

501-7-001
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FARLEY NUCLEAR PLANT
UNIT 2
PHASE III TEST PROCEDURE
501-7-001

DRAFT

COOLDOWN CAPABILITY OF THE CHARGING
AND LETDOWN SYSTEM

Approved:

DRAFT

Plant Manager

Date Issued: _____

Diskette No. 4

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COOLDOWN CAPABILITY OF THE CHARGING
AND LETDOWN SYSTEM

1.0 Purpose

This procedure contains the information necessary to verify plant performance capabilities and provide operator experience and training in the following condition:

- 1.1 Determination of the COOLDOWN CAPABILITY OF THE CHARGING AND LETDOWN SYSTEM with all three S/G's isolated and one RCP in operation.

2.0 Initial Conditions

- 2.1 T_{ave} is approximately 535°F. The Steam Dump is operating (or available) to maintain T_{ave} in the Steam Pressure Mode.
- 2.2 Pressurizer pressure is being maintained at approximately 2235 psig by automatic operation of the Pressurizer Pressure Control System.
- 2.3 Pressurizer level is being maintained at approximately 22% by automatic operation of the Pressurizer Level Control System.
- 2.4 The S/G's are being maintained at approximately 33%. The Main Feedwater or AFW System is operating (or available) to maintain S/G levels.
- 2.5 2B RCP is running.
- 2.6 The CVCS is in a normal at-power lineup.
- 2.7 Excess letdown is available for operation.
- 2.8 Both shutdown banks are fully withdrawn.
- 2.9 RCS Boron concentration is high enough to provide sufficient Shutdown Margin at 450°F.

- 2.10 The Core Subcooling Monitor is operable.
- 2.11 Temporary instrumentation has been installed as required by Appendix A of this procedure.
- 2.12 The computer trend printer is set up to monitor the parameters specified in Appendix B of this procedure.
- 2.13 All test equipment to be used during the performance of this procedure is operational and in calibration, as verified on the Test Equipment Record, Data Sheet 1 of this procedure.
- 2.14 The Shift Supervisor has been notified of the impending performance of this procedure.
- 2.15 S/G chemistry is in a condition such that blowdown may be isolated for the duration of the test.
- 2.16 Prior to commencing this test, record the following information (as applicable) on each Recorder Strip Chart.

Test Procedure Number
Recorder Number
Time and Date
Chart Speed
Scale of each Pen
Input to each Pen

3.0 Precautions and Limitations

- 3.1 The difference in Boron concentration between the RCS and Pressurizer should not exceed 50 ppm. Use Pressurizer Spray to equalize concentration.
- 3.2 Monitor and record Source Range count rate on Data Sheet 4 every 15 minutes. Any unexplained increase in count rate by a factor of two is grounds for test termination and investigation for cause.

4.0 Instructions

- 4.1 Record the time on the recorder charts in the instrument rack area and/or Control Room and start the recorders at an appropriate speed determined by the Test Supervisor.
- 4.2 Record the initial plant conditions on Data Sheet 2.
- 4.3 Close the Main Steam Line 2A (B, C) upstream drain pot to Aux Steam Condensate Tank isolation valves Q2N11V006A (B, C) and Q2N11V008A (B, C).
- 4.4 Shutdown the S/G Blowdown System, if in operation, using FNP-2-SOP-16.1.
- 4.5 Stop 2A and 2C RCP's, if operating.
- 4.6 Adjust T_{ave} to $535^{\circ}\text{F} \pm 2^{\circ}\text{F}$ using the Steam Dump.
- 4.7 Stop feeding the S/G's and shutdown the AFW System using FNP-2-SOP-22.0 or the Main Feedwater System using FNP-2-SOP-21.0.
- 4.8 Verify that S/G 2B Atmospheric Relief Valve is in AUTO and set for 1035 psig.
- 4.9 Close all six MSIV's.
- 4.10 Verify that the Pressurizer Level Control System is in AUTO.
- 4.11 Increase letdown flow to maximum using FNP-2-SOP-2.1.

NOTE

T_{ave} may increase or decrease depending on the charging temperature and flowrate and RCS ambient losses.

- 4.12 Maintain the flow conditions established in step 4.11 for 30 minutes, or until T_{ave} decreases to 525°F , or until T_{ave} increases to 545°F , whichever comes first. Record the information required in Data Sheets 3 and 4.

CAUTION

If T_{ave} reaches 545°F , proceed directly to step 4.15.

- 4.13 After 30 minutes or when T_{ave} reaches 525°F reduce letdown flow to minimum using FNP-2-SOP-2.1.

CAUTION

Maintain 6 to 13 gpm seal injection flow to 2B RCP.

- 4.14 Maintain the flow conditions established in step 4.13 for 30 minutes or until T_{ave} decreases to 520°F , or until T_{ave} increases to 545°F , whichever comes first. Record the information required in Data Sheets 3 and 4.
- 4.15 Stop the recorders and trend printer after the test is completed and restore plant conditions using the following steps.
- 4.16 Re-establish normal Charging and Letdown conditions.
- 4.17 If necessary restore normal levels in all three S/G's with the AFW System using FNP-2-SOP-22.0.
- 4.18 Verify that the Steam Dump is set up for Steam Pressure Mode operation using FNP-2-SOP-18.0.
- 4.19 Open the MSIV's using FNP-2-SOP-17.0.
- 4.20 If required, restore S/G Blowdown using FNP-2-SOP-16.1.
- 4.21 Notify the Shift Supervisor that this Test is complete.

- 4.22 Verify that all Data Sheets associated with
 this procedure are complete and signed-off
 (where required).
- 4.23 Attach all relevant printouts and strip charts
 to this procedure and remove the temporary
 instrumentation if this concludes Natural Circulation
 testing.

Completed By: _____

Time/Date: _____

5.0 Acceptance Criteria

- 5.1 The effects on T_{ave} of variations in Charging
 and Letdown flow rates have been determined.

6.0 References

- 6.1 PLS Document
- 6.2 Farley Unit 2 Technical Specifications
- 6.3 VEPCO North Anna Unit 2 procedure 2-ST-6
- 6.4 Westinghouse Safety Evaluation for Farley Unit 2
 Natural Circulation Testing.

7.0 Data Sheets, and Attachments

- 501-7-001 Data Sheet 1: TEST EQUIPMENT RECORD
- 501-7-001 Data Sheet 2: INITIAL PLANT CONDITIONS
- 501-7-001 Data Sheet 3: LETDOWN AND CHARGING
- 501-7-001 Data Sheet 4: SOURCE RANGE COUNT RATE
- 501-7-001 Appendix A: TEMPORARY RECORDERS
- 501-7-001 Appendix B: PROCESS COMPUTER TREND BLOCKS
- 501-7-001 Attachment 1: TRAINING ATTENDANCE SHEET

DATA SHEET 2

INITIAL PLANT CONDITIONS - STEADY STATE

REACTOR COOLANT SYSTEM

Pressurizer Pressure PR-444 (Red Pen) _____ psig

Pressurizer Level LR-459 (Red Pen) _____ %

RCS Loop 1 Hot Leg Temperature TR-413 (Red Pen) _____ °F

RCS Loop 1 Cold Leg Temperature TR-410 (Red Pen) _____ °F

RCS Loop 2 Hot Leg Temperature TR-413 (Blue Pen) _____ °F

RCS Loop 2 Cold Leg Temperature TR-410 (Blue Pen) _____ °F

RCS Loop 3 Hot Leg Temperature TR-413 (Green Pen) _____ °F

RCS Loop 3 Cold Leg Temperature TR-410 (Green Pen) _____ °F

STEAM GENERATORS

Steam Generator 2A Level (NR) LI-474 _____ %

Steam Generator 2B Level (NR) LI-484 _____ %

Steam Generator 2C Level (NR) LI-494 _____ %

Steam Generator 1 Level (WR) LR-477 Pen 1 (Red) _____ %

Steam Generator 2 Level (WR) LR-477 Pen 2 (Green) _____ %

Steam Generator 3 Level (WR) LR-477 Pen 3 (Blue) _____ %

Steam Generator 2A Pressure PI-474 _____ psig

Steam Generator 2B Pressure PI-484 _____ psig

Steam Generator 2C Pressure PI-494 _____ psig

Data Taken by _____ / _____
Signature / Date

DATA SHEET 3

LETDOWN AND CHARGING

Maximum Letdown and Charging

Charging Flow _____ gpm
Letdown Flow _____ gpm
Average Temperature Change _____ °F (Use the T_{avg} data for the loop with the running RCP.)
Time Period _____ Min.
Rate of Temperature Change = $\frac{\text{Avg. Change}}{(\text{Time Period}/60)}$ = _____ $\frac{°F}{hr.}$

Minimum Letdown and Charging (if applicable)

Charging Flow _____ gpm
Letdown Flow _____ gpm
Average Temperature Change _____ °F (Use the T_{avg} data for the loop with the running RCP.)
Time Period _____ Min.
Rate of Temperature Change = $\frac{\text{Avg. Change}}{(\text{Time Period}/60)}$ = _____ $\frac{°F}{hr.}$

Data Taken by _____ / _____
Signature Date

APPENDIX A
TEMPORARY RECORDERS

Connect temporary strip-chart recorders as indicated below.

NOTE

Set the chart speed on the following recorders to 25 mm/min.

1.0 Strip-Chart Recorder No. 1

<u>Channel</u>	<u>Connection</u>	<u>Monitoring</u>
1	FP-414B, C1-432	RCS Flow, Loop 1
2	FP-424B, C1-433	RCS Flow, Loop 2
3	FP-434B, C1-434	RCS Flow, Loop 3
4	FQY-122, C6 522	RCS Charging Flow
5	FQY-150, C6-433	RCS Letdown Flow

2.0 Strip-Chart Recorder No. 2

<u>Channel</u>	<u>Connection</u>	<u>Monitoring</u>
1	TP-412K, C1-423	Narrow Range T _{AVG} , Loop
2	TP-422K, C2-423	Narrow Range T _{AVG} , Loop
3	TP-432K, C3-723	Narrow Range T _{AVG} , Loop

The above installation has been completed and check-out is satisfactory.

Completed by: _____ / _____
Signature Date

Test Supervisor: _____ / _____
Signature Date

The above installation has been removed.

Completed by: _____ / _____
Signature Date

Test Supervisor: _____ / _____
Signature Date

PROCESS COMPUTER TREND BLOCK A

<u>COLUMNS</u>	<u>ADDRESS</u>	<u>PARAMETER</u>	<u>UNITS</u>
1	T0406A	RCL A T _{COID}	°F
2	T0426A	RCL B T _{COLD}	°F
3	T0446A	RCL C T _{COLD}	°F
4	T0419A	RCL A T _{HOT}	°F
5	T0439A	RCL B T _{HOT}	°F
6	T0459A	RCL C T _{HOT}	°F
7	T0400A	T _{AVG} LOOP A	°F
8	T0420A	T _{AVG} LOOP B	°F
9	T0440A	T _{AVG} LOOP C	°F
10	T0403A	ΔT LOOP A	%
11	T0423A	ΔT LOOP B	%
12	T0443A	ΔT LOOP C	%
13	F0128A	CHARGING FLOW	GPM
14	F0134A	LETDOWN FLOW	GPM
15	U1250	HIGHEST REL FUEL ASSY PWR	
16	L0480A	PRESSURIZER LEVEL	%
17	L0112A	VCT LEVEL	%
18	U1251	HIGHEST REL ASSY PWR INDENT	

PROCESS COMPUTER TREND BLOCK B

<u>COMUMNS</u>	<u>ADDRESS</u>	<u>PARAMETER</u>	<u>UNITS</u>
1	L0400A	S/G A LEVEL	%
2	L0420A	S/G B LEVEL	%
3	L0440A	S/G C LEVEL	%
4	P0400A	S/G A PRESS	PSIG
5	P0420A	S/G B PRESS	PSIG
6	P0440A	S/G C PRESS	PSIG
7	P0483A	PRESSURIZER P	PSIG
8	P0499A	RC SYSTEM P	PSIG
9	P0142A	CHARGING PRESS	PSIG
10	U0482	AVG PZR PRESS	PSIG
11	U0483	AVG PZR LEVEL	%
12	U1118	RX THERMAL POWER	MW
13	U1170	AVG T/C TEMP	°F
14	AS REQUIRED	HOTTEST T/C (QUADRANT 1)	°F
15	AS REQUIRED	HOTTEST T/C (QUADRANT 2)	°F
16	AS REQUIRED	HOTTEST T/C (QUADRANT 3)	°F
17	AS REQUIRED	HOTTEST T/C (QUADRANT 4)	°F

PROCESS COMPUTER TREND BLOCK C

<u>COLUMNS</u>	<u>ADDRESS</u>	<u>PARAMETER</u>	<u>UNITS</u>
1	T0003A	INCORE T/C	°F
2	T0006A	INCORE T/C	°F
3	T0002A	INCORE T/C	°F
4	T0005A	INCORE T/C	°F
5	T0020A	INCORE T/C	°F
6	T0024A	INCORE T/C	°F
7	T0022A	INCORE T/C	°F
8	T0023A	INCORE T/C	°F
9	T0045A	INCORE T/C	°F
10	T0033A	INCORE T/C	°F
11	T0036A	INCORE T/C	°F
12	T0029A	INCORE T/C	°F
13	T0030A	INCORE T/C	°F
14	T0046A	INCORE T/C	°F
15	T0048A	INCORE T/C	°F
16	T0044A	INCORE T/C	°F
17	P0499A	RC SYSTEM P	PSIG
18	P0484A	PRESSURIZER P	PSIG

NOTE

The Training Attendance Sheet will be provided in the Control Room by the Training Department, prior to the performance of this procedure.