of Natural Circulation with Reduced Heat Removal Capacity"), and Attachment 4 ("Demonstration Termination"). These may be performed in any order and repeated as necessary at the discretion of the Watch Engineer and Test Director.

Verified By:
Initial/Date

NOTE

To expedite all operators' participation in the performance of Attachments 2 and 3, as many operators as practicable in addition to the normal shift crew should participate as observers during the performance of each Attachment. Those operators participating during any test will be required to document their participation in Attachment 7, ("Operator Attendance Record"). Special arrangements will be made for those operators unable to attend due to illness, vacation, etc. to receive make-up training at a later date.

CAUTION

IF FOR ANY REASON A DELAY OF GREATER THAN APPROXIMATELY ONE HOUR IS EXPECTED BETWEEN THE TERMINATION OF ONE DEMONSTRATION AND THE START OF THE NEXT, THE ENTIRE DEMONSTRATION SEQUENCE IS TO BE TERMINATED BY PERFORMING ATTACHMENT 4.

8.2.15.2 With the RCS in natural circulation perform Attachment 2 ("Demonstration of Natural Circulation at Reduced Pressures").

_____/_____

8.2.15.3 With the RCS in natural circulation perform Attachment 3 ("Demonstration of Natural Circulation with Reduced Heat Removal Capacity").

_____/_____

8.2.15.4 Perform Attachment 4 ("Demonstration Termination") to recover from natural circulation conditions.

_____/_____

8.3 ACCEPTANCE CRITERIA

All operators listed in Attachment 7 have witnessed the initiation, maintenance, and recovery from natural circulation.

_____/_____

Verified By:
Initial/Date

9.0 SYSTEM RESTORATION

9.1 Return the LOW RCS Flow trip setpoints for each PPS Channel to Tech. Spec. required values per S023-II-9.258:

9.1.1 Channel A _____/_____

9.1.2 Channel B _____/_____

9.1.3 Channel C _____/_____

9.1.4 Channel D _____/_____

9.2 Set the High Linear Power Pretrip/Trip Setpoints to 35/40% respectively on each PPS Channel per S023-II-9.258.

9.2.1 Channel A _____/_____

9.2.2 Channel B _____/_____

9.2.3 Channel C _____/_____

9.2.4 Channel D _____/_____

Verified By:
Initial/Date

9.3 Remove the CPC's from bypass per SO23-3-2.13.

9.3.1 Channel A _____/_____

9.3.2 Channel B _____/_____

9.3.3 Channel C _____/_____

9.3.4 Channel D _____/_____

9.4 Set the 10^{-4}% bistable trip set point to 10^{-4}% for each PPS channel per Attachment 6:

9.4.1 Channel A _____/_____

9.4.2 Channel B _____/_____

9.4.3 Channel C _____/_____

9.4.4 Channel D _____/_____

9.5 Inform the SCE Station Watch Engineer and the SCE Shift Test Engineer that the demonstration has been completed and that systems may be lined up and placed in service in accordance with Station Operating Instructions or as necessary to support plant conditions.

_____/_____ _____/_____
SCE Station Watch Engineer

_____/_____
SCE Shift Test Enginner

10.0 ATTACHMENTS

Attachment 1 - Natural Circulation Demonstration

Attachment 2 - Demonstration of Natural Circulation at Reduced Pressures

Attachment 3 - Demonstration of Natural Circulation with Reduced Heat Removal Capacity

Attachment 4 - Demonstration Termination

Attachment 5 - 10^{-4}% Bistable Adjustment from 5% to 10%

Attachment 6 - 10^{-4}% Bistable Adjustment from 10% to 10^{-4}%

Attachment 7 - Operator Attendance Record

Attachment 8 - Special Procedure for Initial Power Increases

Attachment 9 - Computer Trend Parameters

Attachment 10 - Base Power Level Determination

Attachment 11 - Startup Computer Parameters

Attachment 12 - Depressurization Data Record

Attachment 13 - Auxiliary Spray Log

Attachment 14 - Operational Safety Criteria and Guidelines

1.0 OBJECTIVES

1.1 To establish natural circulation flow conditions.

NOTE

This demonstration is performed with a critical reactor to simulate decay heat.

2.0 LIMITS AND PRECAUTIONS

2.1 Normal pressurizer spray will be unavailable without RCP flow. Auxiliary spray or decreasing RCS temperature may be used for pressure control. If RCS pressure cannot be adequately controlled, manually trip the reactor and start the reactor coolant pumps per S023-3-1.7, ("RCP Operation"). This will terminate the demonstration.

2.2 To avoid lifting the secondary safety valves, steam generator pressure must not exceed 1070 psia. (This corresponds to a saturated temperature of 552.85°F).

NOTE

Use atmospheric dump valves 2HV8419 and 2HV8421 if necessary to prevent lifting secondary safety valves.

2.3 An approach to inadequate core cooling may exist if one or more of the conditions specified in S023-3-2.31 ("Natural Circulation Guidelines") occur.

Verified By:
Initial/Date

2.4 Do not exceed 5% power as determined by Attachment 10 at any time while the demonstration is in progress (see Technical Specification 3.10.3).

2.5 The equipment or systems to be in service to support the performance of this demonstration shall be operated in accordance with appropriate station operating instructions except where deviations are required by Section 4.0 of this Attachment or by existing conditions.

2.6 Do not exceed the limits of Attachment 14.

2.7 Do not at any time start the RCP's (per S023-3-1.7, "RCP Operation") without first having manually tripped the reactor.

2.8 A reactor trip will terminate this demonstration.

2.9 Maintain nominal steady state power between 1% and 3%.

3.0 INITIAL CONDITIONS

NOTE

Where applicable, the parameter computer I.D. to be used for obtaining the required value is noted in parentheses at the end of the sentence.

3.1 Reactor power is stable at ~ 3%, as read from the Keithley picoammeters.

_____/_____

Verified By:
Initial/Date

3.2 All four RCPs are operating. _____/_____

3.3 CEA Group 6 is at $\geq$ 60 inches withdrawn (I.D. CRAVG6). _____/_____

NOTE

Steps 3.4 through 3.11 provide preferable conditions. Attachment 14 does provide additional flexibility. Record actual conditions in the spaces provided.

3.4 RCS temperature is ~ 545°F (I.D. T111Y). _____ _____/_____

3.5 RCS pressure is ~ 2250 psia (I.D. P100X). _____ _____/_____

3.6 Pressurizer level is at ~ 33% (I.D. L110X). _____ _____/_____

3.7 Pressurizer level control is in automatic. _____ _____/_____

3.8 Pressurizer pressure control is in automatic. _____ _____/_____

3.9 The SG's are being fed by the AFWS and level is being maintained at approximately 69%. _____ _____/_____

3.10 SG pressure is ~ 1000 psia (I.D. P1013A and P1023A). _____ _____/_____

3.11 The SBCS is in automatic. _____ _____/_____

3.12 All four PPS channels are in operation. _____/_____

3.13 The reactivity computer is available and operational. _____/_____

3.14 The plant computer is available and operational. _____/_____

Verified By:
Initial/Date

3.15 The computer trend groups listed in Attachment 9 have been set up. ____/____

3.16 The parameters listed in Attachment 11 are input to the Startup Computer. ____/____

3.17 The RCP oil lift pumps are operable and set for automatic operation. ____/____

3.18 SG blowdown has been secured. ____/____

NOTE

No other testing which may interfere with this demonstration should be in progress.

4.0 PROCEDURE AND DATA COLLECTION

4.1 Initial Data Collection

4.1.1 Obtain an RCS sample (Hot Leg 1, S21212MU075) and record boron analysis results and boronometer readings below:

Analysis _____ ppm

Boronometer _____ ppm ____/____

NOTE

The procedure may continue after the RCS sample is drawn, prior to completion of its analysis.

Verified By:
Initial/Date

4.1.2 Start computer trend groups 1 & 2 of Attachment 9 on 60 second trends and trend groups 3 & 4 on 120 second trends. _____/_____

4.1.3 Request a Power Ascension dedicated trend block. _____/_____

4.2 Natural Circulation Demonstration

NOTES

The following conditions are suggested during the demonstration. Attachment 14 provides additonal flexibility.

1. Maintain reactor power between approximately 1% and 3% using CEA Group 6 or RCS dilution/ boration as necessary.

2. Maintain pressurizer pressure control in AUTOMATIC.

3. Maintain pressurizer pressure at ~ 2250 psia with auxiliary spray as necessary.

4. Maintain pressurizer level in AUTOMATIC. Take manual control if necessary.

5. Maintain SG pressure at ~ 1000 psia. It is preferrable to maintain the SBCS in AUTOMATIC.

6. Maintain T_{cold} within approximately $5^{o}F$ of the initial value if practical.

7. Maintain SG levels as steady as possible.

Verified By:
Initial/Date

CAUTIONS

1. IF ANY OF THE FOLLOWING CONDITIONS OCCUR DURING THE PERFORMANCE OF THIS ATTACHMENT MANUALLY TRIP THE REACTOR AND TERMINATE THE TEST.

   a. $T_C < 500^{\circ}F$

   b. $T_H \geq 600^{\circ}F$

   c. MARGIN TO SATURATION $\leq 20^{\circ}F$

   d. LOOP T > $58^{\circ}F$

   e. TAVG > $578^{\circ}F$

   f. REACTOR POWER > 5%

   g. SUSTAINED STARTUP RATE > 1.5 DPM

   h. ANY UNCONTROLLED ROD MOTION

   i. RCS PRESSURE CANNOT BE ADEQUATELY CONTROLLED

2. IF DURING THE PERFORMANCE OF THIS ATTACHMENT T_C FALLS BELOW $510^{\circ}F$, ADJUST FEED FLOW AND/OR STEAM FLOW AS NECESSARY TO STOP THE COOLDOWN.

4.2.1 Approximately one (1) minute prior to the RCP trip initiate Startup Computer sampling at a rate of one (1) scan per second.

_____/_____

4.2.2 Approximately twenty (20) seconds prior to the RCP trip increase the sampling frequency of the Startup Computer to a rate of ten (10) scans per second.

_____/_____

Verified By:
Initial/Date

4.2.3 At time zero, initiate the transient by tripping all four RCP's as near simultaneously as practical from 2CR-50.

_____/_____

NOTE

Immediately following the RCP trip, the following RCS behavior should be observed:

a) Hot leg temperature : increase

b) Cold leg temperature: slight decrease or constant

c) Pressurizer level : increase

d) Pressurizer pressure: increase

NOTE

Reduced flow conditions increase loop cycle times from approximately 12 seconds to 5-10 minutes; therefore, the plant will respond much slower to parameter changes.

4.2.4 At about one (1) minute into the transient decrease the Startup Computer sampling rate to ten (10) scans per minute.

_____/_____

Verified By:
Initial/Date

CAUTION

NO ABNORMAL DIFFERENCES SHOULD EXIST BETWEEN HOT LEG (T_h) RTD'S AND RELIABLE CORE EXIT THERMOCOUPLES.

ANY ABNORMAL DIFFERENCES MAY BE INDICATIVE OF AN APPROACH TO AN INADEQUATE CORE COOLING CONDITION. IF RELIABLE CORE EXIT THERMOCOUPLES INDICATE SUPER-HEAT, THEN THE CORE SHOULD BE CONSIDERED UNCOVERED.

NOTE

The Subcooled Margin Monitor (SMM) is the primary indication of adequate subcooling. Pressurizer pressure and T_h or core exit thermocouples may be used as a backup.

4.2.5 Verify natural circulation has been established with:

1. Loop ΔT's ($T_h - T_c$) less than full power ΔT (<58°F) and stablized. _____/_____
2. T_c's stable. _____/_____
3. T_h's stable. _____/_____
4. No abnormal differences between T_h RTD's and reliable core exit thermocouples exist. _____/_____

Verified By:
Initial/Date

4.2.6 At about thirty (30) minutes into the transient decrease the Startup Computer sampling rate to one (1) scan per minute. _____/_____

4.2.7 Stabilize conditions and remain on natural circulation for at least one hour. Take a Power Ascension dedicated trend block after 1 hour. _____/_____

4.2.8 Blank

4.2.9 When natural circulation has been maintained for at least one hour the Test Director, following consultation with the Watch Engineer, may choose to continue the demonstration per Attachment 2 ("Demonstration of Natural Circulation at Reduced Pressures"), or Attachment 3 ("Demonstration of Natural Circulation with Reduced Heat Removal Capacity"), or to terminate this demonstration per Attacment 4 ("Demonstration Termination").

Record below the Attachment to be performed next.

Attachment _____ _____/_____

ATTACHMENT 2

DEMONSTRATION OF NATURAL CIRCULATION AT REDUCED PRESSURES

1.0 OBJECTIVES

1.1 To demonstrate the capability of maintaining natural circulation and adequate margin to saturation without pressurizer heaters.

1.2 To determine the RCS depressurization rate following the loss of all four RCPs and pressurizer heaters.

1.3 To demonstrate the ability to maintain natural circulation at reduced RCS pressures.

1.4 To demonstrate the ability to control the saturation margin through the use of the Chemical Volume Control System (CVCS) and the steam bypass system.

2.0 LIMITS AND PRECAUTIONS

2.1 The equipment or systems to be in service to support the performance of this demonstration shall be operated in accordance with appropriate Station Operating Instructions except where deviations are required by Section 4.0 of this Attachment or by existing plant conditions.

2.2 Do not exceed 5% power as determined by Attachment 10 at any time while the demonstration is in progress (see Technical Specification 3.10.3). Maintain nominal steady state power between 1% and 3%.

2.3 Do not exceed the limits of Attachment 14.

2.4 Normal pressurizer spray will be unavailable without RCP flow. Auxiliary spray or decreasing RCS temperature may be used for pressure control. If RCS pressure cannot be adequately controlled, manually trip the reactor, and start the RCP's per S023-3-1.7 ("RCP Operation") This will terminate the demonstration.

2.5 To avoid lifting the secondary safety valves, steam generator pressure must not exceed 1070 psia. (This corresponds to a saturation temperature of 552.85°F).

NOTE

Use atmospheric dump valves 2HV8419 and 2HV8421 if necessary to prevent lifting secondary safety valves.

2.6 An approach to inadequate core cooling may exist if one or more of the conditions specified in S023-3-2.31 ("Natural Circulation Guidelines") occur.

Verified By:
Initial/Date

3.0 INITIAL CONDITIONS

3.1 Natural circulation is established. _____/_____

NOTE

Where applicable, the parameter computer I.D. to be used for obtaining the required value is noted in parentheses at the end of the sentence.

3.2 Verify the following:

3.2.1 Reactor power is stable between 1% and 3% as read from the Keithley picoammeters. _____/_____

3.2.2 CEA Group 6 is at $\geq$ 60 inches withdrawn, (I.D. CRAVG6). _____/_____

NOTE

Steps 3.2.3 through 3.2.9 provide preferable conditions. Attachment 14 does provide additional flexibility. Record actual conditions in the spaces provided.

3.2.3 RCS T_{cold} is approximately 545°F (T111Y). _____ _____/_____

3.2.4 RCS pressure is ~2250 psia, (I.D. P100X) _____ _____/_____

3.2.5 Pressurizer level is steady at its automatic value (based on existing T_{avg}). _____ _____/_____

		Verified By: Initial/Date
3.2.6	Pressurizer level control is in automatic.	_____ / _____
3.2.7	Pressurizer pressure control is in automatic.	_____ / _____
3.2.8	The SG's are at ~69% level.	_____ / _____
3.2.9	SG Pressure is ~1000 psia, (I.D. P1013A and P1023A).	_____ / _____
3.2.10	All four PPS channels are in operation.	_____ / _____
3.3	The reactivity computer is available and operational.	_____ / _____
3.4	The plant computer is available and operational.	_____ / _____
3.5	The parameters listed in Attachment 11 are available at the Startup Computer.	_____ / _____

NOTES

1. No other testing which may interfere with this demonstration should be progress.
2. The SBCS should preferably remain in automatic. Any time it is not in automatic should be documented in the test log.

Verified By:
Initial/Date

4.0 PROCEDURE AND DATA COLLECTION

4.1 Initial Data Collection

4.1.1 Obtain an RCS sample (Hot Leg 1, S21212MU075) and record boron analysis results and boronometer readings below:

Analysis _____ppm

Baronameter _____ppm

_____/_____

NOTE

The procedure may continue after the RCS Sample is drawn, prior to completion of its analysis.

4.1.2 Start computer trend groups 1 & 2 of Attachment 9 on 60 second trends and trend groups 3 & 4 on 120 second trends.

_____/_____

4.1.3 Request a Power Ascension dedicated trend block as established by 2ST-344-17.

_____/_____

Verified By:
Initial/Date

4.2 Verification of Natural Circulation at Reduced Pressures.

CAUTIONS

1. IF ANY OF THE FOLLOWING CONDITIONS (TEST TERMINATION CONDITIONS OF ATTACHMENT 14) OCCUR DURING THE PERFORMANCE OF THIS ATTACHMENT, MANUALLY TRIP THE REACTOR AND START RCPs PER S023-3-1.7, ("RCP OPERATION"):

   a. $T_C < 500^{\circ}F$

   b. $T_H \geq 600^{\circ}F$

   c. Margin to saturation $\leq 20^{\circ}F$

2. IF, DURING THE PERFORMANCE OF THIS ATTACHMENT, T_C FALLS BELOW $510^{\circ}F$, ADJUST FEED FLOW AND/OR STEAM FLOW AS NECESSARY TO STOP THE COOLDOWN.

4.2.1 Increase the sampling frequency of the Startup Computer to a rate of one (1) scan per second.

_____/_____

4.2.2 Log the starting conditions below, and begin collecting data on Attachment 12 at approximately ten (10) minute intervals. Commence a plot of saturation margin and RCS pressure versus time (Attachment 12) through step 4.2.7.

Time: _____

T_{cold} (I.D. T111Y): _____ $^{\circ}F$

T_{hot} (I.D. T111X): _____ $^{\circ}F$

RCS Pressure (I.D. P100X): _____ psia

_____/_____

Verified By:
Initial/Date

NOTE

A slow cooling of the pressurizer will begin at this point accompanied by a corresponding decrease in the RCS pressure.

4.2.3 Initiate the transient by securing all pressurizer backup and proportional heater banks. _____/_____

CAUTIONS

1. REDUCED FLOW CONDITIONS INCREASE LOOP CYCLE TIMES FROM APPROXIMATELY 12 SECONDS TO 5-10 MINUTES; THEREFORE THE PLANT WILL RESPOND MUCH SLOWER TO PARAMETER CHANGES.

Verified By:
Initial/Date

CAUTION (Cont.)

2. DO NOT EXCEED A PRESSURIZER COOLDOWN RATE OF $200^{\circ}F$/hr.

3. MAINTAIN A RCS SUBCOOLED MARGIN $\geq 20^{\circ}F$

   If required adjust RCS charging or secondary steam flow.

4. MONITOR FOR VOID FORMATION. SYMPTOMS ARE:

   a. Pressurizer level increase significantly greater than expected while operating auxiliary spray.

   b. Pressurizer level decrease while operating charging.

   c. Letdown flow unexpectedly greater than charging flow if the pressurizer level control system is in automatic.

5. IF VOID FORMATION IS INDICATED, PERFORM THE FOLLOWING:

   a. Stop normal charging flow and/or auxiliary spray flow.

   b. Stop the RCS cooldown (if any) and maintain existing RCS temperature relatively constant.

Verified By:
Initial/Date

c. Energize pressurizer heaters.

d. Increase pressurizer pressure by at least 100 psia.

e. Wait one hour and then try to repeat the depressurization.

f. Record the actions in the test log and mark the cooldown plots to reflect the occurrences.

6. THE RCS PRESSURE DECREASE MAY RESULT IN ACTIVATION OF A PRETRIP AND/OR TRIP ON ANY OR ALL OF THE FOUR PPS CHANNELS FOR:

a. Low Pressurizer Pressure

b. Low Steam Generator Pressure

THESE MUST BE RESET ON ALL FOUR PPS CHANNELS PRIOR TO THE PRESSURE DROPPING TO WITHIN 50 PSIA OF THE PRETRIP SETPOINT. REPEAT THIS AS NECESSARY DURING THE PRESSURE DECREASE TO AVOID A REACTOR TRIP.

Verified By:
Initial/Date

4.2.4 Continue the pressure decrease until the Test Director feels sufficient data has been collected to determine the depressurization rate. (Anticipated to be about a 200 to 250 psia change.) Record ending data below. Continue collecting data on Attachment 12.

Time_____

T_{cold} (T111Y)_____ ^{o}F

T_{hot} (T111X)_____ ^{o}F

RCS Pressure (P100X)_____ psia _____/_____

NOTE

The RCS depressurization will be continued in the following steps to provide further data for subcooled margin verification. Auxiliary pressurizer spray may be used if desired to expedite the depressurization.

CAUTION

DO NOT ALLOW PRESSURE TO FALL BELOW APPROX. 1750 PSIA

Verified By:
Initial/Date

4.2.5 Continue the depressurization using auxiliary pressurizer spray if desired. Continue data collection per Attachment 12, and record any usage of auxiliary spray on Attachment 13. _____/_____

NOTE

Maintain subcooled margin above 20°F, and pressure above 1750 psia during the depressurization. Adjust charging/ letdown and/or secondary steam flow as required.

4.2.6 Continue the depressurization until one of the following is achieved:

a) RCS pressure of approximately 1750 psia _____/_____

b) The Test Director and Watch Engineer decide that sufficient training on Natural Circulation at reduced pressure has occurred

NOTE

As pressure is increased in the next step, verify that the trip setpoints for:

a. Low Pressurizer Pressure

b. Low SG Pressure

are tracking up to their maximum value during system restoration to normal operating pressure.

Verified By:
Initial/Date

4.2.7 Selectively energize the pressurizer backup heaters to increase the RCS pressure to ~2250 psia, the RCS temperature to ~545°F, and increase the saturation margin to above 50°F. _____/_____

4.2.8 This step intentionally left blank.

4.2.9 With the RCS pressure restored to ~2250 psia verify the system to be in natural circulation per SO23-3-2.31. Stabilize conditions and remain in natural circulation for approximately fifteen (15) minutes. _____/_____

4.2.10 When the RCS has been returned to stable natural circulation conditions for at least fifteen (15) minutes the Test Director, following consultation with the Watch Engineer, may choose to repeat this demonstration, to continue the demonstration per Attachment 3 ("Demonstration of Natural Circulation with Reduced Heat Removal Capacity"), or to terminate this demonstration per Attachment 4 ("Demonstration Termination"). Record below the next attachment to be performed.

Attachment_____ _____/_____

ATTACHMENT 3

DEMONSTRATION OF NATURAL CIRCULATION WITH
REDUCED HEAT REMOVAL CAPACITY

1.0 OBJECTIVES

1.1 To demonstrate the capability to maintain natural circulation with one steam generator isolated.

1.2 To demonstrate that natural circulation can be reestablished in the isolated steam generator when this is returned to service.

2.0 LIMITS AND PRECAUTIONS

2.1 The equipment or systems to be in service to support the performance of this demonstration shall be operated in accordance with appropriate Station Operating Instructions except where deviations are required by section 4.0 of this Attachment or by existing plant conditions.

2.2 Normal pressurizer spray will be unavailable without RCP flow. If RCS pressure cannot be adequately controlled, manually trip the reactor and restart the RCP's per S023-3-1.7. This will terminate the demonstration.

2.3 To avoid lifting the secondary safety valves, steam generator pressure must not exceed 1070 psia. (This corresponds to a saturated temperature of 552.85°F).

NOTE

Use atmospheric dump valves 2HV8419 and 2HV8421 if necessary to prevent lifting secondary safety valves.

2.4 An approach to inadequate core cooling may exist if one or more of the conditions specified in S023-3-2.31 ("Natural Circulation Guidelines") occur.

2.5 Do not exceed approximately 1% nuclear power as determined by Attachment 10 while the demonstration is in progress (except during short transients).

2.6 Do not exceed the limits of Attachment 14.

3.0 INITIAL CONDITIONS

NOTE

Where applicable, the parameter computer I.D. to be used for obtaining the required value is noted in parenthesis at the end of the sentence:

ATTACHMENT 3

DEMONSTRATION OF NATURAL CIRCULATION WITH
REDUCED HEAT REMOVAL CAPACITY

Verified By:
Initial/Date

3.1 The plant is in Natural Circulation. ____/____

3.2 Verify the following:

3.2.1 Reactor power is stable at $\leq$ 1% as read from the Keithley picoammeters. ____/____

3.2.2 CEA Group 6 is at $\geq$ 60 inches withdrawn (I.D. CRAVG6). ____/____

3.2.3 RCS T_{cold} is approximately 518°F (I.D. T111Y). ____/____

3.2.4 RCS pressure is ~2250 psia (I.D. P100X). ____/____

3.2.5 Pressurizer level is steady at its automatic value. ____/____

3.2.6 Pressurizer level control is in automatic. ____/____

3.2.7 Pressurizer pressure control is in automatic. ____/____

3.2.8 The SG's are at ~69%. ____/____

3.2.9 SG pressure is $\leq$ 800 psia (I.D.P. 1013A and P1023A). ____/____

		Verified By: Initial/Date
3.2.10	All four PPS channels are in operation.	____/____
3.2.11	The SG2 > SG1 Pressure trip has been bypassed.	____/____
3.2.12	At least one (1) charging pump is in operation and the remaining are in standby.	____/____
3.3	The reactivity computer is available and operational.	____/____
3.4	The plant computer is available and operational.	____/____
3.5	The parameters listed in Attachment 11 are available at the startup computer.	____/____
3.6	This step left blank intentionally.	____/____
3.7	SG blowdown has been secured.	____/____
3.8	No other testing which may interfere with this demonstration is in progress	____/____

Verified By:
Initial/Date

4.0 PROCEDURE AND DATA COLLECTION

4.1 Initial Data Collection

4.1.1 Obtain an RCS sample (Hot Leg 1, S21212MU075) and record boron analysis results and boronometer readings below:

Analysis _____ ppm

Boronometer _____ ppm

_____/_____

NOTE

The procedure may continue after the RCS sample is drawn, prior to completion of its analysis.

4.1.2 Start the trend groups 1 & 2 of Attachment 9 on 60 second trends and groups 3 & 4 on 120 second trends.

_____/_____

4.1.3 Request a Power Ascension dedicated trend block.

_____/_____

4.2 Demonstration of Natural Circulation with one Steam Generator isolated.

CAUTIONS

1. IF ANY OF THE FOLLOWING CONDITIONS (OR THE TEST TERMINATION CRITERIA OF ATTACHMENT 14) OCCUR DURING PERFORMANCE OF THIS ATTACHMENT, MANUALLY TRIP THE REACTOR AND START THE RCP's PER SO23-3-1.7 ("RCP Operation"):

   a. $T_C < 500^{\circ}F$

   b. $T_H \geq 600^{\circ}F$

   c. MARGIN TO SATURATION $\leq 20^{\circ}F$

Verified By:
Initial/Date

CAUTIONS (Cont'd)

2. IF DURING THE PERFORMANCE OF THIS ATTACHMENT T_c FALLS BELOW 510 °F, ADJUST FEED FLOW AND/OR STEAM FLOW AS NECESSARY TO STOP THE COOLDOWN.

3. DO NOT START ANY RCP'S IF A SIGNIFICANT PRESSURE OR TEMPERATURE DIFFERENCE EXISTS BETWEEN THE TWO STEAM GENERATORS.

4.2.1 Approximately two (2) minutes prior to isolating the SG initiate Startup Computer sampling at a rate of one (1) scan per second. _____/_____

4.2.2 Approximately twenty (20) seconds prior to isolating the steam generator increase the sampling frequency of the Startup Computer to a rate of ten (10) scans per second. _____/_____

CAUTION

REDUCED FLOW CONDITIONS INCREASE LOOP CYCLE TIMES FROM APPROXIMATELY 12 SECONDS TO 5-10 MINUTES: THEREFORE, THE PLANT WILL RESPOND MUCH SLOWER TO PARAMETER CHANGES.

4.2.3 Initiate the transient by closing MSIV 2HV8205 to isolate Steam Generator 2 (2E088). Also, close 2HV-8201 (steam to aux. feed, pump) if open. _____/_____

Verified By:
Initial/Date

NOTE

Use atmospheric dump valves 2HV8419 and 2HV8421 to prevent lifting secondary safety valves, if necessary.

4.2.4 Isolate the feedwater to Steam Generator 2. Adjust feed to Steam Generator 1 to maintain level at approximately 69%. _____/_____

NOTE

Slight reductions in water level are to be expected due to condensation and drainage in the main steam lines.

4.2.5 Remain on natural circulation with the Steam Generator isolated until conditions stabilize. _____/_____

4.2.6 Reduce the pressure of Steam Generator 2 (E088) to steam header pressure using the atmospheric dump valves. _____/_____

NOTE

Prior to restoring feedwater to Steam Generator 2, both steam generator pressures should be approximately equal.

4.2.7 Restore feedwater to Steam Generator 2 and maintain feedwater level at approximately 69%. _____/_____

4.2.8 Open loop 2 MSIV bypass valve 2HV8203 to allow pressure equalization. _____/_____

4.2.9 Open MSIV 2HV8205.(and 2HV-8201 if desired). _____/_____

NOTE

Blowdown may be re-established at this time.

4.2.10 Allow conditions to stabilize, then verify that natural circulation is occuring in both Steam Generator loops per SO23-3-2.31. _____/_____

Verified By:
Initial/Date

4.2.11 When the RCS has been returned to stable natural circulation conditions for at least fifteen (15) minutes the Test Director, following consultation with the Watch Engineer, may choose to repeat this demonstration, to continue the demonstration per Attachment 2 ("Demonstration of Natural Circulation at Reduced Pressure"), or to terminate this demonstration per Attachment 4 ("Demonstration Termination"). Record next Attachment to be performed:

Attachment _____

_____/_____

ATTACHMENT 4

DEMONSTRATION TERMINATION

Verified By:
Initial/Date

1.0 PROCEDURE

1.1 Manually trip the reactor. _____/_____

1.2 Start the RCP's per S023-3-1.7 ("RCP Operation"). _____/_____

1.3 Return the High Log Power Trip setpoint for each PPS channel to the Tech Spec required value per S023-II-9.258.

1.3.1 Channel A _____/_____

1.3.2 Channel B _____/_____

1.3.3 Channel C _____/_____

1.3.4 Channel D _____/_____

NOTE

If all Natural Circulation Demonstrations have been completed proceed to section 9.0 of the main procedure otherwise proceed with the following steps.

1.4 Take the reactor critical per S023-3-1.2 ("Reactor Startup").

_____/_____

1.5 Raise the High Log Power trips setpoint to 100% on all four PPS Channels per S023-II-9.258

Channel A _____/_____

Channel B _____/_____

Channel C _____/_____

Channel D _____/_____

Verified By:
Initial/Date

1.6 Remove the CPC's from bypass per S023-3-2.13.

Channel A _____/_____

Channel B _____/_____

Channel C _____/_____

Channel D _____/_____

1.7 Increase reactor power to ~3%. The requirements of Attachment 8 ("Special procedure for initial power increase") shall be adhered to during the increase.

_____/_____

1.8 Maintain steam generator pressure of ~1000 psia by operation of the SBCS in accordance with S023-3-2.18 ("Steam bypass system operation"), with T_c at ~545°F.

_____/_____

1.9 Stabilize plant conditions. Maintain power by means of RCS boration/dilution.

_____/_____

1.10 Place the CPC's in bypass per S023-3-2.13.

1.10.1 Channel A _____/_____

1.10.2 Channel B _____/_____

1.10.3 Channel C _____/_____

1.10.4 Channel D _____/_____

ATTACHMENT 5

10^{-4}% BISTABLE ADJUSTMENT FROM 5% TO 10%

1.0 PURPOSE

1.1 The purpose of this attachment is to adjust the setpoint of the 10^{-4}% bistable to 10% to prevent the generation of CPC related trip signals during the performance of the Low Power Natural Circulation Testing. All operations are performed on one channel at a time.

2.0 REFERENCES

2.1 Ex-core Neutron Flux Monitoring System Technical Manual

3.0 SPECIAL TEST EQUIPMENT

3.1 Digital Voltmeter, Hewlett-Packard 3460B or equivalent.

4.0 PROCEDURE

	CHANNEL A	CHANNEL B	CHANNEL C	CHANNEL D
4.1 On the Bistable Control Panel (2L-32) place the following trips in the "Trip Bypass" state for the Safety Channel to be adjusted.				
4.1.1 Low DNBR	___/___	___/___	___/___	___/___
4.1.2 Hi Local Power Density (LPD)	___/___	___/___	___/___	___/___

ATTACHMENT 5

10^{-4}% BISTABLE ADJUSTMENT FROM 5% TO 10%

		CHANNEL A	CHANNEL B	CHANNEL C	CHANNEL D
4.1.3	Hi LN Power	___/___	___/___	___/___	___/___
4.1.4	Hi Log Power	___/___	___/___	___/___	___/___
4.2	Connect the DVM between test points A4-TP3 and A4-TP1 (common) in the Safety Channel Drawer to be adjusted.	___/___	___/___	___/___	___/___
4.3	Press the 10^{-4}% lamp to extinguish, adjusting A16-R55, if necessary.	___/___	___/___	___/___	___/___
4.4	Adjust Log Trip Test switch for a DVM reading of + 8.699 vdc.	___/___	___/___	___/___	___/___
4.5	Adjust A-16-R55 to illuminate the 10^{-4}% lamp.	___/___	___/___	___/___	___/___
4.6	Place the Log Trip Test switch in the OFF position.	___/___	___/___	___/___	___/___
4.7	Reset the 10^{-4}% lamp.	___/___	___/___	___/___	___/___
4.8	Verify the 10^{-4}% bistable setpoint as follows:				
4.8.1	Adjust the Log Trip Test switch slowly until the 10^{-4}% lamp energizes.	___/___	___/___	___/___	___/___
4.8.2	Record the DVM reading:				

CHA _____vdc CHB_____vdc CHC_____vdc CHD_____vdc

Tolerance = +8.699 $\pm$ 0.025 vdc. ___/___ ___/___ ___/___ ___/___

ATTACHMENT 5

10^{-4}% BISTABLE ADJUSTMENT FROM 5% TO 10%

	CHANNEL A	CHANNEL B	CHANNEL C	CHANNEL D
4.8.3 Verify that DVM reading is within the tolerance specified.	/	/	/	/
4.9 Repeat steps 4.3 thru 4.8.3 as necessary until the DVM readings are within the required tolerance.	/	/	/	/
4.10 Place the Log Trip Test switch in the OFF position.	/	/	/	/
4.11 Remove the DVM connected in step 4.2.	/	/	/	/
4.12 Remove the following Trip Bypasses:				
4.12.1 Low DNBR	/	/	/	/
4.12.2 Hi Local Power	/	/	/	/
4.12.3 Hi LN Power	/	/	/	/
4.12.4 Hi Log Power	/	/	/	/

4.13 Perform steps 4.1 thru 4.12 for the remaining safety channels.

ATTACHMENT 6

10^{-4}% BISTABLE ADJUSTMENT FROM 10% TO 10^{-4}%

A. PURPOSE

To return the setpoint of the 10^{-4}% bistable from 5% to 10^{-4}%. All operations are performed on one channel at a time.

B. REFERENCES

Excore Neutron Flux Monitoring System Technical Manual.

C. SPECIAL TEST EQUIPMENT

Digital multimeter FLUKE 8600A or equivalent.

D. PROCEDURE	Verified By Initial/Date Channel A	Channel B	Channel C	Channel D
1. On the Bistable Control Panel place the following trips in the "Trip Bypass" state for the Safety Channel to be adjusted.				
1.4.1.1 Low DNBR (Bistable #4)	/	/	/	/
1.4.1.2 Hi Local Power (Bistable #3).	/	/	/	/
1.4.1.3 Hi LN Power (Bistable #1)	/	/	/	/
1.4.1.4 Hi Log Power (Bistable #2)	/	/	/	/
2. Connect the DVM between testpoints A4-TP3 and A4-TP1 (common) in the Safety Channel Drawer to be adjusted.	/	/	/	/
3. Press the 10^{-4}% lamp to extinguish, adjusting A16-R55 if necessary.	/	/	/	/

ATTACHMENT 6

10^{-4}% BISTABLE ADJUSTMENT FROM 10% TO 10^{-4}%

	Channel A	Channel B	Channel C	Channel D
4. Adjust LOG TRIP TEST switch for a DVM reading of +3.699 vdc.	/	/	/	/
5. Adjust A16-R55 to illuminate the 10^{-4}% lamp.	/	/	/	/
6. Place the LOG TRIP TEST switch in the OFF position.	/	/	/	/
7. Reset the 10^{-4}% lamp.	/	/	/	/
8. Verify the 10^{-4}% bistable setpoint as follows:				
8.1 Adjust the LOG TRIP TEST switch slowly until the 10^{-4}% lamp energizes.	/	/	/	/
8.2 Record the DVM reading:				
CHA vdc / CHB vdc / CHC vdc / CHD vdc	/	/	/	/
Tolarance = +3.699 $\pm$ 0.025 vdc				
8.3 Verify that DVM reading is within the tolerance specified. Repeat steps 3 thru 8.2 as necessary until the DVM readings are within the required tolerance.	/	/	/	/
9. Place the LOG TRIP TEST switch in the OFF position.	/	/	/	/
10. Remove the DVM connected in Step 2.	/	/	/	/

ATTACHMENT 6

10^{-4}% BISTABLE ADJUSTMENT FROM 10% TO 10^{-4}%

	Channel A	Channel B	Channel C	Channel D
11. Remove the following Trip Bypasses:				
11.1 Low DNBR (Bistable #4)	___/___	___/___	___/___	___/___
11.2 Hi Local Power (Bistable #3)	___/___	___/___	___/___	___/___
11.3 Hi LN Power (Bistable #2)	___/___	___/___	___/___	___/___
11.4 Hi Log Power (Bistable #2)	___/___	___/___	___/___	___/___
12. Perform steps 1 thru 11 for the remaining safety channels.	___/___	___/___	___/___	___/___

ATTACHMENT 7

OPERATOR ATTENDANCE RECORD

This attachment records operator participation during Natural Circulation demonstrations. All operators who participate, either on shift or as observers, are required to sign in on the Attendance Record (Table 1) and indicate which of the following demonstrations they participated in:

Attachment 1: Natural Circulation Verification

Attachment 2: Verification of Natural Circulation at Reduced Pressures

Attachment 3: Verification of Natural Circulation with Reduced Heat Removal Capacity.

In addition Table 2 (Absentee Record) is to be completed by the Watch Engineer to indicate any operator absentees during that particular shift. The operators listed in this table will receive make-up training at a later date.

Table 1
Attendance Record
Sheet __ of __

Operator Name (Printed)	Demonstrations Participated In				Participation		Shift	Date	Initial
	Att. 1	Att. 2	Att. 3	Att. 4	On Shift	As Observer			

ATTACHMENT 7
OPERATOR ATTENDANCE RECORD

Table 2
Absentee Record
Sheet __ of __

Operator Name (Printed)	Noted By (W.E. Name) (and Init.)	Shift	Date	Received Make-Up Training							
				Shift	Date	Att. 1	Att. 2	Att. 3	Att. 4	Other	Operator Initials

ATTACHMENT 8

SPECIAL PROCEDURE FOR INITIAL POWER INCREASE

1.0 General Comments

1.1 Motion of the CEAs should at all times be smooth using small frequent steps. This is particularly true if the motions are performed at a power level that has not previously been exceeded for three(3) hours in the last 60 days or involves CEA withdrawal.

1.2 The most sensitive CEA motions involve movement of assymmetric CEAs since this can cause large power peaks. Introduction of large peaks in previously unpeaked regions will cause those regions to undergo rapid power changes, possibly to power levels not previously experienced in that region.

1.3 Power changes associated with CEA motion can be extremely large over short time spans; therefore, is is prudent to make these changes as smoothly and slowly as is consistent with the test and/or operating objectives.

1.4 Reductions in power may be effected as rapidly as necessary by either CEA insertion or boration as long as they are performed in a manner which maintains a symmetric power distribution. This assumes that no region of the core will see a regional rise in its power level.

1.5 During power decreases the power will shift toward the top of the core.

ATTACHMENT 9

COMPUTER TREND PARAMETERS

Trend Group No.	Parameter	Computer I.D.
1	Loop 1 Hot Leg Temperature	T111X
	Loop 2 Hot Leg Temperature	T121X
	Loop 1A Cold Leg Temperature	T111Y
	Loop 2B Cold Leg Temperature	T121Y
	Loop 1B Cold Leg Temperature	T115-1
	Loop 2A Cold Leg Temperature	T125-1
	Pressurizer Pressure	P100X
	Pressurizer Pressure	P102A
	Pressurizer Level	L110X
	Regen. Heat Exchanger Charging Line Temp.	T229
	RRS #1 TAVG	TAVG1
	CEA Group 6 Position	CRAVG6
2	Steam Generator 1 Pressure	P1013A
	Steam Generator 1 Level	L1111
	Steam Generator 2 Pressure	P1023A
	Steam Generator 2 Level	L1121
	Charging Flow	F212
	Letdown Flow	F202
	Volume Control Tank Level	L226
	Volume Control Tank Pressure	P225
	RCP 1A Differential Pressure	PD110
	RCP 2A Differential Pressure	PD120
	RCP 1B Differential Pressure	PD112
	RCP 2B Differential Pressure	PD122

ATTACHMENT 9

COMPUTER TREND PARAMETERS

Trend Group No.	Parameter	Computer I.D.
3	Incore Thermocouple L-2	TRL02
	" " L-4	TRL04
	" " C-9	TRC09
	" " L-9	TRL09
	" " L-13	TRL13
	" " C-13	TRC13
	" " L-18	TRL18
	" " L-20	TRL20
	" " C-4	TRC04
	" " C-18	TRC18
	" " G-6	TRG06
	" " E-6	TRE06
4	Incore Thermocouple E-16	TRE16
	" " G-16	TRG16
	" " G-9	TRG09
	" " R-6	TRR06
	" " R-16	TRR16
	" " R-13	TRR13
	" " W-9	TRW09
	" " T-6	TRT06
	" " T-16	TRT16
	" " W-13	TRW13
	" " W-4	TRW04
	" " W-18	TRW18

ATTACHMENT 10

BASE POWER LEVEL DETERMINATION

1. Record the required data on page 2 of this attachment as directed by the main procedure.

_____/_____

2. Using the data on page 2 of this attachment determine what the Keithley picoammeters would read at 5% power. Record these values below along with the source for the "REFERENCE" power.

"REFERENCE" power source_____

Keithley-left _____amps

Keithley-right_____amps

_____/_____

3. Using the above results lable the strip chart recorder displaying Keithley output to indicate 5% power.

_____/_____

ATTACHMENT 10

BASE POWER LEVEL DETERMINATION

PARAMETER		MAIN PROCEDURE STEP NO. 8.2.7.4	8.2.11.3
Log Power	2JI-0001-1		
	2JI-0001-2		
	2JI-0001-3		
	2JI-0001-4		
CPC Power (ID 177)	A		
	B		
	C		
	D		
CPC Power (ID 171	A		
	B		
	C		
	D		
Keithley Picoammeters	Left		
	Right		
From ST-344-08	POWER		
From ST-344-19	POWER		

ATTACHMENT 11

STARTUP COMPUTER ASSIGNMENTS

Input to the startup computer for Reactor Coolant Pump speed will be taken from the input to the RCPSSS (Reactor Colant Pump Shaft Speed Sensor System) signal processors. This will require four temporary cables which extend from cabinet 2L151 to the SCE Startup Computer.

The cables should be connected to pulse shaper module "input signal" connectors located on the front panels of the modules. Assignments are:

RCP 1A - S154

_____ / _____
INITIAL DATE

RCP 1B - S164

_____ / _____
INITIAL DATE

RCP 2A - S174

_____ / _____
INITIAL DATE

RCP 2B - S184

_____ / _____
INITIAL DATE

The other end of the cables should be connected to the inputs of the frequency/voltage converters for input to the startup computer.

NOTE

The Test Director is not limited to recording data for only those parameters listed in the following table. At his discretion other parameters may be included in the data collection. These must then be properly identified and documented, and an entry made in the log.

ATTACHMENT 11
STARTUP COMPUTER ASSIGNMENTS

Point No.	Parameter	Input Signal			Terminal Locations			Verified By: Initial/Date
		Computer ID	Range (Units)	Range (Volts)	T Board	Pos	Neg	
1	SG No. 1 Pressure	P1013A	0-1200 psia	0-10V	2L80 (4-1-3)	13	14	/
2	SG No. 2 Pressure	P1023A	0-1200 psia	0-10V	2L80 (4-1-3)	16	17	/
3	SG No. 1 Level	L1111	0-100%	0.2-1V	2L80 (4-2-5)	85	86	/
4	SG No. 2 Level	L1121	0-100%	0.2-1V	2L80 (4-2-5)	88	89	/
5	Loop 1 T_{hot}	T112HA	525-675^{o}F	0-10V	2L80 (4-1-5)	61	62	/
6	Loop 2 T_{hot}	T122HA	525-675^{o}F	0-10V	2L80 (4-1-5)	70	71	/
7	Loop 1A T_{cold}	T112CA	465-615^{o}F	0-10V	2L80 (4-1-5)	58	59	/
8	Loop 2B T_{cold}	T122CB	465-615^{o}F	0-10V	2L80 (4-2-2)	58	59	/
9	Pzr. Pressure	P100X	1500-2500 psia	0-10V	2L80 (4-1-2)	46	47	/
10	Pzr. Level	L110X	0-100%	0-10V	2L80 (4-1-5)	40	41	/
11	Loop 1B T_{cold}	T112CB	465-615^{o}F	0-10V	2L80 (4-2-2)	49	50	/
12	Loop 2A T_{cold}	T122CA	465-615^{o}F	0-10V	2L80 (4-1-5)	67	68	/

Point No.	Parameter	Input Signal			Terminal Locations			Verified By: Initial/Date
		Computer ID	Range (Units)	Range (Volts)	T Board	Pos	Neg	
13	RCP 1A Breaker Status	YS9160A	Contact	0-48V	2L80(4-2-3)	79	80	/
14	RCP 1B Breaker Status	YS9161A	Contact	0-48V	2L80(4-2-3)	82	83	/
15	RCP 2A Breaker Status	YS9162A	Contact	0-48V	2L80(4-2-3)	85	86	/
16	RCP 2B Breaker Status	YS9163A	Contact	0-48V	2L80(4-2-3)	88	89	/
17	Steam Header 1 Press	PT8241	850/1050 psia	4-20 mA	2L81 (5-1-6)	16	17	/
18	Steam Header 2 Press	PT8239	850/1050 psia	4-20 mA	2L81 (5-1-6)	13	14	/
19	Charging Flow	F212	0-150 gpm	0-10V	2L80 (4-1-6)	79	80	/
20	Letdown Flow	F202	0-150 gpm	0-10V	2L80 (4-1-5)	82	83	/
21	RCP 1A Speed	(Note 1)	0-1200 rpm	0-880 Hz	(Note 2)			/
22	RCP 1B Speed	(Note 1)	0-1200 rpm	0-880 Hz	(Note 2)			/
23	RCP 2A Speed	(Note 1)	0-1200 rpm	0-880 Hz	(Note 2)			/
24	RCP 2B Speed	(Note 1)	0-1200 rpm	0-880 Hz	(Note 2)			/
25	RCP 1A ΔP	PDl10	0-150 psid	0-10V	2L80 (4-1-2)	37	38	/
26	RCP 1B ΔP	PD112	0-150 psid	0-10V	2L80 (4-2-2)	25	26	/
27	RCP 2A ΔP	PD120	0-150 psid	0-10V	2L80 (4-1-2)	40	41	/
28	RCP 2B ΔP	PD122	0-150 psid	0-10V	2L80 (4-2-2)	28	29	/
29	Pzr Pressure	P102A	0-3000 psia	0-10V	2L80 (4-2-2)	34	35	/
30	Pzr Pressure	P104	100-750 psia	0-10V	2L80 (4-2-5)	31	32	/
31	Aux. Feed Flow to SG1	N/A	0-800 gpm	0-10V	2CR52/SDM62	+	-	/
32	Aux. Feed Flow to SG2	N/A	0-800 gpm	0-10V	2CR52/SDM64	+	-	/
33	SG 088 ΔP	N/A	0-70 psid	0-10V	2CR56A/SDM	7+	7-	/
34	SG 089 ΔP	N/A	0-70 psid	0-10V	2CR56A/SDM	8+	8-	/
35	SG 088 Level (WR)	LT1125-1	0-100%	0-10V	2L80 (4-1-6)	73	74	/
36	SG 089 Level (WR)	LT1115-1	0-100%	0-10V	2L80 (4-1-5)	73	74	/

NOTES:

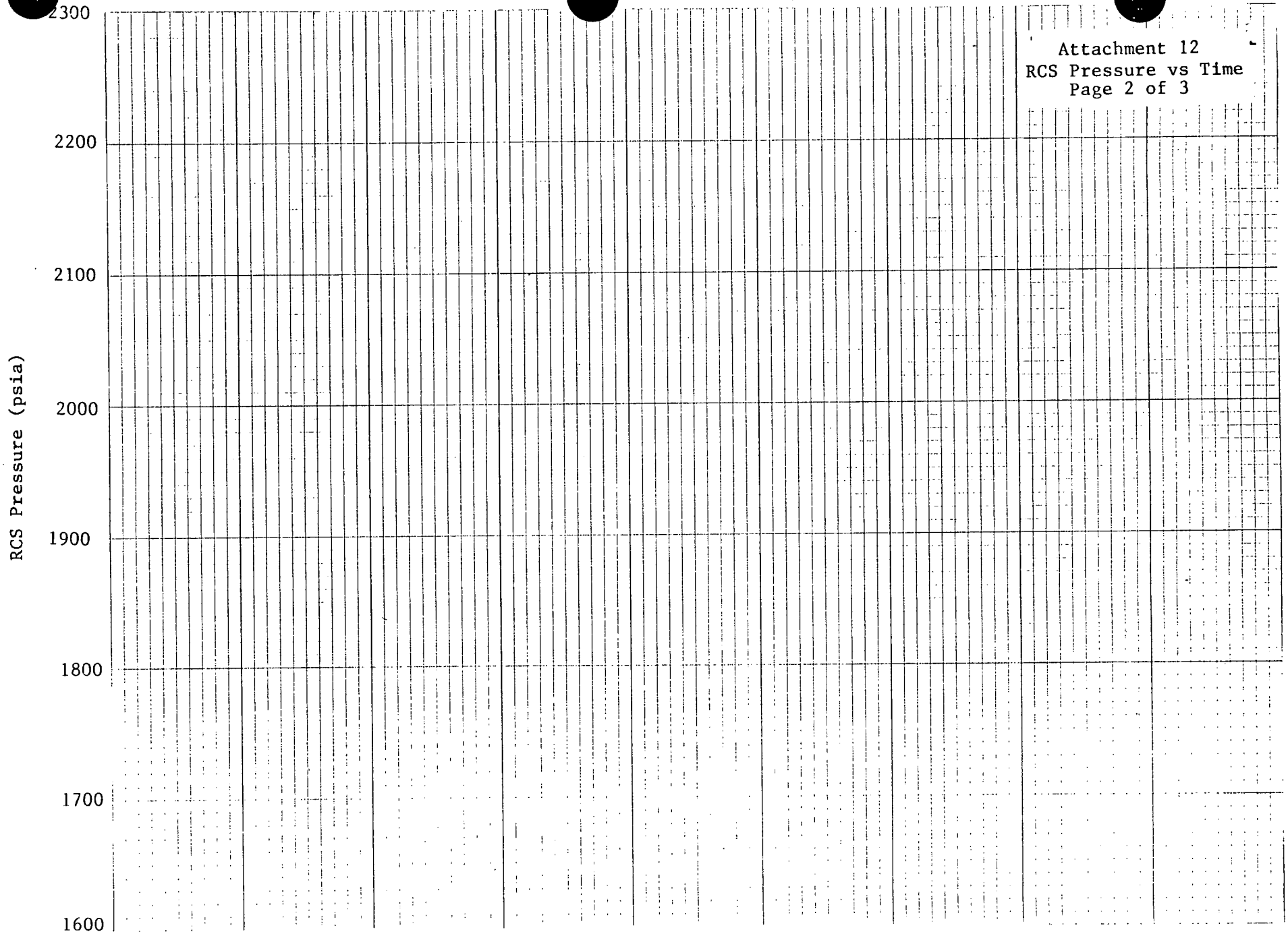
1) From pulse shaper modules through frequency-voltage converters
2) See page 1 of this attachment

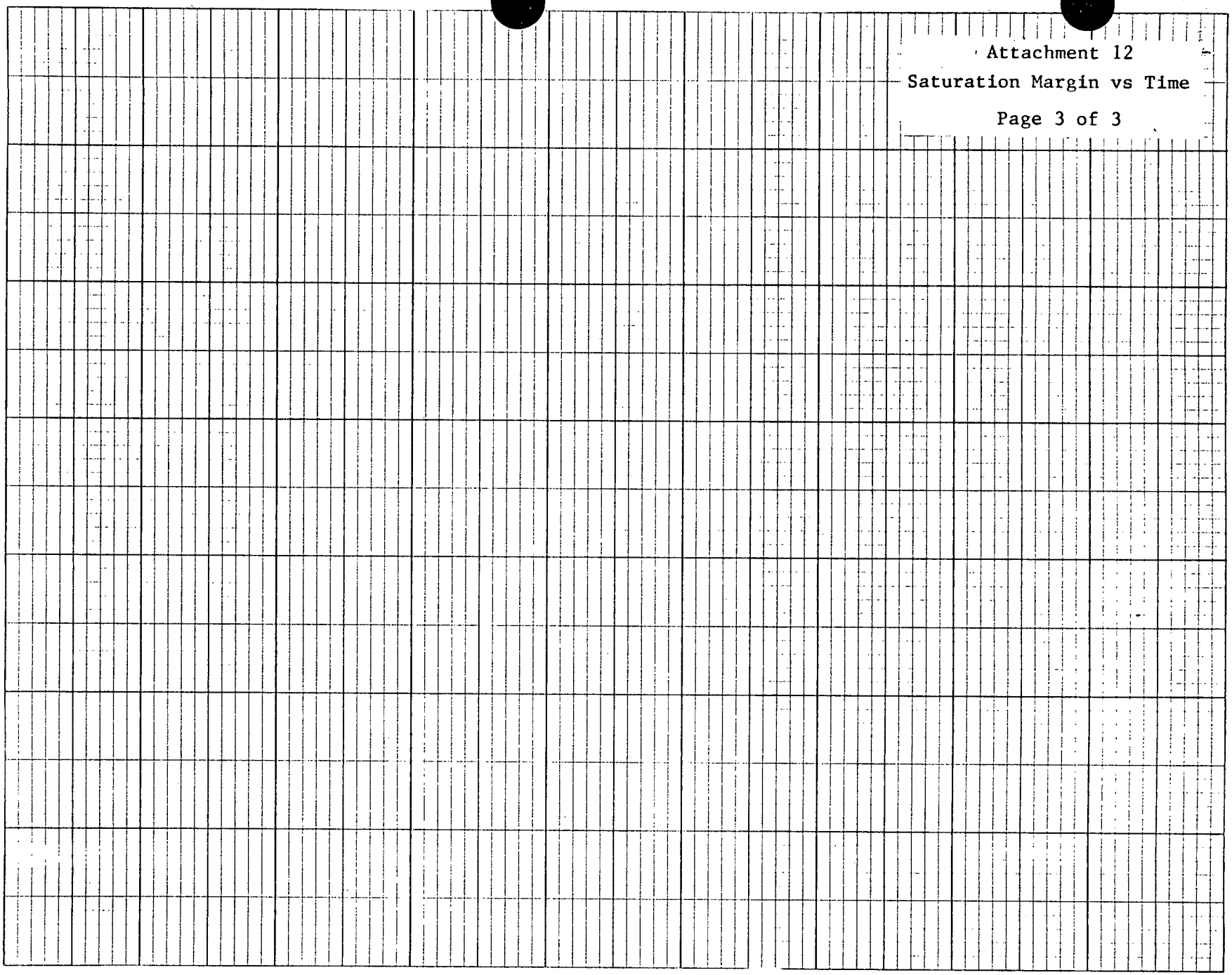
ATTACHMENT 12
DEPRESSURIZATION DATA RECORD
Page 1 of 3

Sheet _____ of _____

Time	T_{hot} TI-0911X1	T_{hot} TI-0921X2	Core Exit TC (1)	Pzr Pressure (2)	Margin to Saturation (3)	Subcooled Margin Monitor A	Subcooled Margin Monitor B	Initial/Date
								____/____
								____/____
								____/____
								____/____
								____/____
								____/____
								____/____
								____/____
								____/____
								____/____
								____/____

(1) Highest reliable value taken from the Trend Blaks 3 and 4.
(2) Lowest reading of P102A, P102B, P102C, P102D from plant computer.
(3) Calculate using pressurizer pressure and highest of T_{hot} and core exit TC.


Attachment 12
RCS Pressure vs Time
Page 2 of 3
2300
2200
2100
2000
1900
1800
1700
1600
RCS Pressure (psia)
Time


Attachment 12
Saturation Margin vs Time
Page 3 of 3
Saturation Margin (°F)
Time

ATTACHMENT 13

AUXILIARY SPRAY LOG

Sheet ___ of ___

Date	Time On	Time Off	Date	Time On	Time Off

ATTACHMENT 14

OPERATIONAL SAFETY CRITERIA
AND GUIDELINES

Page 1 of

The information contained in this Attachment was taken from Reference 3.6.

A. Required Test Conditions

The following conditions must be satisfied for the indicated demonstrations.

1. For Attachments 1, 2, and 3:

a.	CEA Group 6	$\geq$ 60" withdrawn
b.	All other CEA's	At UEL (upper electrical limit)
c.	Use of the CEDM control system in Auto Sequential or Manual Individual mode is prohibited following RCP trip and establishment of natural circulation.	- -
d.	The CEDM control system must be maintained in the "OFF" mode except as required to position Group 6 using manual group mode following establishment of natural circulation.	- -
e.	Do not start an RCP when in natural circulation without first manually tripping the reactor.	- -

2. Additonal Conditions for Attachment 2:

a.	Maximum pressurizer cooldown rate.	$\leq 200^{\circ}F/hr$
b.	Monitor for RCS void formation.	- -

3. Additional Conditions for Attachment 3:

a.	Initial steady-state power level prior to SG isolation.	$\leq$ 1%
b.	Initial steady-state SG pressure prior to SG isolation.	$\leq$ 800 psia

B. Test Termination Criteria

The operator shall trip the reactor and terminate testing if any of the following conditions occur during the demonstrations.

1. For Attachments 1, 2, and 3:

a.	RCS Subcooled margin	$\leq 20^{\circ}F$
b.	Any loop ΔT	$\geq 58^{\circ}F$
c.	Tavg	$\geq 578^{\circ}F$
d.	T_{hot} (highest reading)	$\geq 600^{\circ}F$
e.	T_{cold}	$\leq 500^{\circ}F$
f.	Reactor Power	$\geq$ 5%
g.	Sustained reactor startup rate	$\geq$ 1.5 DPM
h.	RCS pressure	$\leq$ 1750 psia
i.	Any uncontrolled CEA motion (including a dropped CEA)	- -
j.	Inability to adequately control RCS pressure.	- -

C. Operational Guidelines

Attachments 1, 2, and 3 provide guidance for contolling plant parameters within suggested ranges. As the demonstrations progress it may be desirable and more practical to vary parameter values. Operating within the bounds of sections A and B above will satisfy safety analysis requirements. The following parameter bands are however slightly more restrictive and serve as points at which control action should be taken.

1. For Attachments 1, 2, and 3:

a.	T_{cold}	$\geq 510^{o}F$
b.	Minimum power	$\geq$ 0.5%
c.	SG Water Level	$\geq$ 60%
d.	Pressurizer water level	$\geq$ value when RCP's are tripped
e.	Sustained reactor startup rate	$\leq$ 1 DPM
f.	SG Pressure	$\leq$ 1070 psia
g.	Maintain SG levels as steady as possible.	- -