Final Submittal

CATAWBA EXAM 2003-301
50-413 & 50-414

March 31 - April 4 &
April 10, 2003

1. Administrative Questions/JPMs
2. In-plant JPMs
3. Control Room JPMs (simulator JPMs)

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM 4SR/ADMIN

Calculate Low Pressure Service Water Discharge Flow for Liquid Radioactive Release

CANDIDATE _____

EXAMINER _____

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Calculate Low Pressure Service Water Discharge Flow for Liquid Radioactive Release.

Alternate Path:

N/A

Facility JPM #:

New

K/A Rating(s):

2.3.11 (2.7/3.2)

Task Standard:

Candidate obtains needed data, correctly calculates total discharge flow and determines that the liquid waste release can continue.

Preferred Evaluation Location:

Simulator X In-Plant X

Preferred Evaluation Method:

Perform X Simulate _____

References:

PT/0/A/4250/011 (RL Temperature and Discharge Flow Determinations) Revision 037

Validation Time: 22 min. **Time Critical:** No

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Candidate: _____ Time Start : _____
NAME Time Finish: _____

Performance Rating: SAT _____ UNSAT _____ Question Grade _____ Performance Time _____

Examiner: _____ _____ / _____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

Tools/Equipment/Procedures Needed:

Each candidate will be provided a copy of PT/0/A/4250/011, appropriate data sheets, and a copy of the LWR permit report. A calculator will be needed to complete the enclosures.

READ TO OPERATOR

DIRECTION TO TRAINEE:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

- Unit 1 is currently performing a liquid waste release from the Waste Monitor building.
- Low Pressure Service Water (RL) Flow transmitter 0RLP5080 (RL Disch Flow) and OAC points C1P0903 and C2P0903 (RL Line A Disch Flow-Hourly Average) are inoperable and have been removed from service.
- The RN system is aligned to the RL discharge header.
- PT/0/A/4250/011 (RL Temperature and Discharge Flow Determinations) was last completed at 0700.
- Current time is 1030.

INITIATING CUE:

Calculate total discharge flow using Enclosure 13.2 (Total Discharge Flow Calculation Sheet) of PT/0/A/4250/011 and determine if adequate flow exists to continue the release per the LWR currently in progress.

START TIME: _____

EXAMINER CUE: Provide a copy of PT/0/A/4250/011 enclosure 13.2, data sheets, and LWR permit report.	
EXAMINER NOTE: If asked about YT and YF inputs from RL, provide the following cue. CUE: "This is chemistry, inputs to YT and YF were secured at 0645 today."	
STEP 1: To obtain Total RL Supply perform the following: STANDARD: Calculates Total RL supply with the following: RL Disch Pressure = RL HDR PRESS (0RLP5030) + 5.6 psi 67 + 5.6 = 72.6 psi (72.6 psig X 2.311 ft/psig) + (577.25 – 567 ft) = 178.03 ft Total Discharge Head RL Pump A Flow 30000 gpm (obtained from Encl. 13.7 for Pump "A") RL Pump B Flow 32000 gpm (obtained from Encl. 13.7 for Pump "B") RL Pump C Flow OFF gpm Total RL Supply 62000 gpm (A) EXAMINER NOTE: The following ranges on the flow calculations are acceptable: RL pump A: 28500 to 31500 gpm RL pump B: 30500 to 33500 gpm Total Flow range 59000 to 65000 gpm COMMENTS:	CRITICAL STEP ___ SAT ___ UNSAT

STEP 2: To obtain Total RN Flow perform the following: STANDARD: Calculates Total RN Flow with the following: RN Pump 1B is the only pump in service, Train B meter = **16,500** gpm RN Pump Train A Flow = (1RNP7520) + (2RNP7520) = 0 gpm RN Pump Train B Flow = (1RNP7510) + (2RNP7510) = 16500 gpm Total RN Flow = **16500 gpm** (B) COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 3: To obtain Total Cooling Tower Evaporation, perform the following. STANDARD: Calculates Total Cooling Tower evaporation using the following: IF OAC is in service for Unit 1 Cooling Tower evaporation, perform the following calculations: **(3406.879** C1P1355 - **1231** C1A1632 +19) x 6.837 gpm mw = **15006.38** gprn Total Tower Evaporation IF OAC is in service for Unit 2 Cooling Tower evaporation, perform the following calculation: **(3402.602** C1P1355 - **1231** C1A1632 +19) x 6.837 gpm mw = **14977.15** gpm Total Tower Evaporation Total Evaporation = 15006.38 + 14997.15 = **29983.53** gpm (C) **EXAMINER NOTE: Due to potential for rounding, a range of 29983.53 +/- 100 gpm is acceptable.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 4: To obtain Total RL Disch Flow, perform the following. STANDARD: Calculates Total Cooling Tower evaporation using the following: Total RL Supply 62000 (A) gpm + Total RN Flow 16500 (B) gpm - RL Disch Total Evaporation 29983.53 (C) gpm = Total Flow **48516.47** gpm **EXAMINER NOTE: Based on previous acceptable values, a range of 45416.47 gpm to 51616.47 gpm is acceptable.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 5: Data Recorded **by:** STANDARD: Candidate initials and enters date and time. COMMENTS:	___ SAT ___ UNSAT
STEP 6: Compare flow value obtained to required flow per LWR. STANDARD: Determines that LWR required flow is 19000 gpm and that the calculated flow exceeds the required flow and the LWR may continue. COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
This JPM is complete.	

TIME STOP: _____

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Unit 1 and 2 Data Sheet for 1030

Unit 1 Generator Megawatts (PID C1A1632) 1231 MW
Reactor thermal Power, Best (PID C1P1355) 3406.879 MW

Unit 2 Generator Megawatts (PID C2A1632) 1231 MW
Reactor thermal Power, Best (PID C2P1355) 3402.602 MW

Low Pressure Service Water Status:

RL Pump A and B in service
Lake Wylie Level (ORNP7380) 567 feet
RL Header Pressure (ORLP5030) 67 PSIG

Nuclear Service Water Status:

1B RN pump in service
RN Pump Train A Flow (1RNP7520) = 0 gpm
RN Pump Train A Flow (2RNP7520) = 0 gpm
RN Pump Train B Flow (1RNP7510) = 16500 gpm
RN Pump Train B Flow (2RNP7510) = 0 gpm

CANDIDATE CUE SHEET
(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- Unit 1 is currently performing a liquid waste release from the Waste Monitor building.
- Low Pressure Service Water (RL) Flow transmitter 0RLP5080 (RL Disch Flow) and OAC points C IP0903 and C2P0903 (RL Line A Disch Flow-Hourly Average) are inoperable and have been removed from service.
- The RN system is aligned to the RL discharge header.
- PT/0/A/4250/011 (RL Temperature and Discharge Flow Determinations) was last completed at 0700.
- Current time is 1030.

INITIATING CUE:

Calculate total discharge flow using Enclosure 13.2 (Total Discharge Flow Calculation Sheet) of PT/0/A/4250/011 and determine if adequate flow exists to continue the release per the LWR currently in progress.

KEY

Enclosure 13.2

Total Discharge Flow Calculation Sheet

- To obtain Total RL Supply, perform the following:

RL Disch Pressure = RL HDR PRESS (0RLP5030) + 5.6 psi

67

RL Disch Pressure		Lake Elevation		Total Discharge Head
(72.6 psig X 2.311 ft/psig) + (577.25 -	567 ft) =	178.03 ft		

RL Pump A Flow		RL Pump B Flow		RL Pump C Flow		Total RL Supply
30000 gpm +	(28500-31500)	32000 gpm +	(30500-33500)	OFF (0) gpm =		62000 gpm (A) (59000-65000)

ALLOWABLE RANGES

- To obtain Total RN Flow, perform the following:

RN Pump Train A Flow [(1RNP7520) + (2RNP7520)]		RN Pump Train B Flow [(1RNP7510) + (2RNP7510)]		Total RN Flow
0 gpm +		16500 gpm =		16500 gpm (B)

- To obtain Total Cooling Tower Evaporation, perform the following:

IF OAC is in service for Unit 1 Cooling Tower evaporation, perform the following calculations:

(3406.879	-	1231	+19) x 6.837	gpm	=	15006.38
C1P1355		C1A1632		mw		Cooling Tower Evaporation

IF OAC is in service for Unit 2 Cooling Tower evaporation, perform the following calculation:

(3402.602	-	1231	+19) x 6.837	gpm	=	14977.15	{PIP 96-0822}
C2P1355		C2A1632		mw		Cooling Tower Evaporation	

15006.38	+	14977.15	=	29983.53 (C)
Unit 1 Evaporation		Unit 2 Evaporation		Total Evaporation

ALLOWABLE RANGE 29983.53 +/- 1000gpm

Total Discharge Flow Calculation Sheet

IE OAC is **NOT** in service for either **OR** both Units, Cooling Tower Evaporation is calculated by the following:

Cooling Tower Evaporation = **((3411**MW) (%Rx Power) + 19 - Gen MW)(6.837 gpm)
MW

Unit 1 Cooling Tower Evaporation =((3411MW) (_____) + 19 - _____) **(6.837** gpm)= _____
% Rx Power (ex. 95%=0.95) | Gen MW | MW | Unit 1 Evaporation (gpm)

Unit 2 Cooling Tower Evaporation =((3411MW) (_____) + 19 - _____) (6.837 gpm)= _____
Y0 Rx Power (ex. 95%=0.95) | Gen MW | MW | Unit 2 Evaporation (gpm)

Total Cooling Tower Evaporation = _____ + _____ - _____ (C)
Unit 1 Evaporation (gpm) | Unit 2 Evaporation (gpm) | Total Evaporation (gpm)

- To obtain Total RL Disch Flow, perform the following:

Total RL Supply		Total RN Flow		RL Disch Total Evaporation		Total Flow
62000 gpm (A)	+	16500 gpm (B)	-	29983.53 gpm (C)	=	48516.47 gpm

ALLOWABLE RANGE 45416.47 gpm to 51616.47 gpm

Data Recorded By CANDIDATE INITIALS (Operator/Initials) DATE/TIME (Date/Time)

Data IV By _____ (Operatorhitials) _____ (Date/Time)

Duke Power Company Catawba Nuclear Station	Procedure No. PT/0/A/4250/011
	Revision No. 037
Continuous Use	Electronic Reference No. CN005FUH

RL Temperature and Discharge Flow Determinations

1. Purpose

1.1 To verify that the RL total discharge header flow is monitored or manually calculated when the RL discharge flow instrumentation or the OAC is **NOT** operable.

1.2 To verify that the RL System temperature **is** manually obtained when the RL temperature instrumentation is **NOT** operable.

1.3 To verify the RL Heat Rise (AT) is calculated and verified below the NPDES limit when both Unit OACs are inoperable.

2. References

2.1 SLC 16.11-2, Table 16.11-2-1.

2.2 Environmental Report Vol. 2, Section 3.4

2.3 South Carolina Department of Health and Environmental Control, Discharge Permit #SC0004278

2.4 NSM CN-50136, RL Flow Instrumentation Modification

2.5 SD 3.1.23, Scan Lockout/Out of Service

2.6 CN-1575-1.0, RL System Flow Diagram

3. Time Required

3.1 Manpower

3.1.1 One NLO

3.1.2 One NCO

3.2 Time

3.2.1 Five minutes to one hour depending on option used (flow determination)

3.2.2 Thirty minutes (temperature determination)

3.2.3 One hour and 30 minutes (heat rise calculation)

3.3 Frequency

3.3.1 Prior to an actual release and every four hours during the release when RL discharge flow instrumentation or the **OAC** is inoperable.

3.3.2 Once per **24** hours when RL discharge flow instrumentation or the OAC is inoperable.

3.3.3 Once per 24 hours when RL temperature instrumentation or either unit OAC is inoperable.

4. Prerequisite Tests

None

5. Test Equipment

Calibrated Keithly 872 Digital Thermometer

OR

Calibrated Fluke **5**1 or 52 Digital Thermometer with type "K" immersible style probe

6. Limits and Precautions

None

7. Required Unit Status

None

8. Prerequisite System Conditions

—— 8.1 Flow exists through the RL System.

—— 8.2 Both OACs are inoperable or at least one of the following is inoperable:

- RL discharge header flow instrumentation
- RL intake temperature instrumentation
- RL discharge temperature instrumentation
- OAC points C1P1515 (RL Delta T-Hourly Average) and C2P1515 (RL Delta T-Hourly Average)

9. Test Method

9.1 The RL discharge header flow will be determined and recorded using various RL, RN and RC instrumentation when the discharge header or the OAC flow monitoring instrumentation is inoperable.

9.2 The RL System temperature will be obtained (using a calibrated thermometer) and recorded when the RL System temperature indication is inoperable.

9.3 The RL heat rise **(AT)** is calculated from the manually determined values of RL temperature and discharge flow. **A** comparison is then made to the NPDES limit and appropriate action taken.

10. Data Required

10.1 If RL flow instruments are inoperable, complete the following enclosures as required:

- Enclosure 13.2 (Total Discharge Flow Calculation Sheet)
- Enclosure 13.3 (OAC Point Total RL Discharge Flow Calculation)

10.2 If RL intake temperature instruments inoperable, complete Enclosure 13.4 (RL Intake Temperature Determination) as required.

10.3 If RL discharge temperature instruments inoperable, complete Enclosure 13.5 (RL Discharge Temperature Determination) as required.

10.4 If both OAC's are inoperable, complete the following enclosures as required:

- 13.1 (RL Discharge Flow Determination)
- 13.2 (Total Discharge Flow Calculation Sheet)
- 13.3 (OAC Point Total RL Discharge Flow Calculation)
- 13.4 (RL Intake Temperature Determination)
- 13.5 (RL Discharge Temperature Determination)
- 13.6 (RL System Heat Rise (AT) Calculation)

10.5 If Enclosure 13.1 (RL Discharge Flow Determination) is being performed and there is an RL or RN flow change, complete Enclosure 13.2 (Total Discharge Flow Calculation Sheet) and log in Autolog.

11. Acceptance Criteria

11.1 When both OACs are inoperable or RL discharge header flow instrumentation is inoperable, the RL discharge flow is determined and recorded as follows:

11.1.1 If 0RLP5080 (RL Disch Flow) is inoperable, prior to an actual release and every four hours during the release. (SLC 16.11-2)

11.1.2 Once per 24 hours. (SLC 16.11-2)

11.2 When Enclosures 13.4 (RL Intake Temperature Determination) and 13.5 (RL Discharge Temperature Determination) are being performed, the RL System temperature is determined and recorded once per 24 hours. (NPDES)

11.3 When Enclosure 13.6 (RL System Heat Rise (AT) Calculation) is being performed, the RL Heat Rise **(AT)** is calculated once per 24 hours and action is taken to correct over limit conditions. Limits: AT $\leq$ 10.0°F (April-Sept.) $\leq$ 14.0°F (Oct.-Mar.) (NPDES)

12. Procedure

12.1 Complete the appropriate enclosures based on the following conditions:

NOTE: For the following OAC points to be considered inoperable, they must be inoperable on Unit 1 and Unit **2** OAC.

_____ 12.1.1 **IF** any of the following components are inoperable, perform Enclosure 13.1 (RL Discharge Flow Determination):

12.1.1.1 0RLP5080 (RL Disch Flow Summer)

OR

0RLFT5080 (RL Line **A** Disch Flow)

OR

0RLFT5930 (RL Line B Disch Flow)

OR

C1P0903 (RL Line A Disch Flow-Hourly Average) AND C2P0903 (RL Line A Disch Flow-Hourly Average)

OR

C1P0904 (RL Line B Disch Flow-Hourly Average) AND C2P0904 (RL Line B Disch Flow-Hourly Average)

—— 12.1.2 **IF** the following RL intake temperature instrument **OR** OAC point is inoperable, complete Enclosure 13.4 (RL Intake Temperature Determination).

- 0RLTT7420 (RL Intake Temperature)
- C1P1521 (Low Press Service Wtr Inlet Temp - Hr. Avg.) AND C2P1521 (Low Press Service Wtr Inlet Temp - Hr. Avg.)

—— 12.1.3 **IF** any of the following RL discharge temperature instruments **OR** OAC points are inoperable, complete Enclosure 13.5 (RL Discharge Temperature Determination).

- 0RLTT5060 (RL Line **A** Disch Temp)
- 0RLTT5070 (RL Line B Disch Temp)
- C1P1376 (RL Line **A** Discharge Temp #1 - Hourly Avg) AND C2P1376 (RL Line A Discharge Temp #1 - Hourly Avg)
- C1P1377 (RL Line B Discharge Temp #1 - Hourly Avg) AND C2P1377 (RL Line **B** Discharge Temp #1 - Hourly Avg)

12.1.4 **IF** both Unit OACs are out of service, complete Enclosure 13.6 (RL System Heat Rise **(AT)** Calculation).

12.2 Evaluate the acceptance criteria by performing one of the following:

_____ 12.2.1 Verify the acceptance criteria specified in Section 11 is met.

OR

_____ 12.2.2 **IF** the acceptance criteria are **NOT** met, perform the following:

- ☐ Notify the Unit/WCC SRO that the acceptance criteria is **NOT** met.

  _____ ____/____
  Unit/WCC SRO Contacted Date Time

- ☐ Initiate a PIP to document the test failure.
- ☐ Document all issues on a procedure discrepancy sheet.
- ☐ Notify the Environmental Compliance Engineer for determination of reportability.

_____ 12.3 **IF** any discrepancy is noted during the performance of this test that does **NOT** keep the test from meeting the acceptance criteria, it shall be given to the Unit/WCC SRO for evaluation via a discrepancy sheet.

_____ 12.4 Submit PT/0/A/4250/011 (RL Temperature and Discharge Flow Determinations) to the Unit/WCC SRO.

13. Enclosures

13.1 RL Discharge Flow Determination

13.2 Total Discharge Flow Calculation Sheet

13.3 OAC Point Total RL Discharge Flow Calculation

13.4 RL Intake Temperature Determination

13.5 RL Discharge Temperature Determination

13.6 RL System Heat Rise **(AT)** Calculation

13.7 RL Pump Head - Capacity Curves

1. Procedure

1.1 To calculate RL discharge flow, complete the following steps:

1.1.1 **IF** 0RLP5080 (RL Disch Flow) is **NOT** capable of terminating WL discharge when RL discharge flow decreases below an LWR setpoint, place 0RLP5080 (RL Disch Flow) in TSAIL.

1.1.2 **IF** a release is being made **AND** 0RLP5080 (RL Disch Flow) is inoperable, calculate the RL discharge flow every four hours and after an RL **OR** RN discharge flow change.

1.1.3 **IF** flow is **NOT** being calculated every four hours per Step 1.1.2, calculate the RL discharge flow rate every 24 hours and after an RL **OR** RN discharge flow change.

NOTE: Additional copies of the Enclosure 13.2 (Total Discharge Flow Calculation Sheet) may be attached as required.

1.1.4 **IF** a calculation is required **AND** either of the following OAC points are inoperable, perform the following steps:

- C1P0903 (RL Line **A** Discharge Flow - Hourly Average) AND C2P0903 (RL Line A Discharge Flow - Hourly Average)

  OR

- C1P0904 (RL Line **B** Discharge Flow - Hourly Average) AND C2P0904 (RL Line B Discharge Flow - Hourly Average)

1.1.4.1 Ensure Chemistry has secured inputs to YT AND YF from RL for a minimum of 10 minutes. (PIP 96-0822)

NOTE:

- If 0RNP7380 (Lake Wylie level) is unavailable, RN pit level indication may be used as lake level indication if the RN pit is aligned to the lake.
- RN Pit A indications are 1RNP7400 (1MC9), 2RNP7400 (2MC9), or OAC point C1A1453
- RN Pit B indications are 1RNP7370 (1MC9), 2RNP7370 (2MC9), or OAC point C1A1459

1.1.4.2 Calculate and record "Total Discharge Head" on Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

1.1.4.3 Calculate and record the individual "RL Pump Flow" for the operating RL pumps on Enclosure 13.2 (Total Discharge Flow Calculation Sheet). [Refer to Enclosure 13.7 (RL Pumps Head Capacity Curve) for pump capacity curves.]

1.1.4.4 **IF** RN discharge is aligned to the RL discharge header, record the operating RN pump(s) discharge flow on Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

1.1.4.5 Calculate "Total RL Disch Flow" as follows on Enclosure 13.2 (Total Discharge Flow Calculation Sheet):

A. Record "Total RL Supply".

B. Record "Total RN Flow".

C. Calculate "Total Evaporation"

D. Calculate and record "Total RL Disch Flow"

1.1.4.6 Inform Chemistry they may resume any inputs secured in Step 1.1.4.1. {PIP 96-0822}

1.1.4.7 **IF** Unit 1 OAC is operable **AND** RL flow is through both headers, insert a value for the following OAC points using the Insert Value application:

A. Insert value for OAC point C1P0903 (RL Line A Discharge Flow - Hourly Average) of ½ the "Total RL Disch Flow" obtained from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

B. Insert value for OAC point C1P0904 (RL Line B Discharge Flow - Hourly Average) of ½ the "Total RL Disch Flow" obtained from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

1.1.4.8 **IF** Unit 2 OAC is operable **AND** RL flow is through both headers, insert a value for the following OAC points using the Insert Value application:

A. Insert value for OAC point C2P0903 (RL Line A Discharge Flow - Hourly Average) of ½ of the "Total RL Disch Flow" obtained from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

B. Insert value for OAC point C2P0904 (RL Line B Discharge Flow - Hourly Average) of ½ the "Total RL Disch Flow" obtained from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

1.1.4.9 **IF** Unit 1 OAC is operable **AND** RL flow is through Header A only, insert a value for the following OAC points using the Insert Value application:

A. Insert value for OAC point C1P0903 (RL Line A Discharge Flow - Hourly Average) of "Total RL Disch Flow" obtained from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

B. Insert a value of "0" for OAC point C1P0904 (RL Line B Discharge Flow - Hourly Average).

1.1.4.10 **IF** Unit 1 OAC is operable **AND** RL flow is through Header B only, insert a value for the following OAC points using the Insert Value application:

A. Insert a value of "0" for OAC point C1P0903 (RL Line A Discharge Flow - Hourly Average).

B. Insert a value for OAC point C1P0904 (RL Line **B** Discharge Flow - Hourly Average) of "Total RL Disch Flow" obtained from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

1.1.4.11 **IF** Unit **2** OAC is operable **AND** RL flow is through Header A only, insert a value for the following OAC points using the Insert Value application:

A. Insert a value for OAC point C2P0903 (RL Line A Discharge Flow - Hourly Average) of "Total RL Disch Flow" obtained from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

B. Insert a value of "0" for OAC point C2P0904 (RL Line B Discharge Flow - Hourly Average).

1.1.4.12 **IF** Unit 2 OAC is operable **AND** RL flow is through Header B only, insert a value for the following OAC points using the Insert Value application:

A. Insert a value of "0" for OAC point C2P0903 (RL Line A Discharge Flow - Hourly Average).

B. Insert a value for OAC point C2P0904 (RL Line B Discharge Flow - Hourly Average) of "Total RL Disch Flow" obtained from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

1.1.4.13 **WHEN** the following OAC points are restored to operable, perform the following steps:

- C1P0903 (RL Line A Discharge Flow - Hourly Average)
- C2P0903 (RL Line A Discharge Flow - Hourly Average)
- C1P0904 (RL Line B Discharge Flow - Hourly Average)
- C2P0904 (RL Line B Discharge Flow - Hourly Average)

_____ A. **IF** a value was inserted for OAC point C1P0903 (RL Line A Discharge Flow - Hourly Average), remove the inserted value from Unit 1 OAC.

_____ **B.** **IF** a value was inserted for OAC point C1P0904 (RL Line B Discharge Flow - Hourly Average), remove the inserted value from Unit 1 OAC.

_____ C. **IF** a value was inserted for OAC point C2P0903 (RL Line A Discharge Flow - Hourly Average), remove the inserted value from Unit 2 OAC.

_____ D. **IF** a value was inserted for OAC point C2P0904 (IU Line B Discharge Flow - Hourly Average), remove the inserted value from Unit 2 OAC.

1.1.5 **IF** a calculation is required **AND** the following conditions exist, complete Enclosure 13.3 (OAC Point Total RL Discharge Flow Calculation).

- At least one of the following OAC points are operable:
  - C1P0904 (RL Line B Discharge Flow - Hourly Average)
  - C2P0904 (RL Line B Discharge Flow - Hourly Average)

AND

- At least one of the following OAC points are operable:
  - C1P0903 (RL Line A Discharge Flow - Hourly Average)
  - C2P0903 (RL Line A Discharge Flow - Hourly Average)

1.1.6 **WHEN** any affected RL system flow instrumentation is returned to service, evaluate status. Refer to Section 12.

Enclosure 13.2

Total Discharge Flow Calculation Sheet

- To obtain Total RL Supply, perform the following:

RL Disch Pressure = RL HDR PRESS (0RLP5030) + 5.6 psi

RL Disch Pressure | Lake Elevation | Total Discharge Head

(_____psig X 2.311 ft/psig) + (577.25 - _____ft) = _____ft

RL Pump A Flow | RL Pump B Flow | RL Pump C Flow | Total RL Supply

_____gpm + _____gpm + _____gpm = _____gpm (A)

- To obtain Total RN Flow, perform the following:

RN Pump Train A Flow [(1RNP7520) + (2RNP7520)] | RN Pump Train B Flow [(1RNP7510) + (2RNP7510)] | Total RN Flow

_____gpm + _____gpm = _____gpm (B)

- To obtain Total Cooling Tower Evaporation, perform the following:

IF OAC is in service for Unit 1 Cooling Tower evaporation, perform the following calculations:

(_____ - _____ +19) x 6.837 gpm = _____
C1P1355 C1A1632 mw Cooling Tower Evaporation

IF OAC is in service for Unit 2 Cooling Tower evaporation, perform the following calculation:

(_____ - _____ +19) x 6.837 gpm = _____ {PIP 96-0822}
C2P1355 C2A1632 mw Cooling Tower Evaporation

_____ + _____ = _____ (C)
Unit 1 Evaporation | Unit 2 Evaporation | Total Evaporation

IF OAC is **NOT** in service for either **OR** both Units, Cooling Tower Evaporation is calculated by the following:

Cooling Tower Evaporation = **((341**1MW) (%Rx Power) + 19 - Gen MW)(6.837 gpm/MW)

Unit 1 Cooling Tower Evaporation = ((3411MW) (_____ % Rx Power (ex. 95%=0.95)) + 19 - _____ Gen MW) (6.837 gpm/MW) = _____ Unit 1 Evaporation (gpm)

Unit 2 Cooling Tower Evaporation = ((3411MW) (_____ % Rx Power (ex. 95%=0.95)) + 19 - _____ Gen MW) (6.837 gpm/MW) = _____ unit2 Evaporation (gpm)

Total Cooling Tower Evaporation = _____ (unit 1 Evaporation (gpm)) + _____ (Unit 2 Evaporation (gpm)) = _____ (Total Evaporation (gpm)) (C)

- To obtain Total RL Disch Flow, perform the following:

Total RL Supply		Total RN Flow		RL Disch Total Evaporation		Total Flow
_____ gpm	+	_____ gpm	-	_____ gpm	=	_____ gpm
(A)		(B)		(C)		

Data Recorded By _____ (Operator/Initials) _____ (Date/Time)

Data IV By _____ (Operatorhitials) _____ (Date/Time)

Enclosure 13.3

OAC Point Total RL Discharge Flow Calculation

1. Procedure

—— **1.1** Ensure Chemistry has secured inputs to YT and YF from RL for a minimum of 10 minutes. (PIP 96-0822)

—— 1.2 Perform the following calculation:

+	−	
C1P0903 OR C2P0903	C1P0904 OR C2P0904	Total RL Disch Flow

Data Recorded by _____
Operator/Initials Date/Time

Data IV By _____
Operatorhitials Date/Time

—— **1.3** Inform Chemistry they may resume any inputs secured in Step 1.1.

1. Procedure

1.1 **IF** both the OAC points for RL intake temperature C1P1521 (Low Press Service Wtr Inlet Temp - Hr Avg) **AND** C2P1521 (Low Pressure Service Wtr Intake Temp - Hr Avg) **OR** their input device 0RLTT7420 (RL Intake Temperature) is inoperable, perform the following steps once per 24 hours while the indication is inoperable:

1.1.1 **IF** 0RLTT7420 (RL Intake Temperature) is operable, obtain reading from chart recorder 0RLCR5060 point (1) (RL Intake Temp (°F)).

1.1.2 **IF** 0RLTT7420 (RL Intake Temperature) is inoperable, perform the following:

NOTE: Temperature read out should be allowed to stabilize before measurement is recorded.

1.1.2.1 Using a calibrated thermometer, obtain the RL intake temperature by grab sample (sample bottle suspended from handrail by rope at NW corner of RL Intake Structure).

1.1.2.2 Return sample bottle to lake. (Ensure sample bottle is totally submerged.)

1.1.3 Record the intake temperature on the attached RL INTAKE TEMPERATURE DATA SHEET.

1.1.4 **IF** OAC is operable, insert the temperature for the current date recorded on the attached RL INTAKE TEMPERATURE DATA SHEET for both of the following points using the Insert Value (INSERT) application:

- C1P1521 (Low Press Service Wtr Inlet Temp - Hr Avg)
- C2P1521 (Low Press Service Wtr Inlet Temp - Hr Avg)

1.1.5 **WHEN** RL intake temperature OAC point **OR** its input device is restored to operable, remove any inserted values from the following OAC point(s):

_____ • C1P1521 (Low Press Service Wtr Inlet Temp - Hr Avg)

_____ • C2P1521 (Low Press Service Wtr Inlet Temp - Hr Avg)

RL INTAKE TEMPERATURE DATA SHEET

DATE TIME/INITIALS	INTAKE TEMP °F	THERMOMETER # CAL. DATE		PROBE #	OAC UPDATED (INITIAL OR N/A	
					C1P1521	C2P1521

1. Procedure

1.1 **IF** OAC point C1P1376 (RL Line A Discharge Temp #1 - Hourly Avg) **AND** C2P1376 (RL Line A Discharge Temp #1 - Hourly Avg) **OR** input device 0RLTT5060 (RL Line A Disch Temp) are inoperable, perform the following steps once per 24 hours while the indication is inoperable:

1.1.1 Using a calibrated thermometer, obtain the RL line A discharge temperature as follows:

1.1.1.1 Obtain the key for RL Discharge Structure Gate 22A from Environmental Chemistry (Water Chemistry Building).

1.1.1.2 At the RL discharge structure, obtain the RL line **A** discharge temperature as follows:

A. Raise the access cover on the structure (when facing the lake A train is on the left).

B. Lower the sample bottle into the discharge pipe.

C. Allow the sample bottle to remain in the pipe for one minute.

NOTE: Temperature readout should be allowed to stabilize before the measurement is recorded.

D. Raise the sample bottle and measure the temperature using the thermometer.

1.1.1.3 Record the "Discharge A Temp" on the attached RL DISCHARGE TEMPERATURE DATA SHEET.

1.1.1.4 Ensure RL Discharge Structure Gate 22A is closed.

1.1.1.5 Ensure RL Discharge Structure Gate 22A is locked.

1.1.1.6 Return the key to Environmental Chemistry.

1.1.2 **IF OAC** is operable, insert the current temperature value from attached RL DISCHARGE TEMPERATURE DATA SHEET for both of the following OAC points using Insert Value (INSERT) application:

- C1P1376 (RL Line A Discharge Temp #1 - Hourly Avg)
- C2P1376 (RL Line A Discharge Temp #1 - Hourly Avg)

1.1.3 **WHEN** the following OAC points **AND** input device 0RLTT5060 (RL Line A Disch Temp) are restored to operable, remove the inserted value from the following OAC point(s):

_____ • C1P1376 (RL Line A Discharge Temp #1 - Hourly Avg)

_____ • C2P1376 (RL Line A Discharge Temp #1 - Hourly Avg)

1.2 **IF** OAC point C1P1377 (RL Line B Discharge Temp #1 - Hourly Avg), **AND** C2P1377 (RL Line B Discharge Temp #1 - Hourly Avg) **OR** input device 0RLTT5070 (RL Line B Disch temp) are inoperable, perform the following steps once per 24 hours while the indication is inoperable:

1.2.1 Using a calibrated thermometer, obtain the RL line B discharge temperature as follows:

1.2.1.1 Obtain the key for RL Discharge Structure Gate 22A from Environmental Chemistry (Water Chemistry Building).

1.2.1.2 At the RL Discharge Structure, obtain the RL line B discharge temperature:

A. Raise the access cover on the structure (when facing the lake B train is on the right).

B. Lower the samplebottle into the discharge pipe.

C. Allow the sample bottle to remain in the pipe for one minute.

NOTE: Temperature readout should be allowed to stabilize before the measurement is recorded.

D. Raise the sample bottle and measure the temperature using the thermometer.

1.2.1.3 Record the "Discharge B Temp" attached RL DISCHARGE TEMPERATURE DATA SHEET.

1.2.1.4 Ensure RL Discharge Structure Gate 22A is closed.

1.2.1.5 Ensure RL Discharge Structure Gate 22A is locked.

1.2.1.6 Return the key to Environmental Chemistry.

1.2.2 **IF** OAC is operable, insert the current temperature value from attached RL DISCHARGE TEMPERATURE DATA SHEET for both of the following OAC points using Insert Value (INSERT) application:

- C1P1377 (RL Line B Discharge Temp #1 - Hourly Avg)
- C2P1377 (RL Line B Discharge Temp #1 - Hourly Avg)

1.2.3 **WHEN** the following OAC points **AND** input device 0RLTT5070 (RL Line B Disch Temp) are restored to operable, remove the inserted value from the following OAC point(s):

_____ • C1P1377 (RL Line B Discharge Temp #1 - Hourly Avg)

_____ • C2P1377 (RL Line B Discharge Temp #1 - Hourly Avg)

RL DISCHARGE TEMPERATURE DATA SHEET

DATE TIME/INITIALS	DISCH A TEMP °F	DISCH B TEMP °F	THERMOMETER # CAL. DATE		PROBE #	OAC UPDATED (INITIAL OR N/A			
						C1P1376	C2P1376	C1P1377	C2P1377

NOTE: Completion of this enclosure is required only when both Units OAC is inoperable for more than 12 hours, and then once per 24 hours until one OAC is restored operable.

1. Procedure

1.1 Determine the variables of the calculation as follows:

1.1.1 Complete Enclosure 13.1 (RL Discharge Flow Determination).

1.1.2 Complete Enclosure 13.4 (RL Intake Temperature Determination).

1.1.3 Complete Enclosure 13.5 (RL Discharge Temperature Determination).

1.2 Calculate RL System Heat Rise.

I.2.1 Record RL Discharge Temperatures from Enclosure 13.5 (RL Discharge Temperature Determination).

A Train _____ °F (RLADT)
B Train _____ °F (RLBDT)

1.2.2 Record RL Discharge Flows from Enclosure 13.2 (Total Discharge Flow Calculation Sheet).

A Train _____ gpm (RLAF)
B Train _____ gpm (RLBF)

1.2.3 Record RL Intake Temperature from Enclosure 13.4 (RL Intake Temperature Determination).

_____ °F (RLIT)

1.2.4 Calculate RL Heat Rise **(AT).**

$$\frac{\left(\frac{\text{RLADT}}{\text{RLAF}} \times \frac{\text{RLBDT}}{\text{RLBF}}\right)}{\left(\frac{1}{\text{RLAF}} + \frac{1}{\text{RLBF}}\right)} - \text{RLIT} = \text{RL Heat Rise (AT)}\ ^\circ\text{F}$$

1.3 Determine whether RL Heat Rise (AT) Step 1.2.4 is less than limits listed:

RL Heat Rise (AT) $\leq$ 10.0°F (Apr. 1 - Sep. 30)
$\leq$ 14.0°F (Oct. 1 - Mar. 31)

NOTE: Cooling Tower blowdown is the largest variable heat load on the RL System.

_____ 1.4 **IF** the RL Heat Rise (AT) is greater than the limits of Step 1.3 (NPDES Permit), notify the Operations Shift Manager that a plant heat load reduction on the RL System is required.

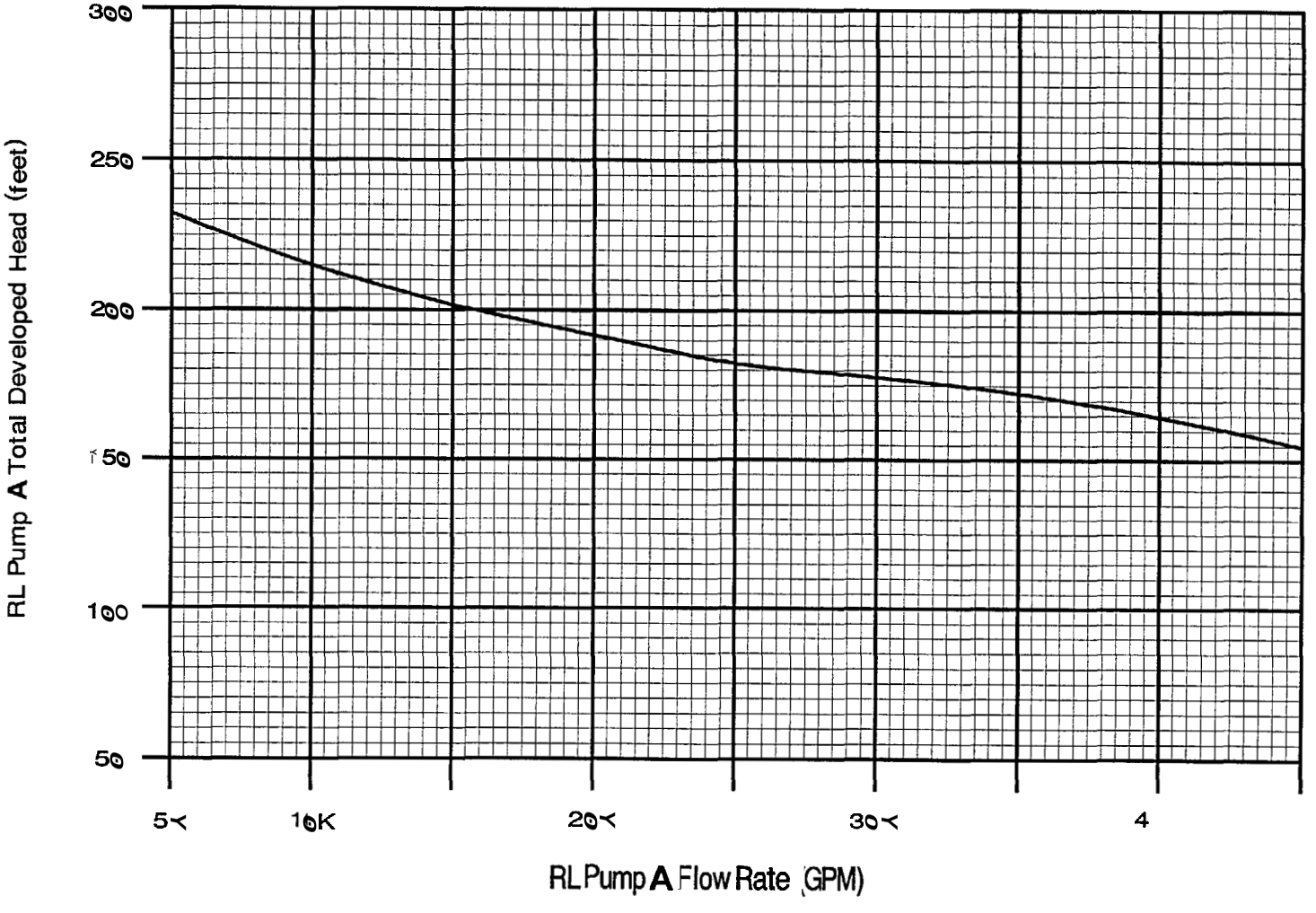
_____ 1.5 Make 2 copies of this enclosure and:

- Attach one copy to the Switchboard Log, page 10.
- Route one copy to the Environmental Management Manager (CN04EM).

Enclosure 13.7

RL Pump Head-Capacity Curve

RL PUMP A HEAD-CAPACITY CURVE

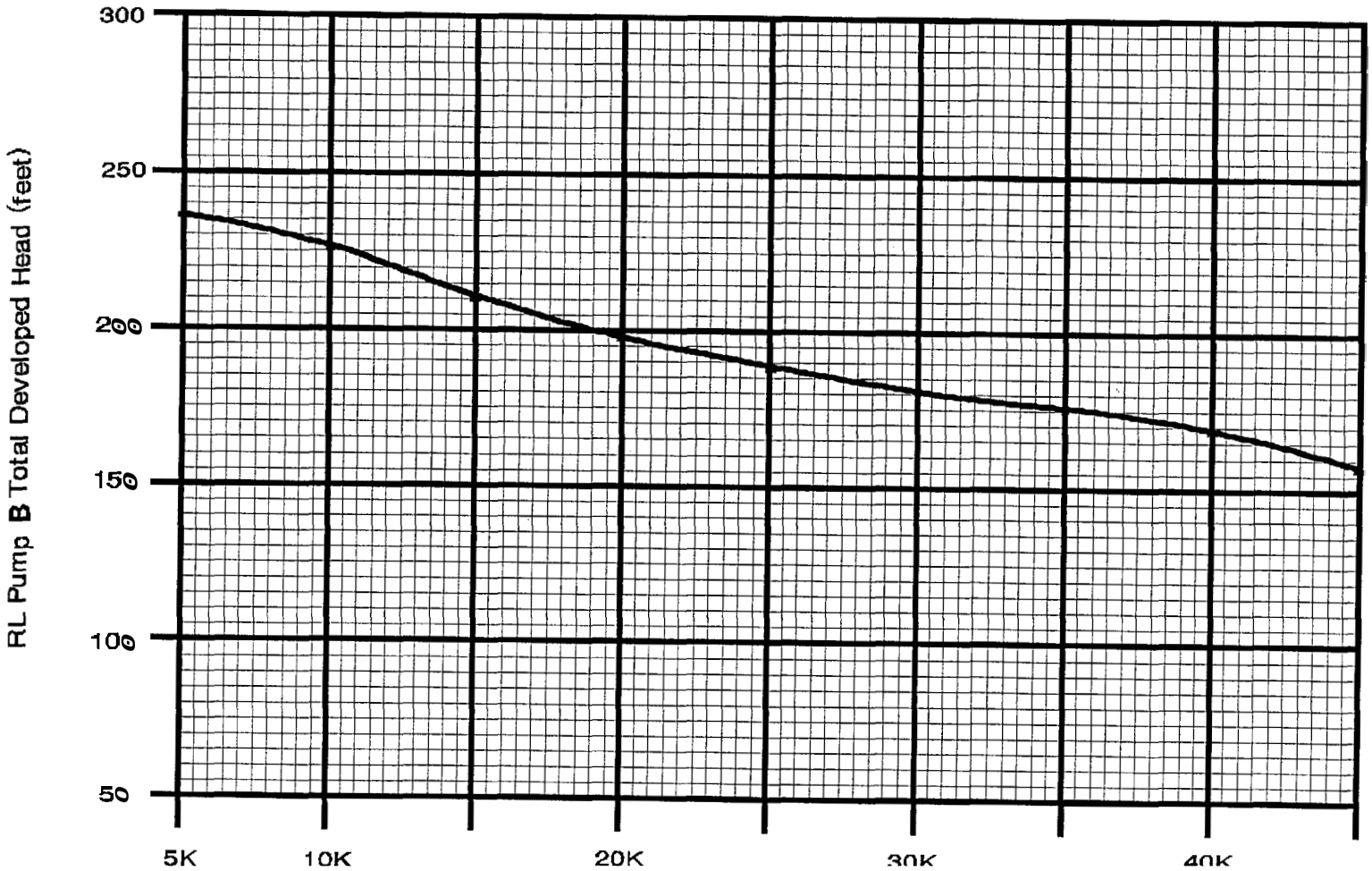


TDH = [Disch Press (psig) x 2.311] + [577.25 - Lake Level Elevation in feet]

Enclosure 13.7

RL Pump Head-Capacity Curve

RL PUMP B HEAD-CAPACITY CURVE

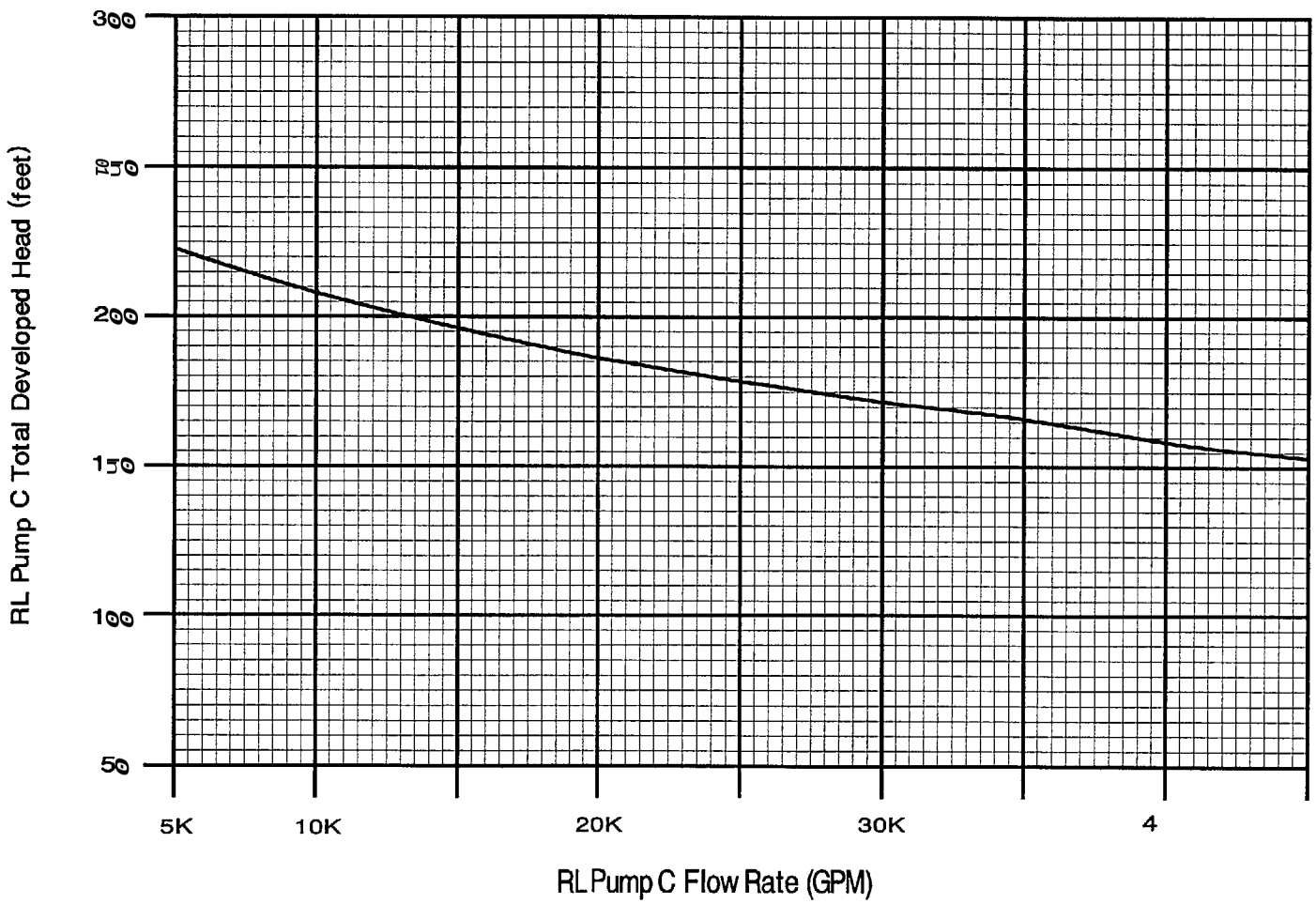


TDH = [Disch Press (psig) x 2.311] + [577.25 - Lake Level Elevation in feet]

Enclosure 13.7

RL Pump Head-Capacity Curve

RL PUMP C HEAD-CAPACITY CURVE



TDH = [Disch Press (psig) x 2.311] + [577.25 - Lake Level Elevation in feet]

LIQUID WASTE RELEASE PERMIT REPORT

LWR Number: 2002130
Release ID: 5 Auxiliary Monitor Tank "A"
Release Mode: 2 Batch
Status: P Pre-Release
Comments:

--- NUCLIDE DATA - INITIAL SAMPLE ---

Nuclide	Undiluted uCi/ml	EC	EC Ratio
CO-57	1.46E-07	6.00E-05	2.43E-03
CO-58	1.66E-05	2.00E-05	8.30E-01
CO-60	2.17E-06	3.00E-06	7.23E-01
Gamma	1.89E-05		
H-3	5.00E-01	1.00E-03	5.00E+02
Beta	5.00E-01		
Total	5.00E-01		5.02E+02

LIQUID WASTE RELEASE PERMIT REPORT

LWR Number: 2002130

--- RL PUMP DATA ---
RL pumps assigned to release..... 1.00

--- RECOMMENDED RELEASE RATE ---
Allowable release rate (gpm)..... 3.86E+02
Recommended release rate (gpm)..... 2.50E+02

--- SETPOINT DATA ---
EMF57L in Service ..... Yes
EMF57L Background (cpm)..... 6.03E+03

Cs-137 Equivalence (uCi/ml)..... 2.89E-05
Expected CPM..... 8.34E+03
Trip 1 setpoint (cpm)..... 8.40E+04
Trip 2 setpoint (cpm)..... 1.20E+05

--- SPECIAL INSTRUCTIONS FOR RELEASE ---
RECOMMENDED RL FLOW INTERLOCK: ~~5,000~~ 18,850 19000 GPM.

Conservative Interlock / Release rate needed for dilution for boron

Performed by: _____ Date: 11-6-02

Verified by: _____ Date: 11-6-02

SRO Admin: Job Performance Measures

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM 1SR/ADMIN

Perform a Manual Shutdown Margin Calculation
(Unit at Power)

CANDIDATE _____

EXAMINER _____

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Perform a manual shutdown margin calculation (Unit at Power)

Alternate Path:

N/A

Facility JPM #:

OP-CN-RT-RB-121 (Modified)

K/A Rating(s):

2.1.25 (2.8/3.1)

Task Standard:

Determine that adequate shutdown margin exists per Technical Specifications.

Preferred Evaluation Location:

Simulator ___X___ In-Plant ___X___

Preferred Evaluation Method:

Perform ___X___ Simulate _____

References:

OP/0/A/6100/006 Reactivity Balance Calculation Enclosure 4.3 Revision 64

ROD Book Section 5

Validation Time: 20 minutes **Time Critical:** No

==========

Candidate: _____ Time Start : _____
NAME Time Finish: _____

Performance Rating: SAT _____ UNSAT _____ Performance Time _____

Examiner: _____ _____ I _____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

Tools/Equipment/Procedures Needed:

OP/0/A/6100/006 Reactivity Balance Calculation Enclosure 4.3
ROD Book Section 5

READ TO OPERATOR

DIRECTION TO TRAINEE:

I will explain the initial conditions, and state the task to be performed. **All** control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

You are the Unit 1 Balance of Plant operator. You have just been informed by the Control Room SRO that the following rods are determined to be untrippable:

- B-4
- c-7

Current Plant Conditions:

Present Thermal Power Best Estimate	97.75%
Present Cycle Burnup	277 EFPD
Present Control Bank Position	215 steps Bank "D"
Present Shutdown Bank Positions	All Banks at 226 Steps
Present Boron Concentration	779 ppm

INITIATING CUE:

Perform a Manual Shutdown Margin Calculation for these untrippable rods per OP/0/A/6100/006 (Reactivity Balance Calculation) and determine if adequate shutdown margin exists.

Start Time:

STEP 1: Performs Section 2.3 and N/A's Section 2.2. STANDARD: Step 2.2 marked N/A. COMMENTS:	___SAT ___UNSAT
STEP 2: Record data required in step 2.3. STANDARD: Operator determines the following using the initial conditions.; Unit: **1** Datemime: **Present Datemime** Present Thermal Power, Best Estimate: **97.75%** Present Cycle Burnup: **277 EFPD** Present Control Bank Position: 215 SWD, Control Bank D Number of untrippable RCCA(s): **64 and C7** COMMENTS:	___SAT ___UNSAT
STEP 3: Determine total available rod worth. STANDARD: Determine total available rod worth to be **4879 pcm** per section 5.7 of R.O.D. Manual. COMMENTS:	___SAT ___UNSAT
STEP 4: Determine there are multiple untrippable RCCAs. STANDARD: N/A steps 2.4.3 and 2.4.4. COMMENTS:	___SAT ___UNSAT

STEP 5: Determine location of highest reactivity worth RCCA and its reactivity worth penalty.. STANDARD: Determines RCCA **C7** Rod worth is **263 pcm** per section **5.8** *of* the R.O.D. Manual. COMMENTS:	___SAT ___UNSAT
STEP 6: Determine maximum stuck rod worth during cycle. STANDARD: Determines maximum stuck rod worth during cycle is **970 pcm** per section **5.7** *of* the R.O.D. Manual. COMMENTS:	___SAT ___UNSAT
3TEP 7: Calculate total untrippable RCCA reactivity worth penalty. STANDARD: Calculates a penalty: {[2-1] X 970pcm} + 263pcm = **1233** pcm COMMENTS:	___SAT ___UNSAT
STEP 8: Calculate inserted reactivity worth of rods. STANDARD: Determines: Worth of Control Banks HFP, Eq Xenon IRW: **12 pcm** Worth of Shutdown Banks HFP Eq Xenon IRW: **0 pcm** Inserted Worth of Present Position **12 pcm**. COMMENTS:	___SAT ___UNSAT

STEP 9: Calculate available reactivity worth of trippable rods. STANDARD: Determines: Total available rod worth **4879 pcrn** Untrippable RCCA penalty **1233 pcm** Inserted Rod Worth **12 pcm** Available Worth of Trippable RCCA's: **3634 pcm** COMMENTS:	___SAT ___UNSAT
STEP 10: Calculate total misaligned RCCA reactivity worth. STANDARD: Determines: Quantity of Misaligned Rods: **0 pcm** Maximum Dropped or Misaligned Rod Worth: **200 pcm** Total Misaligned RCCA Worth: **0 pcm** COMMENTS:	
STEP 11: Calculate SDM for present conditions. STANDARD: Determines: Available Worth of trippable RCA's: **3634 pcrn** Total Misaligned RCCA Worth: **0 pcrn** Total Power Defect **1882 pcm** Transient Flux Redistribution Allowance: **340 pcrn** Present SDM: **1412 pcm** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT

STEP 12: Ensure Present **SDM** equal to greater than 1300 PCM. STANDARD: Determines present SDM is greater than 1300 pcm. COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT

TIME STOP: _____

CANDIDATE CUE SHEET
(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

You are the Unit 1 Balance of Plant operator. You have just been informed by the Control Room SRO that the following rods are determined to be untrippable:

- B-4
- c-7

Present Thermal Power Best Estimate	97.75%
Present Cycle Burnup	277 EFPD
Present Control Bank Position	**215** steps Bank "D"
Present Shutdown Bank Positions	All Banks at 226 Steps
Present Boron Concentration	779 ppm

INITIATING CUE:

Perform a Manual Shutdown Margin Calculation for these untrippable rods per OP/0/A/6100/006 (Reactivity Balance Calculation) and determine if adequate shutdown margin exists.

Key

Enclosure 4.3

Shutdown Margin - Untrippable RCCA(S) - Modes 1 & 2

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

2.1 **IF** performing a MANUAL calculation, N/A Step 2.2.

N/A 2.2 Perform the following steps if using the REACT program to complete the calculation:

2.2.1 Access Reactivity Balance Program per Enclosure 4.7.

2.2.2 Select "View" then "Reactivity Balance Calculations" on toolbar.

2.2.3 Select "SDM – Mode 1 or 2" tab in Reactivity Balance Calculations window.

NOTE:
1. Sign must be provided with Difference from Equilibrium Samarium [i.e., ( ) ___ pcm].
2. "Quantity of Misaligned Rods" refers to rods that are misaligned but remain OPERABLE (trippable). Only the total number of rods is required.
3. Input inoperable (untrippable) control rods by clicking "Select Inoperable Rods" and input any inserted shutdown banks using "Shutdown Banks Inserted" tab.

2.2.4 Enter appropriate values as prompted.

2.2.5 Click Calculate, print program results, label appropriately, and attach to this enclosure.

2.2.6 Ensure Effective Shutdown Margin for Present Position is greater than Required Shutdown Margin.

2.2.7 Ensure that a separate, independent calculation has been performed per steps 2.2.1 through 2.2.6.

2.2.8 Verify that both attachments to this enclosure yield the same results.

2.2.9 N/A the rest of this enclosure (steps 2.3 through 2.7).

Performed By: _____ Date/Time: ____/____

Verified By: _____ Date/Time: ____/____

Shutdown Margin - Untrippable RCCA(S) - Modes 1 & 2

NOTE:
1. In Modes 1 or 2 with all RCCA's trippable, shutdown margin is satisfied provided control banks are positioned above the Control Rod Insertion limits in Section 2.2 of the R.O.D. manual.
2. Assume all values are positive unless otherwise indicated by parentheses. **IF** parentheses precede the value [i.e. ( )_____ pcm], record the sign provided with data. The calculations account for these sign conventions.

2.3 Determine

Step	Description	Reference	Value
2.3.1	Unit	N/A	1
2.3.2	Date/Time	N/A	Present
2.3.3	Present Thermal Power, Best Estimate	P1385	97.75 %
2.3.4	Present cycle burnup	P1457 or Reactor Group Duty Engineer	277 EFPD
2.3.5	Present control bank position	N/A	215 SWD on Control Bank D
2.3.6	Present shutdown bank position	N/A	A 226 B 226 C 226 D 226 E 224
2.3.7	Quantity of misaligned rods	N/A	0
2.3.8	Number of untrippable RCCA(s)	N/A	2
2.3.9	Untrippable RCCA(s) core location(s).	N/A	B4, F7

2.4 Determine available reactivity worth of trippable RCCA's for present conditions:

2.4.1 Determine Total Available Rod Worth (Section 5.7 of R.O.D. manual) 4879 pcm

2.4.2 **IF** there are multiple untrippable RCCA's, N/A steps **2.4.3** and 2.4.4

N/A 2.4.3 Determine reactivity worth penalty for untrippable RCCA core location of Step 2.3.9 (Section 5.8 of R.O.D. manual). _____ pcm

N/A 2.4.4 N/A steps 2.4.5 through 2.4.8.

2.4.5 Determine untrippable RCCA of Step 2.3.9 with the highest reactivity worth penalty(Section 5.8 of ROD Manual). Core Location C7

2.4.6 Record reactivity worth of the untrippable RCCA of Step 2.4.5 (Section 5.8 of ROD Manual). 263 pcm

2.4.7 Determine maximum stuck rod worth during cycle (Section 5.7 of the R.O.D. manual). 970 pcm

2.4.8

Description	Reference	Value
A.Number of Untrippable RCCA's	Step 2.3.8	2 pcm
B.Max Stuck Rod	Step 2.4.7	970 pcm
C. Highest Worth Penalty	Step 2.4.6	263 pcm
Total untrippable RCCA Worth Penalty for Multiple RCCA's	**{ [(A) - 1] X (B) } + (C)**	1233 **pcm**

2.4.9 _____

NOTE: Interpolation is not required in step 2.4.10. Reactivity worth may be determined by choosing the highest reactivity worth from Section 5.6 of the R.O.D Manual associated with rod positions that bound the present rod position.

2.4.10 Determine Inserted Rod Worth for present bank positions:

Description	Reference	Value
A. HFP, Eq Xenon IRW for current control bank position	Step 2.3.5	12 pcm
B. HFP, Eq Xenon IRW for current shutdown bank positions	Step 2.3.6	A 0 pcm B 0 pcm C 0 pcm D 0 pcm E 0 pcm
Inserted Worth of Present Position	**Sum of above**	12 **pcm**

2.4.11

Description	Reference	Value
A. Total Available Rod Worth	Step 2.4.1	4979 pcm
B. Untrippable RCCA's Penalty	Step 2.4.9	1233 pcm
C. Inserted Worth of Present Position	Step 2.4.10	12 pcm
Available Worth of Trippable RCCA's	**(A) - (B) - (C)**	3634 **pcm**

Description	Reference	Value
A. Quantity of Misaligned Rods	Step 2.3.7	0
B. Maximum Dropped or Misaligned Rod Worth	ROD Manual Section 5.7	200 pcm
Total misaligned RCCA Worth	**A*B**	0 **pcm**

NOTE: Interpolation of Power Defect is not required for step 2.5. Bounding burnups and power levels may be used to select the highest Power Defect from section 5.9 of the R.O.D. manual.

CAUTION: SDM shall be within the limits specified by the COLR per Tech Spec 3.1.1.

Description	Reference	Value
A. Available worth of Trippable RCCA's	Step 2.4.11	3634 pcm
B. Total misaligned RCCA Worth	Step 2.4.12	0 pcm
C. Total Power Defect at present thermal power (Step 2.3.3) and cycle burnup (Step 2.3.4)	Section 5.9 of R.O.D. manual	
D. Transient Flux Redistribution Allowance	Section 5.7 of R.O.D. manual	340
Present SDM	**(A) - (B) - (C) - (D)**	(+) 1412 **pcm**

2.6 Ensure Present SDM is ≥ 1300 pcm. (TS 3.1.1 via COLR)

NOTE: Separate, independent calculation must be performed by the verifier.

2.7 Sign the appropriate space below. N/A the unsigned space.

Performed By: _____ Datemime: _____/_____

Verified By: _____ Date/Time: _____/_____

Duke Power Company
Catawba Nuclear Station

Reactivity Balance Calculation

Continuous Use

Procedure No.
OP/0/A/6100/006

Revision No.
064

Electronic Reference No.
CN0092MR

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

Reactivity Balance Calculation

1. Purpose

1.1 To estimate critical NC System boron concentration before criticality based on other assumed core reactivity conditions.

1.2 To estimate critical control bank position before criticality based on other assumed core reactivity conditions.

1.3 To calculate shutdown margin in Modes 1 and 2 with UNTRIPPABLE RCCA's (ITS 3.1.4)

1.4 To calculate the NC System boron concentration at which shutdown margin will **NOT** be met in Modes 2 (with K-eff < 1.0), 3, 4, and 5. (ITS 3.1.1)

1.5 To verify K-eff < 0.99 with shutdown banks withdrawn.

1.6 To calculate the NC System boron concentration at which refueling boron concentration will **NOT** be met in Mode 6. (ITS 3.9.1)

2. Limits and Precautions

NOTE:	All curves/tables used in this procedure are found in Unit One (Two) Reactor Operating Data (R.O.D.) manual.

2.1 Ensure all data used by this procedure are for the correct unit.

2.2 NC System T-AVG should be maintained within ±1 °F of T-REF in Modes 1 and 2 to reduce uncertainties in calculations.

2.3 Shutdown margin (SDM) shall be 21000 pcm in Mode 5. (Tech Spec 3.1.1 and Enclosure 4.4)

2.4 SDM shall be 21300 pcm in Modes 1, 2, 3, and 4. (Tech Spec 3.1.1 and Enclosure 4.3, or 4.4)

2.5 Required refueling boron concentration is obtained from Tech Spec 3.9.1 and Enclosure 4.6.

2.6 IF T-AVG <500 °F, credit for only 50% of xenon worth can be taken for verifying SDM.

2.7 NC System boron concentration shall be ≥ required boron concentration for SDM at a new NC System T-AVG before beginning NC System T-AVG changes in Modes 3, 4, and 5.

2.8 Criticality shall **NOT** be obtained outside the maximum window (±750 pcm) of estimated critical control bank position.

2.9 Desired critical control bank position shall **NOT** be below the control bank insertion limits **OR** above **any** temporary control bank withdrawal limits.

2.10 Verification of K-eff < 0.99 with shutdown banks withdrawn shall only be performed above 200 °F.

2.11 REACT and manual calculations may **NOT** yield equal results due to minor differences in methods (ie interpolation). Reactor Engineering should be contacted if questions arise.

3. Procedure

3.1 For estimated critical NC System boron concentration (ECB), refer to Enclosure 4.1.

3.2 For estimated critical control bank position (ECP) refer to Enclosure 4.2.

3.3 For SDM calculation with untrippable RCCA's, refer to Enclosure 4.3.

3.4 For SDM verification in Modes 5, 4, 3, or 2 (with K-eff < 1.0), (with or without xenon credit), refer to Enclosure 4.4.

3.5 For Verification of K-eff < 0.99 with shutdown banks withdrawn, refer to Enclosure 4.5.

3.6 For refueling boron concentration verification in Mode 6, refer to Enclosure 4.6.

3.7 For instructions on running REACT computer program, refer to Enclosure 4.7.

3.8 For Shutdown Fission Product Correction Factor, refer to Enclosure 4.8.

4. Enclosures

4.1 Estimated Critical Boron Concentration (ECB).

4.2 Estimated Critical Control Bank Position (ECP).

4.3 Shutdown Margin - Modes 1 and 2 - Untrippable RCCA(s).

4.4 Shutdown Margin - (With or Without Xenon Credit).

4.5 Verification of K-eff < 0.99 with Shutdown Banks Withdrawn

4.6 Shutdown Boron Concentration - Mode 6.

4.7 REACT Computer Program Directions.

4.8 Shutdown Fission Product Correction Factor

Estimated Critical Boron Concentration (ECB)

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

NOTE: 1. Assume all values are positive unless otherwise indicated by parentheses. **IF** parentheses precede the value [i.e.( )_____pcm], enter the sign provided with data. The calculations account for these sign conventions.

2. All ECB calculations must be performed independently by a Qualified Reactor Engineer and a Licensed Operator.

2.1 **IF** cycle burnup is > 12 EFPD, perform Enclosure 4.8 to determine Shutdown Fission Product Correction Factor.
Shutdown Fission Product Correction Factor _____ppm

2.2 Access Reactivity Balance Program per Enclosure 4.7.

2.3 Select "View" then "Reactivity Balance Calculations" on toolbar.

2.4 Select ECB (Estimated Critical Boron Concentration) tab in Reactivity Balance Calculations window.

NOTE: 1. Sign must be provided with Difference from Equilibrium Samarium [i.e., ( ) ___ pcm].

2.5 Enter appropriate values as prompted.

2.6 Enter a desired critical rod position at least 1000 pcm above HZP Rod Insertion Limit (Section 2.2 of ROD Manual).

2.7 Click Calculate, print program results, label appropriately, and attach to this enclosure.

2.8 Ensure that separate, independent calculation has been performed per steps 2.1 through 2.7.

2.9 Verify that both attachments to this enclosure yield the same result.

Licensed Operator: _____ Date/Time: _____/_____

Reactor Engineer: _____ Datemime: _____/_____

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

NOTE: 1. Assume all values are positive unless otherwise indicated by parentheses. **IF** parentheses precede the value [i.e.( )_____pcm], enter the sign provided with data. The calculations account for these sign conventions.

2. All ECP calculations must be performed independently by a Qualified Reactor Engineer and a Licensed Operator.

2.1 **IF** cycle burnup is > 12 EFPD, perform Enclosure **4.8** to determine Shutdown Fission Product Correction Factor.
Shutdown Fission Product Corrrection Factor _____ppm

2.2 Access Reactivity Balance Program per Enclosure 4.7.

2.3 Select "View" then "Reactivity Balance Calculations" on toolbar.

2.4 Select ECP (Estimated Critical Control Bank Position) tab in Reactivity Balance Calculations window.

NOTE: 1. Sign must be provided with Difference from Equilibrium Samarium [i.e., ( )___ pcm].

2.5 Enter appropriate values as prompted.

2.6 Click Calculate and verify that Rod Insertion Limits and (if applicable) Rod Withdrawal Limits will **NOT** be violated based on ECP results.

2.7 Print program results, label appropriately, and attach to this enclosure.

2.8 Ensure that separate, independent calculation has been performed per steps 2.1 through 2.7.

2.9 Verify that both attachments to this enclosure yield the same results.

Licensed Operator:_____ Date/Time: _____/_____

Reactor Engineer: _____ Date/Time: _____/_____

Shutdown Margin - Untrippable RCCA(S) - Modes 1 & 2

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

2.1 **IF** performing a MANUAL calculation, N/A Step 2.2.

2.2 Perform the following steps if using the REACT program to complete the calculation:

2.2.1 Access Reactivity Balance Program per Enclosure 4.7.

2.2.2 Select "View" then "Reactivity Balance Calculations" on toolbar.

2.2.3 Select "SDM – Mode 1 or 2" tab in Reactivity Balance Calculations window.

NOTE:
1. Sign must be provided with Difference from Equilibrium Samarium [i.e., ( ) ___ pcm].
2. ''Quantityof Misaligned Rods" refers to rods that are misaligned but remain OPERABLE (trippable). Only the total number of rods is required.
3. Input inoperable (untrippable) control rods by clicking "Select Inoperable Rods" and input any inserted shutdown banks using "Shutdown Banks Inserted" tab.

2.2.4 Enter appropriate values as prompted.

2.2.5 Click Calculate, print program results, label appropriately, and attach to this enclosure.

2.2.6 Ensure Effective Shutdown Margin for Present Position is greater than Required Shutdown Margin.

2.2.7 Ensure that a separate, independent calculation has been performed per steps 2.2.1 through 2.2.6.

2.2.8 Verify that both attachments to this enclosure yield the same results.

2.2.9 N/A the rest of this enclosure (steps 2.3 through 2.7).

Performed By: _____ Date/Time: _____/_____

Verified By: _____ Date/Time: _____/_____

NOTE:
1. In Modes 1 or 2 with all RCCA's trippable, shutdown margin is satisfied provided control banks are positioned above the Control Rod Insertion limits in Section 2.2 of the R.O.D. manual.
2. Assume all values are positive unless otherwise indicated by parentheses. **IF** parentheses precede the value [i.e. (_____ pcm], record the sign provided with data. The calculations account for these sign conventions.

Step	Description	Reference	Value
2.3.1	Unit	N/A	
2.3.2	Date/Time	N/A	
2.3.3	Present Thermal Power, Best Estimate	P1385	%
2.3.4	Present cycle burnup	P1457 or Reactor Group Duty Engineer	EFPD
2.3.5	Present control bank position	N/A	_____ SWD on Control Bank_____
2.3.6	Present shutdown bank position	N/A	A _____ B _____ C _____ D _____ E _____
2.3.7	Quantity of misaligned rods	N/A	
2.3.8	Number of untrippable RCCA(s)	N/A	
2.3.9	Untrippable RCCA(s) core location(s).	N/A	

2.4 Determine available reactivity worth of trippable RCCA's for present conditions:

2.4.1 Determine Total Available Rod Worth (Section 5.7 of R.O.D. manual) _____ pcm

2.4.2 **IF** there are multiple untrippable RCCA's, N/A steps 2.4.3 and 2.4.4

2.4.3 Determine reactivity worth penalty for untrippable RCCA core location of Step 2.3.9 (Section 5.8 of R.O.D. manual). _____ pcm

2.4.4 N/A steps 2.4.5 through 2.4.8.

2.4.5 Determine untrippable RCCA of Step 2.3.9 with the highest reactivity worth penalty(Section 5.8 of ROD Manual). Core Location _____

2.4.6 Record reactivity worth of the untrippable RCCA of Step 2.4.5 (Section 5.8 of ROD Manual). _____ pcm

2.4.7 Determine maximum stuck rod worth during cycle (Section 5.7 of the R.O.D. manual). _____ pcm

2.4.8 Calculate total untrippable RCCA reactivity worth penalty below:

Description	Reference	Value
A.Number of Untrippable RCCA's	Step 2.3.8	pcm
B.Max Stuck Rod	Step 2.4.7	pcm
C. Highest Worth Penalty	Step 2.4.6	pcm
Total untrippable RCCA Worth Penalty for Multiple RCCA's	**{ [(A) - 1] X (B) } + (C)**	**pcm**

2.4.9 Record Total Untrippable RCCA Penalty from Step 2.4.3 or Step 2.4.8, whichever is applicable. _____ pcm

NOTE: Interpolation is not required in step 2.4.10. Reactivity worth may be determined by choosing the highest reactivity worth from Section 5.6 of the R.O.D Manual associated with rod positions that bound the present rod position.

Description	Reference	Value
A. HFP, **Eq** Xenon IRW for current control bank position	Step 2.3.5	_____ pcm
B. HFP, **Eq** Xenon IRW for current shutdown bank positions	Step 2.3.6	A _____ pcm B _____ pcm C _____ pcm D _____ pcm E _____ pcm
Inserted Worth of Present Position	**Sum of above**	**pcm**

2.4.11

Description	Reference	Value
A. Total Available Rod Worth	Step 2.4.1	pcm
B. Untrippable RCCA's Penalty	Step 2.4.9	ncm
C. Inserted Worth of Present Position	Step 2.4.10	pcm
Available Worth of Trippable RCCA's	**(A) - (B) - (C)**	**pcm**

2.4.12 Calculate total misaligned RCCA reactivity worth below:

Description	Reference	Value
A. Quantity of Misaligned Rods	Step 2.3.7	
B. Maximum Dropped or Misaligned Rod Worth	ROD Manual Section 5.7	pcm
Total misaligned RCCA Worth	**A*B**	**acm**

NOTE: Interpolation of Power Defect is not required for step 2.5. Bounding burnups and power levels may be used to select the highest Power Defect from section 5.9 of the R.O.D. manual.

CAUTION: SDM shall be within the limits specified by the COLR per Tech Spec 3.1.1.

2.5 Calculate SDM for present conditions:

Description	Reference	Value
A. Available worth of Trippable RCCA's	Step 2.4.1 1	pcm
B. Total misaligned RCCA Worth	Step 2.4.12	pcm
C. Total Power Defect at present thermal power (Step 2.3.3) and cycle burnup (Step 2.3.4)	Section 5.9 of R.O.D. manual	pcm
D. Transient Flux Redistribution Allowance	Section 5.7 of R.O.D. manual	
Present SDM	**(A) - (B) - (C) - (D)**	**pcm**

2.6 Ensure Present SDM is ≥ 1300 pcm. (TS 3.1.1 via COLR)

NOTE: Separate, independent calculation must be performed by the verifier.

2.7 **Sign** the appropriate space below. N/A the unsigned space.

Performed By: _____ DateITime: _____/_____

Verified By: _____ DateITime: _____/_____

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

2.1 **IF** performing a MANUAL calculation, N/A Step 2.2.

2.2 Perform the following steps if using the REACT program to complete the calculation:

2.2.1 Access Reactivity Balance Program per Enclosure 4.7.

2.2.2 Select "View" then "Reactivity Balance Calculations" on toolbar.

NOTE: "SDM – Mode 5, 4, or 3" option also applies to Mode 2 with K-eff < 1.0.

2.2.3 Select "SDM – Mode 5, 4, or 3" tab in Reactivity Balance Calculations window.

NOTE:
1. Sign must be provided with Difference from Equilibrium Samarium [i.e., ( ) ___ pcm].
2. In REACT, "Inoperable RCCAs" refers to untrippable RCCAs.
3. Rod locations are put in REACT in a text only format (e.g. B12 or B-12). REACT uses the maximum stuck rod worth for all known untrippable RCCAs.

2.2.4 Enter appropriate values as prompted.

2.2.5 Click Calculate, print program results, label appropriately, and attach to this enclosure.

2.2.6 Compare required boron concentration to present boron concentration.

2.2.7 **IF** Xenon Credit was selected **AND** a potential boron deficit is indicated in the calculation results, complete the following steps:

A. Record "Adjusted SDM Deficit" from Reacivity Balance Calculation output: _____ pcm

B. Select "View" then "Xenon/Samarium Calculations" on toolbar.

C. Select "Xenon" for Isotope and "Transient Prediction" for Calculation Type.

D. Enter initial concentrations. These can be obtained from the OAC or Reactor Engineering. The **OAC** point id's for these concentrations are C1(2)P0125 and C1(2)P0124.

E. Enter appropriate power history.

F. Print program results, label appropriately, and attach to this enclosure.

NOTE: Adequate SDM exists when Xenon worth from Xenon predict calculation equals or exceeds adjusted SDM deficit recorded in step 2.2.7.A.

2.2.8 Ensure that a separate, independent calculation has been performed per steps 2.2.1 through 2.2.7.

2.2.9 Verify that both attachments to this enclosure yield the same results.

2.2.10 N/A the rest of this enclosure (steps 2.3 through 2.9).

Performed By: _____ Datemime: _____/_____

Verified By: _____ Datemime: _____/_____

NOTE: Assume all values are positive unless otherwise indicated by parentheses. **IF** parentheses precede the value [i.e. ( )_____ pcm], record the sign provided with data. The calculations account for these sign conventions.

Step	Description	Reference	Value
2.3.1	Unit	N/A	
2.3.2	Date/Time	N/A	
2.3.3	Present NC System Boron Conc	N/A	ppm
2.3.4	Present NC System T-AVG	N/A	" F
2.3.5	Desired NC System T-AVG	N/A	" F
2.3.6	Present cycle burnup	P1457 or Duty Reactor Engineer	EFPD
2.3.7	Present Difference from Equilibrium Samarium Worth	P1475 or Duty Reactor Engineer	( ) pcm
2.3.8	Date and time of latest valid Iodine and Xenon concentrations. N/A if xenon free.	Duty Reactor Engineer or current time if using OAC	/
2.3.9	Iodine concentration at time listed in step 2.3.8; 0 if xenon free.	P0124 or Duty Reactor Engineer	atm/cc
2.3.10	Xenon concentration at time listed in step 2.3.8; 0 if xenon free.	P0125 or Duty Reactor Engineer	atm/cc

NOTE: Interpolation is not required for step 2.4. Bounding temperatures and burnups may be used to select the highest boron concentration in Section 5.11 of R.O.D manual.

2.4 Select the highest boron concentration for the T-AVG's between _____ ppm the range of Step 2.3.4 and Step 2.3.5 at current cycle burnup (Step 2.3.6) in Section 5.11 of the R.O.D. manual. (PIP 0-C99-0318)

2.5 Calculate additional boron concentration penalties:

2.5.1 Calculate untrippable RCCA penalty:

Description	Reference	Value
A. Number of Untrippable RCCA(s) not fully inserted	N/A	
B. Boron Penalty per Untrippable rod	N/A	160 ppm
Untrippable RCCA Penalty	**(A) X (B)**	ppm

2.5.2 Enter Zero Power Physics Testing penalty; 100 ppm if physics testing is not complete, otherwise, enter 0 ppm. _____ ppm

2.5.3 Calculate total additional boron concentration penalty:

Description	Reference	Value
A. Untrippable RCCA Penalty	Step 2.5.1	ppm
B. Additional Boron Conc Penalty for ZPPT	Step 2.5.2	ppm
Total Boron Penalty	**(A) + (B)**	ppm

Description	Reference	Value
A. Required SDM Boron	Step 2.4	ppm
B. Total Boron Penalty	Step 2.5.3	ppm
Total Required Boron Concentration for SDM (Xenon Free)	**(A) + (B)**	ppm

2.7 Determine the Boron Difference between Required Boron Concentration for SDM and current NC System boron concentration.

Description	Reference	Value
A. Total Required Boron Concentration for SDM	Step 2.6	ppm
B. Present NC System Boron Concentration	Step 2.3.3	ppm
Boron Difference	**(A) - (B)**	**ppm**

2.7.1 **IF** Boron Difference (Step 2.7) is negative, N/A Step 2.8.

2.8 Determine the Xenon Credit as follows:

NOTE: Interpolation is not required for step 2.8.1. Bounding NC System T-AVG and cycle burnup may be used to select the highest Differential Boron Worth from Section 5.3 of R.O.D manual.

2.8.1 Determine the **ARI,** Differential Boron Worth at lower T-AVG of Step 2.3.4 or 2.3.5 **AND** cycle burnup of step 2.3.6 from Section 5.3 of the R.O.D. manual. _____ pcm/ppm

2.8.2 Calculate the reactivity worth of the boron difference:

Description	Reference	Value
A. Boron Difference	Step 2.7	ppm
B. **ARI** Differential Boron Worth	Step 2.8.1	pcm/ppm
Reactivity Worth of Boron Difference	**(A) X (B)**	**pcm**

2.8.3 Calculate the xenon worth that is required to ensure SDM at the present NC System boron.

A. **IF** T-AVG is ≥ 500 ° **F,** calculate the Xenon Worth as follows:

Description	Reference	Value
A. Reactivity Worth	Step 2.8.2	pcm
B. Difference from **Eq** Sm Worth	Step 2.3.7	O pcm
Xenon Worth	**((A) - (B)) / 0.85**	**pcm**

B. IF T-AVG is < 500 ° **F,** calculate the Xenon Worth as follows:

Description	Reference	Value
A. Reactivity Worth	Step 2.8.2	pcm
B. Difference from Eq Sm Worth	Step 2.3.7	( ) pcm
Xenon Worth	**{(A) - (B)} X 2**	**pcm**

2.8.4 Predict Xenon for approximately two days into the future using OAC Xenon Predict Program or REACT program (per Enclosure 4.7) and data from 2.3.1 through 2.3.10.

NOTE: SDM is ensured between the Dates/Times of step 2.8.5 at the present NC System boron or higher. After the Date/Time of xenon decay of step 2.8.5, NC System boration will be required to maintain SDM.

2.8.5 Interpolate the Dates/Times from the xenon predict of step 2.8.4 that equal the xenon worth of step 2.8.3.

xenon build-in _____/_____

xenon decay _____/_____

NOTE: Separate, independent calculation must be performed by the verifier.

2.9 Sign the appropriate space below. **N/A** the unsigned space.

Performed By: _____ Date/Time: _____/_____

Verified By: _____ DateITime: _____/_____

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

NOTE: Assume all values are positive unless otherwise indicated by parentheses. **IF** parentheses precede the value [i.e.( )_____pcm], enter the sign provided with data. The calculations account for these sign conventions.

2.1 **IF** cycle burnup is > 12 EFPD, perform Enclosure **4.8** to determine Shutdown Fission Product Correction Factor.

Shutdown Fission Product Correction Factor _____ppm

2.2 Access Reactivity Balance Program per Enclosure **4.7.**

2.3 Select "View" then "Reactivity Balance Calculations" on toolbar.

2.4 Select "Mode 3 Verification" tab in Reactivity Balance Calculations window.

NOTE: 1. Sign must be provided with Difference from Equilibrium Samarium [i.e.( )_____pcm].

2.5 Enter appropriate values as prompted.

2.6 Click calculate, print program results, label appropriately, and attach to this enclosure.

2.7 Compare current boron concentration to required.

2.8 **IF** Xenon Worth is **NOT** zero **AND** Potential Mode 2 Boron Deficit is negative, obtain and attach printout of Xenon Predict from OAC program or REACT program for current and future xenon worth.

2.9 Record date and time Adjusted Mode 2 Deficit equals value of Xenon Worth on printout attached per Step 2.8. Mode 3 shall be maintained until this date and time. Prior to exceeding this date and time, boration will be required to maintain Mode 3 k-eff <0.99 with shutdown banks withdrawn.

Date _____ Time _____

2.10 Ensure that separate, independent calculation has been performed per steps 2.1 - 2.9.

2.11 Verify that attachments to this enclosure yield the same result.

Performed By: _____ Datemime: _____/_____

Verified By: _____ Datemime: _____/_____

Shutdown Boron Concentration - Mode 6

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

2.1 Determine present boron concentration of the operating ND train. _____ ppm

2.2 Record Tech Spec Refueling Boron Concentration from bottom of page of Section 5.11 of the R.O.D. manual. _____ ppm

2.3 Verify present boron concentration of Step **2.1** is greater than refueling boron concentration of Step **2.2.**

NOTE: Separate, independent calculation must be performed by the verifier.

2.4 Sign the appropriate space below. **N/A** the unsigned space.

Performed By: _____ Date/Time: _____/_____

Verified By: _____ DateITime: _____/_____

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

NOTE: The following steps assume the use of the BOP PC located in the control room horseshoe.

2.1 Select (Double-Click) the Reactivity Balance icon on the desktop.

CAUTION: Check all inputs carefully and correct as needed before calculating results. Ensure the correct Unit is specified.

2.2 Select an option as directed by the procedure. Input data appropriately where prompted. Hit the tab key or use left mouse button to move from one item to the next.

2.3 Once the "Calculate" button is left clicked, results will be displayed. The program output can then be printed by clicking on ''File" followed by "print".

2.4 When finished using program, select "File" and "Exit" or left click on **x** in upper right corner.

1. Initial Conditions

1.1 Limits and Precautions have been reviewed.

2. Procedure

2.1 **IF** no previous Unit Trip/Shutdown has occurred in the last **3** EFPD, determine the Shutdown Fission Product Correction Factor as follows:

Description	Reference	Value
A. Datemime of Unit Trip or Shutdown:	Control Room Log Books	_____/_____
B. Datemime of anticipated Unit **Startup:**	N/A	_____/_____
C. Duration of Shutdown	(B) **- (A)**	_____ hours
D. Shutdown Fission Product Correction Factor(using duration from 2.1.C)	**ROD Manual (Sec 5.13)**	_____ **ppm**

2.1.1 N/A Steps 2.2 and 2.3.

2.2 **IF** previous Unit Trip/Shutdown has occurred in the last 1 EFPD, perform the following:

Description	Reference	Value
A. Date/Time of previous Unit Trip or Shutdown:	Control Room Log Books	_____/_____
B. Date/Time of anticipated Unit Startup:	**N/A**	_____/_____
C. Duration of Shutdown	(B) **- (A)**	_____ hours
D. Shutdown Fission Product Correction Factor (using duration from 2.2.C)	**ROD Manual (Sec 5.13)**	_____ **ppm**

2.2.1 N/A Step 2.3

Description	Reference	Value
A. Date/Time of Unit Trip or Shutdown:	Control Room Log Books	/
B. Date/Time of anticipated Unit Startup:	N/A	/
C. Duration of Shutdown	(B) - (A)	hours
D. Shutdown Fission Product Correction Factor - Present Shutdown (using duration from 2.3.C)	**ROD Manual (Sec 5.13)**	**ppm**

2.3.1 **IF** duration of shutdown from 2.3.C is > 72 hours Shutdown Fission Product Correction Factor is **as** shown in Step 2.3.D.

A. N/A Step 2.3.2.

2.3.2 **IF** duration from 2.3.C is < 72 hours perform the following:

Description	Reference	Value
A. Date/Time of previous Unit Trip or Shutdown:	Control Room Log Books	/
B. Date/Time of previous Unit Startup:	Log Books	/
C. Duration of Previous Shutdown		
D. Shutdown Fission Product Correction Factor - Previous Shutdown . (using duration from 2.3.2.C)		ppm
E. Shutdown Fission Product Correction Factor	**(2.3.2.D) * 0.5 + (2.3.D)**	**ppm**

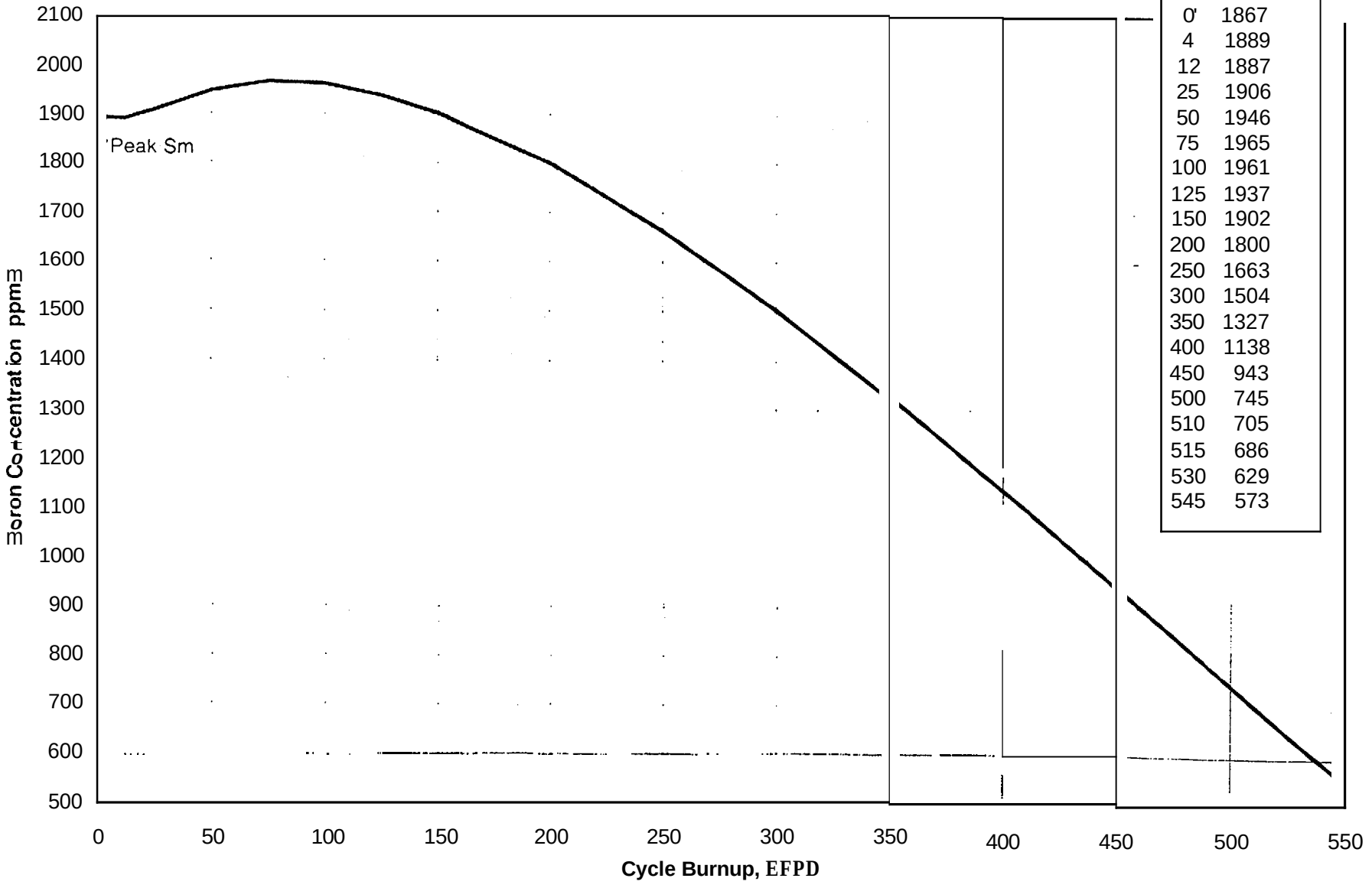
2.4 Ensure that separate, independent calculation has been performed and yields the same result.

Performed By: _____ Date/Time: _____/_____

Verified By: _____ Date/Time: _____/_____

Source: CNEI-0400-26
Prepared by: M.W. **Hawes**
Revision Number: 373
Date: 7/17/02

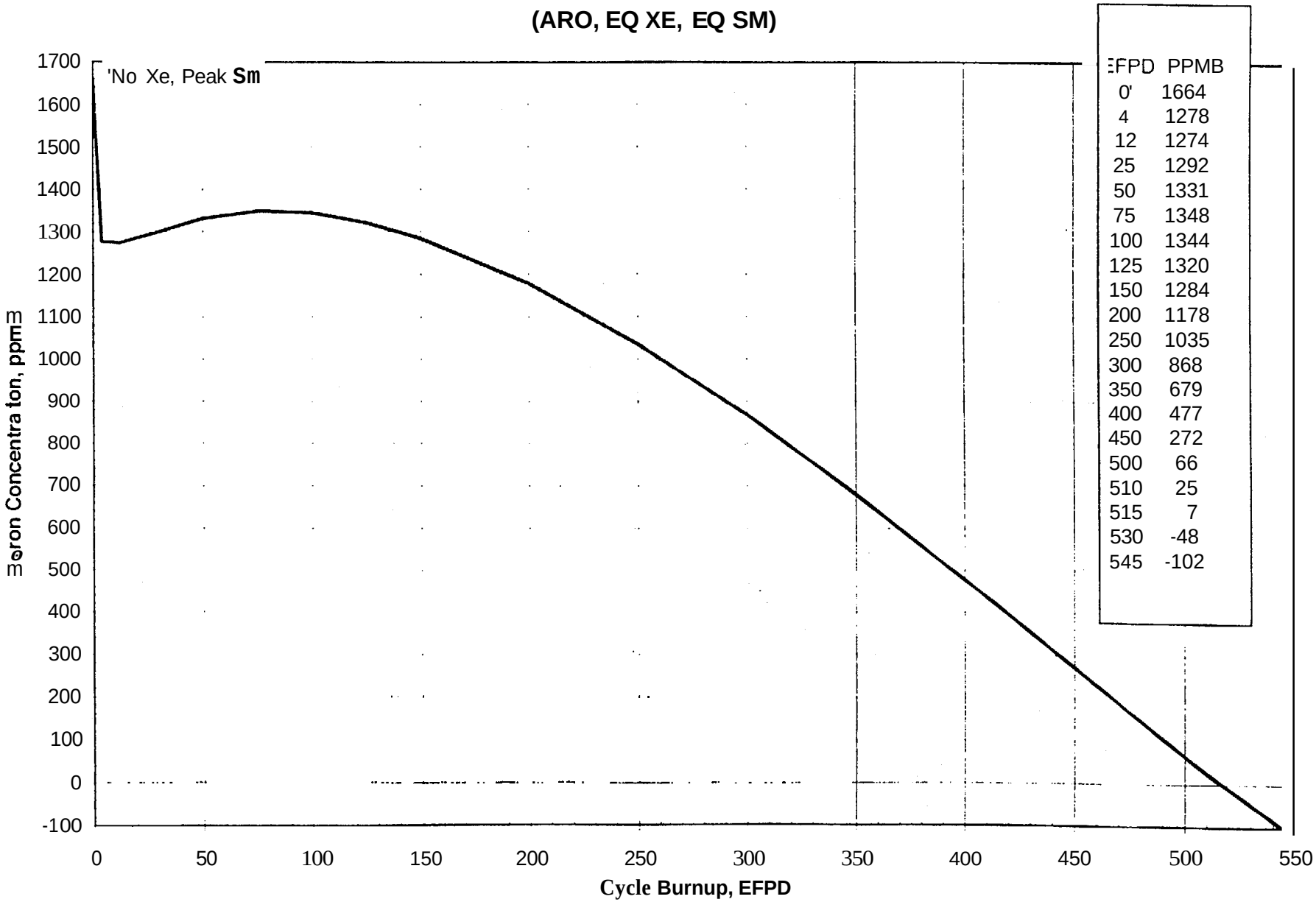
UNIT ONE
REACTOR OPERATING DATA
SECTION 5.1
HZP CRITICAL BORON CONCENTRATION
(ARO, NO XE, EQ SM)



EFPD	PPMB
0	1867
4	1889
12	1887
25	1906
50	1946
75	1965
100	1961
125	1937
150	1902
200	1800
250	1663
300	1504
350	1327
400	1138
450	943
500	745
510	705
515	686
530	629
545	573

Source: CNEI-0400-26
Prepared **by:** MW Hawes
Revision **Number:** 373
Date: 7/17/02

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.2
HFP CRITICAL BORON CONCENTRATION
(ARO, EQ XE, EQ SM)



EFPD	PPMB
0'	1664
4	1278
12	1274
25	1292
50	1331
75	1348
100	1344
125	1320
150	1284
200	1178
250	1035
300	868
350	679
400	477
450	272
500	66
510	25
515	7
530	-48
545	-102

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.3
DIFFERENTIAL BORON WORTH

Source: CNEI-0400-26
Prepared By: M.W. Hawes
Revision Number: 363
Date: 5/14/02

(PCM/PPM)

BURNUP (EFPD)	TEMPERATURE															
	68	100	150	200	250	300	350	400	450	500	510	520	530	540	550	557
0	-9.14	-9.08	-8.96	-8.82	-8.61	-8.41	-8.15	-7.89	-7.57	-7.25	-7.15	-7.05	-6.94	-6.84	-6.74	-6.67
20	-9.10	-9.04	-8.92	-8.77	-8.56	-8.35	-8.09	-7.83	-7.51	-7.19	-7.09	-6.99	-6.89	-6.79	-6.68	-6.61
40	-9.05	-9.00	-8.88	-8.72	-8.51	-8.30	-8.04	-7.78	-7.45	-7.13	-7.03	-6.93	-6.83	-6.73	-6.63	-6.56
60	-9.01	-8.96	-8.84	-8.68	-8.46	-8.24	-7.98	-7.72	-7.39	-7.07	-6.97	-6.87	-6.77	-6.67	-6.57	-6.50
80	-8.97	-8.94	-8.82	-8.65	-8.43	-8.21	-7.95	-7.69	-7.36	-7.03	-6.93	-6.83	-6.73	-6.63	-6.54	-6.47
100	-9.04	-8.99	-8.86	-8.70	-8.47	-8.25	-7.99	-7.73	-7.40	-7.07	-6.97	-6.86	-6.76	-6.66	-6.56	-6.49
120	-9.09	-9.04	-8.91	-8.74	-8.52	-8.30	-8.03	-7.77	-7.44	-7.10	-7.00	-6.90	-6.79	-6.69	-6.59	-6.51
140	-9.14	-9.09	-8.95	-8.79	-8.56	-8.34	-8.07	-7.81	-7.48	-7.14	-7.04	-6.93	-6.82	-6.72	-6.61	-6.54
160	-9.21	-9.15	-9.02	-8.85	-8.63	-8.40	-8.13	-7.86	-7.52	-7.19	-7.08	-6.98	-6.87	-6.77	-6.66	-6.59
180	-9.30	-9.24	-9.11	-8.94	-8.71	-8.48	-8.21	-7.93	-7.58	-7.24	-7.13	-7.03	-6.93	-6.83	-6.73	-6.66
200	-9.39	-9.34	-9.19	-9.03	-8.79	-8.56	-8.28	-8.00	-7.64	-7.29	-7.19	-7.09	-7.00	-6.90	-6.81	-6.74
220	-9.48	-9.42	-9.28	-9.11	-8.88	-8.64	-8.35	-8.07	-7.70	-7.33	-7.24	-7.15	-7.06	-6.97	-6.88	-6.82
240	-9.57	-9.51	-9.37	-9.20	-8.96	-8.72	-8.43	-8.14	-7.76	-7.38	-7.30	-7.21	-7.13	-7.04	-6.95	-6.89
260	-9.66	-9.61	-9.46	-9.28	-9.04	-8.80	-8.51	-8.21	-7.84	-7.46	-7.37	-7.29	-7.20	-7.12	-7.04	-6.98
280	-9.75	-9.69	-9.54	-9.37	-9.13	-8.88	-8.59	-8.30	-7.93	-7.55	-7.47	-7.38	-7.30	-7.22	-7.13	-7.07
300	-9.84	-9.79	-9.64	-9.45	-9.21	-8.97	-8.67	-8.38	-8.02	-7.65	-7.56	-7.48	-7.39	-7.31	-7.22	-7.16
320	-9.93	-9.87	-9.72	-9.54	-9.29	-9.05	-8.76	-8.47	-8.11	-7.75	-7.66	-7.58	-7.49	-7.40	-7.32	-7.26
340	-10.02	-9.96	-9.81	-9.63	-9.38	-9.13	-8.84	-8.56	-8.20	-7.84	-7.76	-7.67	-7.58	-7.50	-7.41	-7.35
360	-10.14	-10.08	-9.93	-9.74	-9.49	-9.24	-8.95	-8.67	-8.31	-7.95	-7.87	-7.78	-7.69	-7.61	-7.52	-7.46
380	-10.29	-10.23	-10.07	-9.88	-9.63	-9.37	-9.08	-8.79	-8.44	-8.08	-7.99	-7.90	-7.82	-7.73	-7.64	-7.58
400	-10.43	-10.37	-10.22	-10.03	-9.76	-9.51	-9.22	-8.92	-8.57	-8.21	-8.12	-8.03	-7.94	-7.85	-7.77	-7.70
420	-10.57	-10.51	-10.36	-10.17	-9.90	-9.64	-9.35	-9.06	-8.69	-8.33	-8.24	-8.15	-8.07	-7.98	-7.89	-7.83
440	-10.72	-10.66	-10.50	-10.31	-10.04	-9.77	-9.48	-9.19	-8.82	-8.46	-8.37	-8.28	-8.19	-8.10	-8.01	-7.95
460	-10.88	-10.82	-10.66	-10.46	-10.19	-9.92	-9.63	-9.33	-8.96	-8.60	-8.50	-8.41	-8.32	-8.22	-8.13	-8.06
480	-11.06	-10.99	-10.83	-10.63	-10.36	-10.09	-9.79	-9.49	-9.12	-8.76	-8.65	-8.55	-8.45	-8.35	-8.24	-8.17
500	-11.23	-11.17	-11.00	-10.80	-10.53	-10.25	-9.95	-9.65	-9.28	-8.91	-8.80	-8.69	-8.58	-8.47	-8.36	-8.28
515	-11.37	-11.30	-11.13	-10.93	-10.65	-10.38	-10.07	-9.77	-9.40	-9.03	-8.91	-8.80	-8.68	-8.56	-8.44	-8.36
530	-11.50	-11.43	-11.26	-11.06	-10.78	-10.50	-10.19	-9.89	-9.52	-9.15	-9.03	-8.90	-8.78	-8.65	-8.53	-8.44
545	-11.64	-11.57	-11.40	-11.20	-10.92	-10.63	-10.32	-10.02	-9.62	-9.22	-9.10	-8.97	-8.85	-8.72	-8.60	-8.51

Note: Calculated at the ARI critical boron concentration for each temperature and burnup.

Cycle Burnup (EFPD)	Critical Boron Concentration (PPMB)	Differential Boron Wortt (PCM/PPMB)
0*	1867	-6.43
4	1889	-6.42
12	1887	-6.41
25	1906	-6.38
50	1946	-6.36
75	1965	-6.36
100	1961	-6.38
125	1937	-6.41
150	1902	-6.45
200	1800	-6.56
250	1663	-6.70
300	1504	-6.87
350	1327	-7.06
400	1138	-7.28
450	943	-7.51
500	745	-7.78
510	705	-7.83
515	686	-7.82
530	629	-7.85
545	573	-7.95

*Peak Samarium

Source: CNEI-0400-26, C1C14 SOR
Prepared By: MW Hawes
Revision Number 373
Date: 7/17/02

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.5
HFP DIFFERENTIAL BORON WORTH

(HFP, **ARO. Eq Xe, Eq Sm)**

Cycle Burnup (EFPD)	Critical Boron Concentration (PPMB)	Differential Boron Worth (PCM/PPMB)	ITC (PCM/°F)
0*	1664	-6.15	-10.10
4	1278	-6.14	-13.11
12	1274	-6.13	-13.11
25	1292	-6.11	-12.92
50	1331	-6.08	-12.73
75	1348	-6.08	-12.98
100	1344	-6.10	-13.57
125	1320	-6.14	-14.39
150	1284	-6.18	-15.36
200	1178	-6.30	-17.68
250	1035	-6.46	-20.39
300	868	-6.64	-23.35
350	679	-6.78	-26.53
400	477	-7.06	-29.87
450	272	-7.37	-33.26
500	66	-7.72	-36.77
510	25	-7.80	-37.47
515	7	-7.83	-37.75
530	-48	-7.89	-38.02
545	-102	-7.95	-38.28

* No **Xenon, Peak** Samarium

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
HZP, No Xenon

Control Bank Position Steps Withdrawn				50 EFPD	150 EFPD	250 EFPD	350 EFPD	450 EFPD
				0 - 100 EFPD	101 - 200 EFPD	201 - 300 EFPD	301 - 400 EFPD	401 - EOW
				IRW	IRW	IRW	IRW	IRW
Bk A	Bk B	Bk C	Bk D	(PCM)	(PCM)	(PCM)	(PCM)	(PCM)
226	226	226	226	0	0	0	0	0
226	226	226	225	1	1	1	2	3
226	226	226	220	6	6	8	12	18
226	226	226	215	12	10	15	23	32
226	226	226	210	17	15	22	33	47
226	226	226	205	31	29	42	60	79
226	226	226	200	45	44	62	86	111
226	226	226	195	60	58	82	113	144
226	226	226	190	74	72	102	139	176
226	226	226	185	90	89	124	166	205
226	226	226	180	106	106	146	193	234
226	226	226	175	122	123	168	219	263
226	226	226	170	138	140	190	246	292
226	226	226	165	154	157	209	266	313
226	226	226	160	170	173	228	287	334
226	226	226	155	186	190	247	307	355
226	226	226	150	202	207	266	328	375
226	226	226	145	219	223	283	345	391
226	226	226	140	236	240	300	362	407
226	226	226	135	252	257	317	378	423
226	226	226	130	269	273	334	395	439
226	226	226	125	286	289	349	408	449
226	226	226	120	302	305	363	420	460
226	226	226	116	316	318	375	430	468
226	226	226	110	336	337	392	445	481
226	226	221	105	355	355	409	464	504
226	226	216	100	374	372	426	482	526
226	226	211	95	400	399	458	524	578
226	226	206	90	427	425	490	565	630
226	226	201	85	454	452	522	607	682

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
HZP, *No* Xenon

Control Bank Position Steps Withdrawn				50 EFPD 0 - 100 EFPD	150 EFPD 101 - 200 EFPD	250 EFPD 201 - 300 EFPD	350 EFPD 301 - 400 EFPD	450 EFPD 401 - EOW
Bk A	Bk B	Bk C	Bk D	IRW (PCM)	IRW (PCM)	IRW (PCM)	IRW (PCM)	IRW (PCM)
226	226	196	80	480	478	554	649	734
226	226	191	75	510	509	591	696	790
226	226	186	70	540	540	629	743	845
226	226	181	65	570	572	666	791	901
226	226	176	60	600	603	704	838	956
226	226	171	55	632	635	739	879	1000
226	226	166	50	663	668	775	919	1044
226	226	161	45	695	700	811	960	1088
226	226	156	40	727	732	847	1001	1132
226	226	151	35	760	766	882	1037	1169
226	226	146	30	794	799	917	1074	1206
226	226	141	25	827	832	952	1111	1242
226	226	136	20	861	866	987	1147	1279
226	226	131	15	896	900	1021	1181	1311
226	226	126	10	931	935	1055	1215	1343
226	226	121	5	966	970	1089	1249	1374
226	226	116	0	1000	1004	1123	1282	1406
226	226	110	0	1021	1025	1144	1303	1425
226	221	105	0	1049	1054	1172	1331	1456
226	216	100	0	1076	1083	1200	1360	1486
226	211	95	0	1109	1117	1233	1399	1536
226	206	90	0	1142	1150	1267	1439	1586
226	201	85	0	1175	1184	1301	1478	1636
226	196	80	0	1208	1218	1335	1517	1685
226	191	75	0	1248	1259	1376	1562	1737
226	186	70	0	1288	1300	1418	1606	1789
226	181	65	0	1328	1341	1459	1651	1840
226	176	60	0	1368	1382	1501	1695	1892
226	171	55	0	1416	1429	1548	1743	1939
226	166	50	0	1463	1476	1596	1791	1986

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
HZP, No Xenon

Control Bank Positron Steps Withdrawn				50 EFPD	150 EFPD	250 EFPD	350 EFPD	450 EFPD
				0 - 100 EFPD	101 - 200 EFPD	201 - 300 EFPD	301 - 400 EFPD	401 - EOW
				IRW	IRW	IRW	IRW	IRW
Bk A	Bk B	Bk C	Bk D	(PCM)	(PCM)	(PCM)	(PCM)	(PCM)
226	161	45	0	1511	1524	1644	1838	2033
226	156	40	0	1558	1571	1691	1886	2080
226	151	35	0	1608	1618	1739	1932	2122
226	146	30	0	1657	1665	1787	1979	2163
226	141	25	0	1707	1712	1836	2025	2204
226	136	20	0	1756	1760	1884	2071	2245
226	131	15	0	1797	1798	1921	2106	2274
226	126	10	0	1838	1837	1959	2140	2303
226	121	5	0	1878	1876	1996	2175	2332
226	116	0	0	1919	1915	2034	2209	2361
226	110	0	0	1943	1938	2057	2230	2379
221	105	0	0	1967	1963	2080	2254	2403
216	100	0	0	1992	1988	2104	2277	2427
211	95	0	0	2022	2019	2134	2310	2465
206	90	0	0	2052	2049	2164	2343	2503
201	85	0	0	2082	2080	2195	2376	2541
196	80	0	0	2112	2111	2225	2408	2579
191	75	0	0	2149	2148	2261	2445	2618
186	70	0	0	2186	2185	2297	2482	2656
181	65	0	0	2223	2223	2333	2518	2695
176	60	0	0	2259	2260	2369	2555	2733
171	55	0	0	2302	2301	2408	2590	2764
166	50	0	0	2345	2342	2448	2625	2794
161	45	0	0	2388	2384	2487	2660	2825
156	40	0	0	2430	2425	2527	2696	2856
151	35	0	0	2471	2462	2561	2724	2877
146	30	0	0	2512	2499	2596	2752	2899
141	25	0	0	2553	2535	2630	2780	2921
136	20	0	0	2594	2572	2665	2808	2942
131	15	0	0	2625	2600	2689	2826	2957

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Hod Worth in Overlap
HZP, *No* Xenon

Control Bank Position Steps Withdrawn				50 EFPD 0 - 100 EFPD IRW	150 EFPD 101 - 200 EFPD IRW	250 EFPD 201 - 300 EFPD IRW	350 EFPD 301 - 400 EFPD IRW	450 EFPD 401 - EOW IRW
Bk A	Bk B	Bk C	Bk D	(PCM)	(PCM)	(PCM)	(PCM)	(PCM)
126	10	0	0	2656	2628	2713	2845	2972
121	5	0	0	2687	2655	2737	2864	2987
116	0	0	0	2718	2683	2761	2883	3001
110	0	0	0	2737	2699	2775	2894	3010
105	0	0	0	2755	2716	2789	2904	3017
100	0	0	0	2773	2733	2803	2914	3025
95	0	0	0	2792	2750	2815	2921	3029
90	0	0	0	2811	2767	2827	2928	3034
85	0	0	0	2830	2784	2840	2936	3039
80	0	0	0	2850	2801	2852	2943	3043
75	0	0	0	2870	2817	2862	2948	3046
70	0	0	0	2891	2834	2872	2952	3048
65	0	0	0	2911	2851	2883	2957	3050
60	0	0	0	2932	2868	2893	2962	3053
55	0	0	0	2951	2881	2900	2964	3054
50	0	0	0	2970	2895	2907	2967	3055
45	0	0	0	2990	2908	2915	2970	3056
40	0	0	0	3009	2922	2922	2973	3057
35	0	0	0	3021	2929	2926	2974	3058
30	0	0	0	3033	2937	2930	2976	3058
25	0	0	0	3046	2945	2934	2977	3059
20	0	0	0	3058	2953	2938	2979	3060
15	0	0	0	3063	2956	2939	2979	3060
10	0	0	0	3068	2959	2941	2980	3060
5	0	0	0	3073	2963	2942	2980	3060
0	0	0	0	3078	2966	2944	2981	3060

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
HZP, No Xenon

Control Bank Position	Shutdown Bank Position Steps Withdrawn					50 EFPD 0 - 100 EFPD IRW (PCM)	150 EFPD 101 - 200 EFPD IRW (PCM)	250 EFPD 201 - 300 EFPD IRW (PCM)	350 EFPD 301 - 400 EFPD IRW (PCM)	450 EFPD 401 - EOV IRW (PCM)
	SD E	SD D	SD C	SD B	SD A					
226	226	226	226	226	226	0	0	0	0	0
0	226	226	226	226	226	3078	2966	2944	2981	3060
0	0	226	226	226	226	3786	3709	3712	3762	3844
0	0	0	226	226	226	4419	4310	4312	4379	4486
0	0	0	0	226	226	5153	5004	5010	5105	5254
0	0	0	0	0	226	6025	5907	5946	6077	6252
0	0	0	0	0	0	6305	6083	6130	6281	6487

UNIT ONE
REACTOR OPERATING **DATA**
SECTION 5.6
INTEGRAL ROD **WORTH** IN **OVERLAP**

Integral Rod Worth in Overlap
HZP, Peak Xenon

Control Bank Position Steps Withdrawn				50 EFPD	150 EFPD	250 EFPD	350 EFPD	450 EFPD
				0 - 100 EFPD	101 - 200 EFPD	201 - 300 EFPD	301 - 400 EFPD	401 - EOW
Bk A	Bk B	Bk C	Bk D	IRW (PCM)	IRW (PCM)	IRW (PCM)	IRW (PCM)	IRW (PCM)
226	226	226	226	0	0	0	0	0
226	226	226	225	2	2	2	3	4
226	226	226	220	11	11	13	17	22
226	226	226	215	20	19	24	31	40
226	226	226	210	29	28	35	45	58
226	226	226	205	52	53	63	79	96
226	226	226	200	76	77	92	112	133
226	226	226	195	99	101	121	145	
226	226	226	190	122	126	149	178	
226	226	226	185	145	150	177	208	
226	226	226	180	167	175	204	238	270
226	226	226	175	190	199	232	268	301
226	226	226	170	212	224	260	297	332
226	226	226	165	231	243	280	319	353
226	226	226	160	250	263	301	340	374
226	226	226	155	268	283	322	361	395
226	226	226	150	287	303	343	382	415
226	226	226	145	304	320	360	398	431
226	226	226	140	321	337	377	415	447
226	226	226	135	338	354	395	431	463
226	226	226	130	355	371	412	448	478
226	226	226	125	370	386	425	459	488
226	226	226	120	385	400	438	471	498
226	226	226	116	397	411	448	480	506
226	226	226	110	415	428	463	494	518
226	226	221	105	434	446	482	514	544
226	226	216	100	452	464	501	535	569
226	226	211	95	485	500	544	587	629
226	226	206	90	517	536	588	638	689
226	226	201	85	550	571	631	690	748

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROO WORTH IN OVERLAP

Integral Rod Worth in Overlap
HZP, Peak Xenon

Control Bank Position Steps Withdrawn				50 EFPD	150 EFPD	250 EFPD	350 EFPD	450 EFPD
				0 - 100 EFPD	101 - 200 EFPD	201 - 300 EFPD	301 - 400 EFPD	401 - EOW
Bk A	Bk B	Bk C	Bk D	IRW (PCM)	IRW (PCM)	IRW (PCM)	IRW (PCM)	IRW (PCM)
226	226	196	80	582	607	675	741	808
226	226	191	75	615	646	722	797	868
226	226	186	70	649	685	770	852	928
226	226	181	65	683	723	818	907	989
226	226	176	60	716	762	865	963	1049
226	226	171	55	750	798	905	1006	1094
226	226	166	50	783	834	946	1050	1139
226	226	161	45	817	870	986	1093	1183
226	226	156	40	850	906	1026	1137	1228
226	226	151	35	885	941	1062	1173	1263
226	226	146	30	921	976	1098	1209	1298
226	226	141	25	956	1011	1134	1245	1333
226	226	136	20	991	1046	1170	1281	1368
226	226	131	15	1024	1079	1203	1312	1396
226	226	126	10	1057	1112	1236	1343	1424
226	226	121	5	1090	1145	1269	1373	1452
226	226	116	0	1123	1178	1302	1404	1480
226	226	110	0	1143	1198	1322	1423	1497
226	221	105	0	1166	1223	1350	1453	1530
226	216	100	0	1190	1249	1378	1483	1564
226	211	95	0	1219	1281	1419	1535	1628
226	206	90	0	1249	1314	1459	1588	1691
226	201	85	0	1278	1346	1500	1640	1755
226	196	80	0	1307	1379	1541	1693	1818
226	191	75	0	1344	1418	1585	1747	1881
226	186	70	0	1381	1458	1629	1801	1943
226	181	65	0	1418	1497	1674	1855	2005
226	176	60	0	1456	1536	1718	1909	2068
226	171	55	0	1504	1585	1766	1957	2117
226	166	50	0	1552	1633	1814	2005	2166

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
HZP, Peak Xenon

Control Bank Position Steps Withdrawn				50 EFPD	150 EFPD	250 EFPD	350 EFPD	450 EFPD
				0 - 100 EFPD	101 - 200 EFPD	201 - 300 EFPD	301 - 400 EFPD	401 - EOW
				IRW	IRW	IRW	IRW	IRW
Bk A	Bk B	Bk C	Bk D	(PCM)	(PCM)	(PCM)	(PCM)	(PCM)
226	161	45	0	1600	1681	1862	2053	2214
226	156	40	0	1648	1729	1910	2101	2263
226	151	35	0	1704	1782	1959	2144	2302
226	146	30	0	1760	1835	2008	2187	2340
226	141	25	0	1815	1888	2057	2230	2379
226	136	20	0	1871	1940	2106	2274	2417
226	131	15	0	1914	1981	2143	2305	2444
226	126	10	0	1957	2022	2181	2337	2471
226	121	5	0	2000	2062	2218	2369	2498
226	116	0	0	2043	2103	2256	2401	2525
226	110	0	0	2069	2127	2278	2420	2541
221	105	0	0	2091	2150	2302	2444	2567
216	100	0	0	2112	2173	2326	2468	2592
211	95	0	0	2139	2202	2359	2506	2633
206	90	0	0	2166	2231	2392	2544	2675
201	85	0	0	2193	2260	2425	2581	2717
196	80	0	0	2220	2289	2458	2619	2759
191	75	0	0	2256	2326	2495	2657	2797
186	70	0	0	2292	2362	2532	2695	2836
181	65	0	0	2327	2399	2570	2733	2874
176	60	0	0	2363	2436	2607	2771	2912
171	55	0	0	2410	2481	2644	2801	2938
166	50	0	0	2457	2526	2682	2832	2964
161	45	0	0	2504	2570	2720	2862	2990
156	40	0	0	2551	2615	2758	2892	3017
151	35	0	0	2600	2657	2788	2913	3034
146	30	0	0	2649	2698	2818	2934	3051
141	25	0	0	2698	2739	2848	2955	3068
136	20	0	0	2747	2781	2878	2976	3085
131	15	0	0	2778	2806	2896	2991	3097

UNIT ONE
REACTOR OPERATING DATA
SECTION **5.6**
INTEGRAL ROD **WORTH** IN **OVERLAP**

Integral Rod Worth in Overlap
HZP, Peak Xenon

Control Bank Position Steps Withdrawn				50 EFPD	150 EFPD	250 EFPD	350 EFPD	450 EFPD
				0 - 100 EFPD	101 - 200 EFPD	201 - 300 EFPD	301 - 400 EFPD	401 - EOW
				IRW	IRW	IRW	IRW	IRW
Bk A	Bk B	Bk C	Bk D	(PCM)	(PCM)	(PCM)	(PCM)	(PCM)
126	10	0	0	2808	2832	2915	3005	3108
121	5	0	0	2839	2857	2934	3019	3120
116	0	0	0	2870	2882	2953	3033	3132
110	0	0	0	2889	2897	2964	3042	3138
105	0	0	0	2902	2909	2973	3049	3144
100	0	0	0	2915	2922	2982	3056	3150
95	0	0	0	2928	2933	2989	3060	3153
90	0	0	0	2942	2944	2996	3065	3156
85	0	0	0	2955	2955	3004	3069	3159
80	0	0	0	2969	2966	3011	3074	3163
75	0	0	0	2983	2975	3015	3076	3164
70	0	0	0	2998	2985	3020	3078	3166
65	0	0	0	3013	2995	3024	3081	3168
60	0	0	0	3028	3005	3028	3083	3169
55	0	0	0	3041	3012	3031	3084	3170
50	0	0	0	3055	3019	3034	3085	3171
45	0	0	0	3069	3027	3037	3086	3171
40	0	0	0	3082	3034	3040	3087	3172
35	0	0	0	3091	3038	3041	3088	3172
30	0	0	0	3100	3042	3043	3089	3172
25	0	0	0	3108	3047	3044	3090	3172
20	0	0	0	3117	3051	3045	3090	3173
15	0	0	0	3120	3052	3046	3090	3173
10	0	0	0	3123	3054	3047	3090	3173
5	0	0	0	3126	3055	3047	3090	3173
0	0	0	0	3130	3057	3048	3090	3173

Source: CNEI-0400-26
Prepared by: M.W. Hawes
Revision Number: 363
Date: 5/14/02

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
HZP, Peak Xenon

Control Bank Position	Shutdown Bank Position Steps Withdrawn					50 EFPD 0 - 100 EFPD IRW (PCM)	150 EFPD 101 - 200 EFPD IRW (PCM)	250 EFPD 201 - 300 EFPD IRW (PCM)	350 EFPD 301 - 400 EFPD IRW (PCM)	450 EFPD 401 - EOW IRW (PCM)
	SD E	SD D	SD C	SD B	SD A					
226	226	226	226	226	226	0	0	0	0	0
0	226	226	226	226	226	3130	3057	3048	3090	3173
0	0	226	226	226	226	3811	3768	3777	3823	3899
0	0	0	226	226	226	4484	4417	4427	4489	4592
0	0	0	0	226	226	5279	5181	5199	5291	5439
0	0	0	0	0	226	6181	6111	6162	6279	6441
0	0	0	0	0	0	6430	6346	6412	6560	6773

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
HFP, Equilibrium Xenon

Control Bank Position Steps Withdrawn				50 EFPD 0 - 100 EFPD IRW	150 EFPD 101 - 200 EFPD IRW	250 EFPD 201 - 300 EFPD IRW	350 EFPD 301 - 400 EFPD IRW	450 EFPD 401 - EOW IRW
Bk A	Bk B	Bk C	Bk D	(PCM)	(PCM)	(PCM)	(PCM)	(PCM)
226	226	226	226	0	0	0	0	0
226	226	226	225	1	1	1	1	2
226	226	226	220	5	5	7	9	12
226	226	226	215	10	10	12	16	21
226	226	226	210	14	14	18	23	31
226	226	226	205	26	26	32	40	51
226	226	226	200	38	38	45	57	71
226	226	226	195	50	50	59	74	91
226	226	226	190	61	61	73	91	111
226	226	226	185	75	76	89	109	132
226	226	226	180	89	90	105	127	152
226	226	226	175	103	104	121	145	173
226	226	226	170	117	118	137	164	193
226	226	226	165	132	133	153	181	212
226	226	226	160	146	148	169	198	230
226	226	226	155	161	163	184	214	248
226	226	226	150	176	178	200	231	267
226	226	226	145	192	193	216	248	285
226	226	226	140	208	209	232	265	303
226	226	226	135	224	225	249	282	321
226	226	226	130	241	241	265	299	339
226	226	226	125	257	257	280	315	356
226	226	226	120	274	273	296	331	372
226	226	226	116	287	286	309	344	386
226	226	226	110	307	306	328	363	406
226	226	221	105	328	325	348	385	430
226	226	216	100	348	345	368	406	454
226	226	211	95	378	374	399	441	494
226	226	206	90	408	403	430	475	533
226	226	201	85	438	432	461	510	572

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
HFP, Equilibrium Xenon

Control Bank Position Steps Withdrawn				50 EFPD 0 - 100 EFPD IRW	150 EFPD 101 - 200 EFPD IRW	250 EFPD 201 - 300 EFPD IRW	350 EFPD 301 - 400 EFPD IRW	450 EFPD 401 - EOW IRW
Bk A	Bk B	Bk C	Bk D	(PCM)	(PCM)	(PCM)	(PCM)	(PCM)
226	226	196	80	468	461	492	544	611
226	226	191	75	503	497	530	585	654
226	226	186	70	539	533	567	625	698
226	226	181	65	574	568	605	665	742
226	226	176	60	610	604	642	706	785
226	226	171	55	648	642	682	746	827
226	226	166	50	687	680	721	787	870
226	226	161	45	725	718	761	828	912
226	226	156	40	763	756	800	869	955
226	226	151	35	804	796	840	911	998
226	226	146	30	845	836	881	953	1041
226	226	141	25	885	876	921	994	1084
226	226	136	20	926	915	962	1036	1127
226	226	131	15	966	954	1001	1076	1169
226	226	126	10	1006	993	1040	1116	1211
226	226	121	5	1046	1033	1079	1157	1253
226	226	116	0	1087	1072	1118	1197	1295
226	226	110	0	1111	1095	1141	1221	1320
226	221	105	0	1142	1126	1172	1253	1354
226	216	100	0	1173	1156	1203	1284	1389
226	211	95	0	1212	1195	1242	1326	1435
226	206	90	0	1251	1233	1281	1368	1481
226	201	85	0	1290	1272	1321	1410	1527
226	196	80	0	1329	1310	1360	1452	1573
226	191	75	0	1374	1356	1407	1500	1624
226	186	70	0	1419	1401	1453	1549	1676
226	181	65	0	1464	1447	1500	1597	1727
226	176	60	0	1509	1493	1547	1646	1778
226	171	55	0	1560	1544	1599	1699	1831
226	166	50	0	1610	1595	1650	1751	1885

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Integral Rod Worth in Overlap
IIFP, Equilibrium Xenon

Control Bank Position Steps Withdrawn				50 EFPD	150 EFPD	250 EFPD	350 EFPD	450 EFPD
				0 - 100 EFPD	101 - 200 EFPD	201 - 300 EFPD	301 - 400 EFPD	401 - EOW
				IRW	IRW	IRW	IRW	IRW
Bk A	Bk B	Bk C	Bk D	(PCM)	(PCM)	(PCM)	(PCM)	(PCM)
226	161	45	0	1660	1646	1702	1804	1938
226	156	40	0	1711	1698	1754	1856	1991
226	151	35	0	1764	1751	1808	1911	2047
226	146	30	0	1817	1804	1862	1966	2102
226	141	25	0	1870	1857	1916	2021	2158
226	136	20	0	1923	1910	1970	2076	2213
226	131	15	0	1969	1954	2015	2123	2262
226	126	10	0	2015	1999	2060	2169	2311
226	121	5	0	2061	2043	2105	2216	2360
226	116	0	0	2107	2088	2150	2263	2409
226	110	0	0	2134	2115	2177	2291	2438
221	105	0	0	2162	2142	2205	2320	2470
216	100	0	0	2191	2170	2233	2349	2502
211	95	0	0	2226	2205	2268	2386	2542
206	90	0	0	2261	2240	2303	2423	2582
201	85	0	0	2297	2274	2339	2460	2622
196	80	0	0	2332	2309	2374	2497	2663
191	75	0	0	2374	2351	2416	2540	2707
186	70	0	0	2415	2393	2457	2582	2752
181	65	0	0	2457	2434	2499	2625	2796
176	60	0	0	2498	2476	2540	2668	2841
171	55	0	0	2544	2522	2587	2714	2888
166	50	0	0	2590	2569	2634	2761	2935
161	45	0	0	2636	2616	2680	2808	2982
156	40	0	0	2682	2662	2727	2854	3029
151	35	0	0	2728	2708	2773	2902	3077
146	30	0	0	2774	2753	2819	2949	3125
141	25	0	0	2820	2798	2865	2996	3173
136	20	0	0	2866	2844	2912	3044	3221
131	15	0	0	2902	2877	2944	3077	3256

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL R00 WORTH IN OVERLAP

Integral *Rod* Worth in Overlap
HFP, Equilibrium Xenon

Control Bank Position Steps Withdrawn				50 EFPD 0 - 100 EFPD IRW (PCM)	150 EFPD 101 - 200 EFPD IRW (PCM)	250 EFPD 201 - 300 EFPD IRW (PCM)	350 EFPD 301 - 400 EFPD IRW (PCM)	450 EFPD 401 - EOW IRW (PCM)
Bk A	Bk B	Bk C	Bk D					
126	10	0	0	2937	2910	2977	3111	3290
121	5	0	0	2973	2943	3009	3144	3325
116	0	0	0	3009	2976	3042	3177	3360
110	0	0	0	3030	2995	3062	3198	3381
105	0	0	0	3047	3012	3077	3212	3395
100	0	0	0	3065	3028	3092	3227	3410
95	0	0	0	3083	3045	3107	3241	3424
90	0	0	0	3101	3062	3123	3256	3438
85	0	0	0	3119	3079	3138	3270	3453
80	0	0	0	3137	3096	3153	3285	3467
75	0	0	0	3156	3114	3169	3299	3480
70	0	0	0	3175	3131	3185	3313	3494
65	0	0	0	3194	3149	3201	3328	3507
60	0	0	0	3212	3167	3217	3342	3521
55	0	0	0	3232	3185	3233	3357	3534
50	0	0	0	3251	3203	3250	3372	3547
45	0	0	0	3270	3221	3266	3387	3561
40	0	0	0	3290	3240	3283	3401	3574
35	0	0	0	3307	3256	3298	3416	3587
30	0	0	0	3325	3272	3313	3430	3599
25	0	0	0	3343	3288	3328	3444	3612
20	0	0	0	3361	3305	3344	3458	3625
15	0	0	0	3372	3314	3352	3466	3633
10	0	0	0	3382	3323	3361	3475	3641
5	0	0	0	3393	3332	3370	3483	3649
0	0	0	0	3403	3341	3378	3492	3657

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.6
INTEGRAL ROD WORTH IN OVERLAP

Individual Shutdown Bank Integral Rod Worth
HFP, Equilibrium Xenon

Shutdown Bank Position		50 EFPD	150 EFPD	250 EFPD	350 EFPD	450 EFPD
		0 - 100 EFPD	101 - 200 EFPD	201 - 300 EFPD	301 - 400 EFPD	401 - EOW
Bank	SWD	IRW (PCM)	IRW (PCM)	IRW (PCM)	IRW (PCM)	IRW (PCM)
SD E	226	0	0	0	0	0
	220	3	2	3	4	6
	200	40	39	48	60	77
	0	785	800	816	831	847
SD D	226	0	0	0	0	0
	220	2	2	2	3	5
	200	31	30	37	48	63
	0	686	665	674	698	732
SD C	226	0	0	0	0	0
	220	2	2	2	4	5
	200	34	32	38	51	66
	0	769	742	749	777	812
SD B	226	0	0	0	0	0
	220	3	3	4	6	8
	200	47	46	57	74	96
	0	1176	1183	1226	1284	1352
SD A	226	0	0	0	0	0
	220	1	1	1	2	3
	200	15	14	18	27	39
	0	416	398	437	516	627

Source: CNEI-0400-26
Prepared by: M.W. Hawes
Revision Number: 380
Date: 9/18/02

UNIT *ONE*
REACTOR OPERATING DATA
SECTION 5.7
TOTAL AVAILABLE ROD WORTH

NOTE: Most conservative (lowest) value of Total Available Rod Worth over applicable Burnup range is to be used for Shutdown Margin calculations.

CYCLE BURNUP	TOTAL AVAILABLE ROD WORTH
I 4 EFPD	5127 pcm
100 EFPD	4936 pcrn
200 EFPD	4879 pcm
300 EFPD	4935 pcrn
400 EFPD	5050 pcrn
500 EFPD	5198 pcrn
530 EFPD	5260 pcrn
545 EFPD	5295 pcrn

Maximum Stuck Rod Worth During Cycle = 970 pcm

Transient Flux Redistribution Allowance = 340 pcm

Maximum Dropped or Mis-aligned Rod Worth = 200 pcm

Source: CNEI-0400-26
Prepared by: M.W. Hawes
Revision Number: 380
Date: 9/18/02

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.8
INOPERABLE RCCA WORTHS

CRDM NUMBER	CRDM LOCATION	WORTH (PCM)	CRDM NUMBER	CRDM LOCATION	WORTH (PCM)
SA2-1	B-4	45	CA1-2	H-10	658
CB2-1	B-6	212	SE1-3	H-12	418
CC1-2	B-8	40	CC1-3	H-14	40
CB1-2	B-10	212	SB2-4	J-3	263
SA1-2	8-12	45	SB1-3	J-13	263
SD1-1	C-5	588	CB24	K-2	212
SB2-1	C-7	263	CC2-4	K-6	658
SB1-2	c-9	263	CA2-2	K-8	658
SC1-2	C-11	588	CC2-3	K-10	658
SA1-1	D-2	45	CB1-3	K-14	212
CD1-1	D-4	604	SD1-4	L-3	588
SE1-2	D-8	418	SC1-3	L-13	588
CD2-1	D-12	604	SA2-4	M-2	45
SA2-2	D-14	45	CD2-2	M-4	604
SC1-1	E-3	588	SE1-4	M-8	418
SD1-2	E-13	588	CD1-2	M-12	604
CB1-1	F-2	212	SA1-3	M-14	45
cc2-1	F-6	658	SC1-4	N-5	588
cA2-1	F-8	658	SB1-4	N-7	263
cc2-2	F-10	658	SB2-3	N-9	263
CB2-2	F-14	212	SD1-3	N-11	588
SB1-1	G-3	263	SA1-4	P-4	45
SB2-2	G-13	263	CB1-4	P-6	212
CC1-1	H-2	40	CC1-4	P-8	40
SE1-1	H-4	418	CB2-3	P-10	212
CA1-1	H-6	658	SA2-3	P-12	45
CD2-3	H-8	363			

Total Power Defect (PCM) as a Function of Power and Cycle Burnup

from 0 - 50% FP

BURNUP (EFPD)	POWER (%FP)										
	0	5	10	15	20	25	30	35	40	45	50
	0	80	161	[illegible]	322	402	475	547	619	691	763
20	0	79	159	238	318	397	469	541	613	684	756
40	0	78	157	235	314	392	464	535	607	678	750
60	0	78	155	233	310	388	459	530	601	672	743
80	0	77	154	[illegible]	308	385	456	526	597	668	739
	0	77	155	232	309	387	458	529	601	672	744
120	0	79	157	236	315	394	466	539	611	684	756
140	0	80	160	240	320	400	474	548	622	695	769
160	0	82	164	246	328	411	486	561	637	712	788
180	0	85	170	254	339	424	502	579	657	734	812
	0	88	175	263	350	438	517	597	676	756	836
220	0	90	180	271	361	451	533	614	696	778	860
240	0	93	186	279	372	465	548	632	716	800	884
260	0	96	192	288	384	480	566	652	739	825	911
280	0	99	199	298	397	497	586	675	764	853	942
	0	103	205	[illegible]	411	514	605	697	789	881	973
320	0	106	212	318	424	530	625	720	815	909	1004
340	0	109	219	328	438	547	645	742	840	937	1035
360	0	113	225	338	451	564	664	765	865	966	1066
380	0	116	232	[illegible]	464	580	683	787	890	994	1097
	0	119	238	357	476	595	702	808	915	1022	1128
420	0	122	244	367	489	611	721	830	940	1050	1159
440	0	125	251	376	502	627	740	852	965	1078	1190
460	0	128	257	385	513	641	757	872	988	1104	1219
480	0	131	262	393	524	654	[illegible]	891	1009	1127	1245
[illegible]	0	134	267	[illegible]	534	668	788	909	1030	1151	1272
515	0	135	271	406	542	677	800	923	1046	1169	1292
530	0	137	275	412	550	687	812	937	1062	1187	1312
545	0	138	276	[illegible]	552	690	816	941	[illegible]	1193	1318

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.9
POWER DEFECT

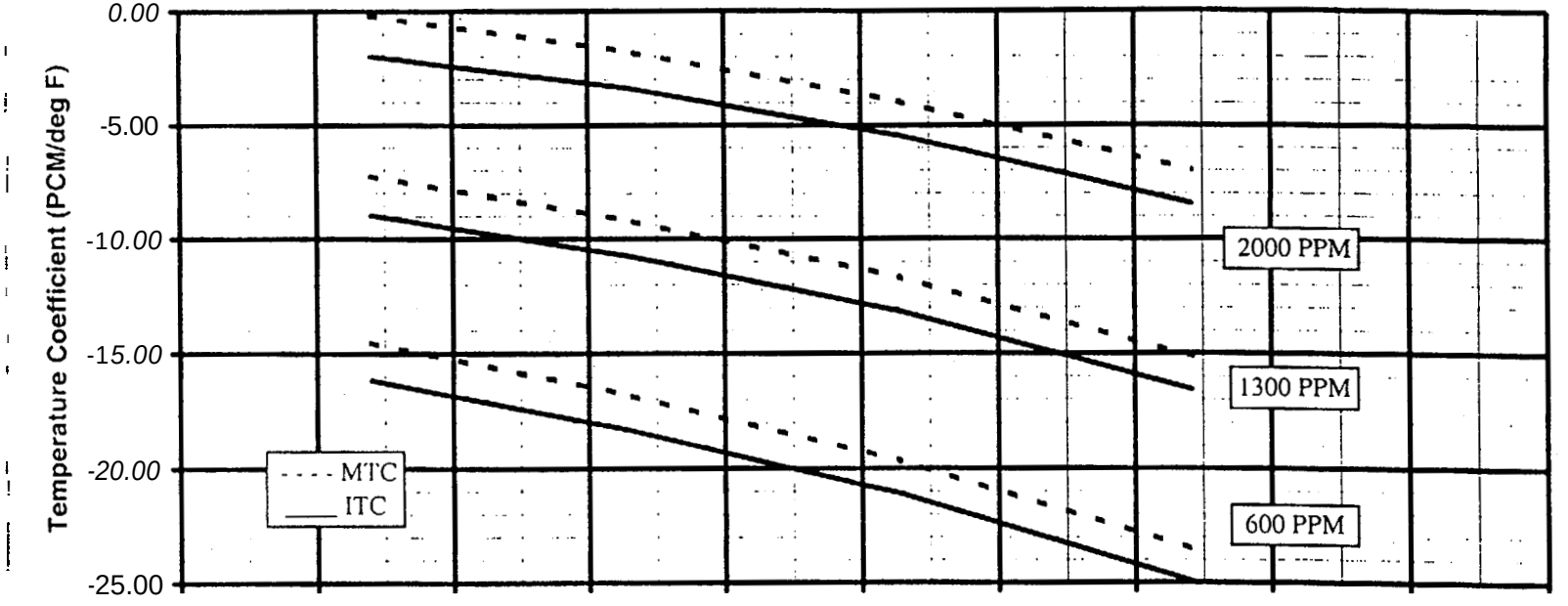
Source: CNEI-0400-26
Prepared By: MW Hawes
Revision 363
Date: 5/14/02

Total Power Defect (PCM) as a Function of Power and Cycle Burnup from 55 - 100% FP

BURNUP (EFPD)	POWER (%FP)									
	55	60	65	70	75	80	85	90	95	100
0	835	907	979	1051	1123	1199	1275	1351	1426	1502
20	828	899	971	1042	1114	1189	1264	1340	1415	1490
40	821	892	963	1035	1106	1181	1256	1331	1406	1481
60	814	885	956	1027	1098	1173	1248	1323	1398	1473
80	810	881	952	1023	1094	1169	1245	1320	1395	1470
100	815	887	959	1030	1102	1178	1255	1331	1407	1483
120	829	902	976	1049	1122	1200	1278	1356	1434	1512
140	844	918	992	1067	1141	1221	1301	1381	1461	1540
160	864	940	1016	1092	1169	1251	1332	1414	1496	1578
180	890	968	1047	1125	[illegible]	1288	1372	1457	1541	1626
200	916	996	1077	1157	1238	1325	1412	1499	1586	1673
220	942	1025	1107	1190	1273	1362	1452	1541	1631	1721
240	968	1053	1138	1222	1307	1399	1492	1584	1676	1768
260	998	1085	1172	1260	1347	1442	1537	1632	1727	1822
280	1032	1122	1212	1301		1489	1588	1686	1784	1882
300	1066	1158	1251	1343	1436	1537	1638	1740	1841	1942
320	1099	1194	1290	1385	1480	1585	1689	1794	1898	2003
340	1133	1231	1329	1427	1525	1632	1740	1848	1955	2063
360	1167	1268	1368	1469	1570	1681	1792	1903	2014	2125
380	1201	1305	1409	1513	1616	1731	1846	1960	2075	2189
400	1235	1342	1449	1556	1663	1781	1899	2017	2135	2253
420	1269	1379	1489	1599	1709	1831	1952	2074	2196	2318
440	1303	1416	1529	1642	1755	1881	2006	2131	2256	2382
460	1335	1451	1567	1683	1799	1928	2056	2185	2313	2442
480	1364	1483	1602	1721	1839	1971	2103	2235	2367	2499
500	1394	1515	1637	1758	1880	2015	2150	2285	2420	2555
515	1416	1539	1563	1787	1910	2048	2185	2323	2460	2598
530	1438	1563	1589	1815	1941	2081	2221	2361	2500	2640
545	1445	1571	1698	1824	1951	2091	2232	2372	2513	2653

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.10
MODERATOR AND ISOTHERMAL TEMPERATURE COEFFICIENTS

Source: CNEI-0400-26
Prepared By: M W Hawes
Revision Number: 383
Date: 10/16/02



Temp.	600 PPM ITC	1300 PPM ITC	2000 PPM ITC	600 PPM MTC	1300 PPM MTC	2000 PPM MTC
557	-16.17	-8.97	-1.99	-14.53	-7.26	-0.21
566.5	-18.34	-10.76	-3.39	-16.83	-9.20	-1.78
576.4	-21.11	-13.18	-5.47	-19.66	-11.70	-3.96
587.1	-24.96	-16.58	-8.46	-23.57	-15.16	-7.02

UNIT ONE
REACTOR OPERATING **DATA**
SECTION **5.11**
MINIMUM SI-IUTDOWN MARGIN BORON

Required Boron Concentration for 1.0% Shutdown Margin as a Function of Temperature and Burnup

CORE AVERAGE TEMPERATURE (°F)

BURNUP (EFPD)	33	68	70	80	YO	100	110	I20	I30	140	150	I60	I70	180	190	200
0	1590	1584	1584	1582	1581	I579	1577	1576	I574	1573	1571	I570	I569	1567	I566	1564
20	1620	1610	1610	1608	1606	1605	1604	1603	1601	1600	1599	1598	1597	1596	1594	1593
40	1641	1620	1629	1627	1625	1624	I623	I622	1621	I620	I620	1619	1618	1617	1615	1614
60	1653	1641	1641	1639	1637	I636	1635	I634	I634	I633	I632	I632	1631	I630	I629	1627
80	1657	1647	1646	1644	1643	1642	1641	1640	1640	I639	1638	1638	1637	I636	1635	I634
100	1654	1646	1645	1644	1642	1641	I640	1640	1639	1638	1638	I637	1637	1636	1635	I634
120	1645	1638	1638	1637	1636	1635	I634	1633	1632	I632	1631	1630	1630	I629	I628	1628
140	1630	1625	1625	I624	I623	I622	1621	1620	I620	1619	1618	1618	1617	1616	1616	1615
160	1610	1607	1607	I606	I605	1604	1603	I602	1601	1601	I600	1599	1598	1598	IS97	1s97
180	1586	1584	1583	1582	1581	1581	I580	I579	1578	1577	1576	1575	1575	1574	I574	1573
200	1559	1555	1555	I554	1553	1552	1551	I550	I549	1549	1548	1547	1S46	I545	1545	1544
220	1527	1523	1523	1522	1521	1520	1519	1518	1517	1516	1515	1514	1513	1513	1512	1511
240	1492	1487	1487	1486	1485	I483	I482	1481	1480	I479	1479	I478	1477	1476	1475	1474
260	1454	1449	1448	I447	1446	1444	1443	I442	1441	I440	1439	I438	1437	1436	1435	1434
280	1414	1407	1407	1406	I404	I403	I402	I400	1399	1398	I397	1396	I395	1393	1392	1391
300	1371	1364	I363	1362	1360	I359	I357	I356	1355	1353	I352	1351	I349	1348	1346	1345
320	1325	1317	1317	1315	1313	1312	1310	I309	1307	I306	I305	I303	1301	I300	I298	I296
340	11-76	1268	1268	1266	1264	1262	1261	1259	1258	I256	1255	I253	1251	I249	1247	I245
360	1225	1217	1216	1214	1212	1211	1209	I207	1206	1204	1202	1200	1198	1196	1194	1192
380	1171	1163	1162	1160	1159	1157	1155	1153	1151	1149	1148	1146	1143	1141	1139	1137
400	1115	1108	1107	I105	1103	1101	I099	I097	I095	I093	1091	1089	1087	1085	I082	1080
420	1059	1051	1051	1049	1046	I044	1042	I040	1038	1036	1034	I032	I029	1027	I024	1022
440	1002	994	993	991	989	981	985	983	980	978	916	973	971	968	966	963
460	945	936	936	933	931	929	926	924	922	919	917	914	912	909	906	903
480	889	879	x7x	876	873	870	868	865	863	X60	858	855	853	E50	847	844
500	834	822	821	818	815	813	810	807	805	802	799	796	194	791	788	785
515	792	780	779	776	773	770	767	764	761	759	756	753	150	747	144	741
530	750	738	737	734	731	728	725	722	719	716	713	710	707	704	700	697
545	708	697	696	693	690	687	684	681	678	674	671	668	665	661	658	654

NOTES: 1) Tech Spec Refueling **boron concentration is 2700 ppmB (per C1C14 COLR)**

2) Fill and Vent **Boron concentration is 1791 ppmB.**

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.11
MINIMUM SHUTDOWN MARGIN BORON

Required Boron Concentration for 1.3% Shutdown Margin as a Function of Temperature and Burnup

CORE AVERAGE TEMPERATURE (°F)

BURNUP (EFPD)	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	557
0	1598	1595	1592	1587	1582	1575	1567	1557	1545	1533	1518	1499	1474	1442	1403	1390
20	1627	1626	1623	1620	1616	1610	1603	1594	1582	1571	1557	1538	1514	1483	1443	1431
40	1649	1648	1647	1644	1641	1636	1629	1621	1610	1600	1586	1567	1543	1512	1474	1461
60	1662	1663	1662	1660	1657	1653	1646	1638	1628	1618	1605	1586	1563	1532	1494	1481
80	1669	1670	1669	1668	1665	1661	1655	1647	1638	1628	1614	1596	1573	1542	1504	1492
100	1669	1670	1670	1669	1666	1662	1656	1649	1639	1629	1615	1597	1574	1543	1505	1493
120	1662	1663	1663	1662	1660	1656	1650	1642	1632	1622	1608	1590	1566	1536	1498	1485
140	1650	1651	1651	1649	1647	1643	1637	1629	1618	1608	1594	1576	1551	1520	1482	1469
160	1631	1632	1632	1631	1628	1623	1617	1609	1598	1587	1573	1554	1529	1497	1457	1444
180	1607	1608	1608	1606	1603	1598	1592	1583	1572	1561	1546	1526	1500	1467	1425	1411
200	1578	1579	1578	1577	1573	1568	1561	1552	1540	1528	1513	1492	1465	1430	1385	1371
220	1544	1545	1544	1542	1539	1533	1525	1515	1503	1491	1474	1452	1424	1387	1340	1325
240	1507	1507	1507	1504	1500	1494	1485	1475	1461	1448	1431	1408	1378	1339	1289	1274
260	1467	1467	1465	1462	1458	1451	1442	1430	1416	1402	1384	1359	1327	1286	1235	1218
280	1423	1423	1421	1418	1412	1405	1395	1383	1367	1352	1333	1307	1273	1230	1176	1159
300	1377	1376	1374	1370	1364	1356	1345	1332	1315	1299	1278	1251	1215	1170	1114	1096
320	1329	1327	1324	1319	1313	1304	1292	1278	1260	1243	1220	1191	1154	1107	1049	1030
340	1277	1275	1272	1266	1259	1249	1237	1221	1203	1184	1160	1129	1090	1041	980	961
360	1224	1221	1217	1211	1203	1192	1179	1162	1143	1122	1097	1065	1024	972	909	889
380	1168	1164	1160	1153	1144	1133	1119	1101	1080	1059	1033	998	955	901	835	814
400	1110	1106	1101	1094	1084	1072	1057	1039	1017	994	966	931	886	829	760	738
420	1051	1047	1041	1033	1023	1010	994	975	952	928	899	862	815	757	685	663
440	992	987	981	972	961	947	931	910	886	861	830	792	744	684	612	589
460	932	926	919	910	898	884	866	845	820	794	763	722	672	609	532	508
480	872	866	858	848	835	820	802	780	754	728	695	654	601	534	452	423
500	812	805	797	786	773	757	738	715	688	661	626	583	530	464	384	359
515	768	760	752	741	727	711	691	668	640	609	573	530	478	418	346	324
530	724	717	707	696	682	665	645	620	592	557	519	475	428	317	322	306
545	681	674	664	653	638	620	599	574	545	505	462	419	379	343	314	307

NOTES: 1) Tech Spec Refueling boron concentration is 2700 ppmB (per C1C14 COLR)

2) Fill and Vent Boron concentration is 1791 ppmB.

Operational Mode Boron Concentrations

Boron Concentration (PPMB) for K-eff = 0.99 as a function of Temperature and Burnup with *Control Banks Only Inserted*

Bounds **ARI** cases with Highest Worth Bank Withdrawn

NC SYSTEM AVERAGE TEMPERATURE (°F)

BURNUP (EFPD)	68	75	I00	125	I50	175	200	225	250	275	300
0	1751	I756	1754	I752	1750	1748	1748	1748	I747	1749	1747
20	1768	1767	1765	1763	I762	1761	1761	1761	1762	1764	1763
40	1781	1780	177X	1777	1776	1776	1777	I777	1778	1781	1781
60	1803	I803	1801	1800	1800	1800	1801	1803	1805	I808	1809
80	1810	I809	1808	1807	1807	1807	1809	1811	1813	1818	1818
100	1808	1807	1x05	1804	1805	1806	1807	1809	1811	1817	1818
120	1799	1798	1796	1795	1796	1797	1798	1800	I803	I808	1810
140	1781	1781	1778	1778	1778	1779	1781	1783	1785	1791	1792
160	1761	1761	I758	I757	1758	1759	1760	1762	1765	1770	1771
180	1737	I736	1734	1733	I733	I734	1735	I737	1739	I744	1745
200	1707	1707	I704	1703	1704	1704	1705	1706	I708	1714	1714
220	1669	1668	1666	1665	1665	1665	1666	1667	I668	1674	1673
240	1633	1632	1630	1629	1629	1628	1629	I629	1631	1636	1635
260	1594	1593	1591	1590	1589	1589	1589	1589	I590	1594	1593
280	1552	1551	1549	1547	1546	1546	1545	1545	1545	1549	1547
300	1507	1506	1504	1502	I501	1500	I300	1498	1498	1501	1499
320	1456	1456	1453	1450	1449	1447	1446	1435	1444	1446	1443
340	1407	1406	1403	1401	1399	1397	1395	1394	1392	I394	I389
360	1356	I355	1352	1349	1347	1344	1342	1340	I338	1339	1334
380	1303	1302	1299	1296	1293	1290	1288	I285	1282	1283	1277
400	1249	1248	1244	1241	1238	1234	1231	1228	1225	I224	1218
420	1189	1188	1184	1181	1177	1173	1170	1166	1162	1161	1153
440	1132	1131	1128	1124	1120	Ill6	1111	1107	1102	1100	I092
460	1075	1074	1070	I066	1062	I057	1052	1047	1042	I039	1030
480	1018	101:	1012	1008	1003	998	993	987	981	978	968
500	957	955	950	945	941	935	930	924	917	912	901
515	914	912	907	001	897	891	885	879	871	866	855
530	R?1	869	864	859	853	847	841	834	826	821	809
545	829	827	822	816	811	804	797	789	781	776	764

UNIT ONE REACTOR OPERATING DATA
SECTION 5.12
MODE 3, 4, AND 5 BORON CONCENTRATION

PREPARED BY M.W.Haw
REVISION 363
DATE 5/14/02

Operational Mode Boron Concentrations

Boron Concentration (PPMB) for K-eff = 0.99 as a function of Temperature and Burnup with *Control Banks Only Inserted*

Bounds ARI cases with Highest Worth Bank Withdrawn

NC SYSTEM AVERAGE TEMPERATURE (°F)

BURNUP				400	425	450	475	500	525	550	557
0	1744	1740	1736	1729	1720	1709	1701	1683	1661	1631	1621
20	1761	1758	1755	1749	1741	1732	1724	1708	1688	1659	1649
40	1779	1777	1775	1770	1763	1755	1748	1733	1713	1686	1676
60	1808	1807	1805	1800	1794	1787	1782	1767	1747	1720	1711
80	1818	1817	1816	1812	1806	1799	1794	1779	1760	1733	1724
100	1818	1817	1816	1812	1806	1798	1793	1778	1760	1732	1723
120	1810	1809	1808	1804	1797	1790	1783	1768	1750	1722	1713
140	1792	1790	1789	1784	1778	1770	1763	1748	1728	1700	1690
160	1771	1769	1767	1762	1755	1746	1739	1723	1702	1673	1664
180	1744	1742	1740	1734	1727	1717	1709	1692	1671	1640	1630
200	1713	1710	1707	1701	1692	1682	1673	1655	1632	1600	1590
220	1671	1668	1663	1656	1646	1635	1625	1605	1582	1547	1535
240	1632	1628	1622	1614	1604	1591	1581	1559	1534	1497	1485
260	1589	1584	1578	1569	1557	1544	1532	1510	1482	1443	1430
280	1543	1537	1530	1520	1508	1493	1480	1456	1427	1385	1372
300	1494	1487	1479	1468	1454	1438	1424	1398	1367	1323	1309
320	1437	1429	1421	1408	1393	1375	1360	1332	1298	1252	1237
340	1383	1374	1365	1351	1335	1316	1299	1269	1233	1185	1169
360	1327	1317	1307	1292	1275	1254	1236	1204	1166	1115	1098
380	1269	1258	1247	1231	1212	1190	1171	1137	1096	1043	1026
400	1209	1197	1185	1168	1148	1124	1103	1067	1025	969	951
420	1143	1130	1117	1099	1077	1051	1029	991	945	886	867
440	1081	1068	1053	1034	1010	984	960	920	872	811	791
460	1018	1004	989	968	944	915	890	848	799	735	715
480	955	940	924	902	876	847	820	777	725	660	639
500	889	873	857	834	807	776	748	703	650	582	561
515	841	825	808	784	757	725	696	649	595	526	504
530	794	777	760	735	706	674	643	596	541	470	448
545	748	730	711	686	656	623	591	543	487	415	392

SOURCE CNEI-0400-26
PREPARED BY M W.Hawes
REVISION 363
DATE 5/14/02

UNIT ONE REACTOR OPERATING DATA
SECTION 5.13
SHUTDOWN FISSION PRODUCT CORRECTION

Time (hours)	Time (days)	Correction (ppm)	Time (hours)	Time (days)	Correction (ppm)	Time (hours)	Time (days)	Correction (ppm)
0	0.00	0.0						
6	0.25	2.7	246	10.25	49.0	1080	45.00	55.4
12	0.50	5.5	252	10.50	49.1	1104	46.00	55 6
18	0.75	9.3	258	10.75	49.2	1128	47.00	55.7
24	1.00	13.0	264	11.00	49.2	1152	48.00	55.8
30	1.25	15.7	270	11.25	49.3	1176	49.00	55.9
36	1.50	18.4	276	11.50	49.3	1200	**50.00**	56.1
42	1.75	21.1	282	11.75	49.4	1224	51.00	56.2
48	2.00	23.7	288	12.00	49.4	1248	52.00	56.3
54	2.25	26.3	312	13.00	49.7	1272	53.00	56.5
60	2.50	28.9	336	14.00	49.9	1296	54.00	56.6
66	2.75	31.6	360	15.00	50.1	1320	55.00	56.7
72	3.00	34.2	384	16.00	50.3	1344	56.00	56.8
78	3.25	35.1	408	17.00	50.6	1368	57.00	57.0
84	3.50	36.1	432	18.00	50.8	1392	58.00	57.1
90	3.75	37.1	456	19.00	51.0	1416	59.00	57.2
96	4.00	38.0	480	20.00	51.2	1440	60.00	57.4
102	4.25	39.0	504	21.00	51.5	1464	61.00	57.3
108	4.50	39.9	528	22.00	51.7	1488	62.00	57.3
114	4.75	40.8	552	23.00	51.9	1512	63.00	57.2
120	5.00	41.7	576	24.00	52.2	1536	64.00	57.2
126	5.25	42.1	600	25.00	52.4	1560	65.00	57.2
132	5.50	42.5	624	26.00	52.6	1680	70.00	57.0
138	5.75	42.8	648	27.00	52.8	1800	75.00	56.8
144	6.00	43.2	672	28.00	53.1	1920	80.00	56.7
150	6.25	43.6	696	29.00	53.3	2040	85.00	56.5
156	6.50	43.9	720	30.00	53.5	2160	90.00	56.3
162	6.75	44.3	744	31.00	53 6	2280	95.00	56.2
168	7.00	44.6	768	32.00	53.8	2400	100.00	56.0
174	7.25	45.0	792	33.00	53.9	2520	105.00	55.8
180	7.50	45.4	816	34.00	54.0	2640	110.00	55.6
186	7.75	45.7	840	35.00	54.2	2760	115.00	5575
192	8.00	46.1	864	36.00	54.3	2880	120.00	55.3
198	8.25	46.5	888	37.00	54.4	3000	125.00	55.1
204	8.50	46.8	912	38.00	54.5	3120	130.00	54.9
210	8.75	47.2	936	39.00	54.7	3240	135.00	54.7
216	9.00	47.5	960	40.00	54 8	3360	140.00	54.5
222	9.25	47.9	984	41.00	54.9	3480	145.00	54.3
228	9.50	48.3	1008	42.00	55.0	3600	150.00	54.1
234	9.75	48.6	1032	43.00	55 7			

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM 2S/ADMIN

Evaluate Reactor Coolant System Leakage
And Determine Tech Spec actions
During Loss of OAC

CANDIDATE _____

EXAMINER _____

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Evaluate reactor coolant system leakage and determine Tech Spec actions during **loss** of OAC.

Alternate Path:

N/A

Facility JPM #:

NEW

K/A Rating(s):

2.1.33(3.4/4.0)

Task Standard:

Evaluate data collected on reactor coolant system leakage and correctly determines that leakage exceeds 1 GPM UNIDENTIFIED per **T.S.3.4.13.**

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator ___X_ In-Plant __X___ Perform __X___ Simulate _____

References:
PT/1A/4600/009 (Loss of Operator Aid Computer) Revision 67
CNS Tech Specs **3.4.13** and **3.4.15**

Validation Time: 10 minutes **Time Critical:** No

==========

Candidate: _____ Time Start : _____
NAME Time Finish: _____

Performance Rating: SAT _____ UNSAT _____ Performance Time _____

Examiner: _____ _____ / _____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

/Equipment/Pr((,r Needed:

PT/1A/4600/009 (Loss of Operator Aid Computer)
CNS Tech Specs 3.4.13 and 3.4.15
Completed Enclosures with the first set of readings.

READ TO TOR

DIRECTION TO TRAINEE:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

Unit 1 is in Mode 3 and a loss of OAC has occurred. You are the Control Room SRO supervising the actions contained in PT/1/A/4600/009 (Loss of Operator Aid Computer).

The BOP has completed the initial data entries (0830 hrs) for:

Enclosure 13.4 (Ventilation Unit Condensate Drain Tank Input Rate Determination)
Enclosure 13.5 (Containment Floor and Equipment Sumps Input Rate Determination)
Enclosure 13.6 (1EMF-38 Delta Count Rate Determination)
Enclosure 13.7 (1EMF-39 Delta Count Rate Determination)

Data from previously performed NC Leakage Calculation:

- Identified leakage = 0.2 gpm
- Unidentified leakage = 0.1 gpm

INITIATING CUE:

You are directed to gather the next set of readings (0930 hrs), evaluate the data collected in Enclosures 13.4 through Enclosure 13.7, and determine the applicable Technical Specification actions (if any).

Start Time:_____

STEP 1: Record second data set for "Unit 1 VUCDT LEVEL" on Enclosure 13.4, VUCDT INLEAKAGE RATE LOG SHEET STANDARD: Contacts either Radwaste Chemistry or sends NLO to Unit 1 VUCDT Level instrument on panel 1ELCC0013 to obtain data. **EXAMINER CUE: WHEN operator dispatched or Radwaste technician is called, report that VUCDT level is reading 14%.** COMMENTS:	___**SAT** ___UNSAT
STEP 2: Candidate determines that VUCDT level has increased less than 1% since last data collection STANDARD: Based on previous data and current VUCDT level, candidate determines level increase is 0% per hour and criteria is met. COMMENTS:	___SAT ___UNSAT

STEP 3: Enclosure 13.5 Containment Floor and Equipment Sumps Input Rate Determination actions are performed. **EXAMINER CUE:** The Containment Floor and Equipment pumps were turned off 90 minutes ago. STANDARD: Enters time and sump levels. Calculates leak rate per calculation formula on Enclosure 13.5 Page 4 of 4: "A" Sump 10.9 inches is 439.6 gallons, (current reading) 8.5 inches is 360.8 gallons, (previous reading) 439.6 − 360.8 = 78.8 gallons per hour "B" Sump 7.7 inches is 322.4 gallons, (current reading) 7.2 inches is 296.0 gallons, (previous reading) 322.4 − 296.0 = 26.4 gallons per hour Total leakage = 78.8 + 26.4 = 105.2 gallons per hour 105.2 gallons/60 minutes = 1.753 gallons per minute **EXAMINER CUE: Containment Floor and Equipment Sump "A" reads 10.9 inches and Sump "B" reads 7.7 inches** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
STEP 4: Enclosure 13.5, Containment Floor and Equipment Sumps Input Rate Determination leakage is checked against the criteria. STANDARD: Candidate determines that the leak rate is greater than 1 gpm for the Containment Floor and Equipment Sump and criteria is NOT met. **EXAMINER NOTE: Candidate may complete remaining enclosures before determining if Tech Spec 3.4.13 and 3.4.15, Limiting Conditions for Operation, are met.** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT

STEP 5: Candidate reads 1EMF-38 counts from Control Boards and completes appropriate entries on enclosure 13.6. STANDARD: Candidate enters time, countrate, calculates change in the last hour to be 200 cpm, and determines leakage is acceptable. **EXAMINER CUE: 1EMF-38 is currently reading 276 cpm.** COMMENTS:	___SAT ___UNSAT
STEP 6: Candidate reads 1EMF-39 counts from Control Boards and completes appropriate entries on enclosure 13.7. STANDARD: Candidate enters time, countrate, calculates change in the last hour to be 1201 cpm, and determines leakage is acceptable. **EXAMINER CUE: 1EMF-39 is currently reading 1677 cpm.** COMMENTS:	___SAT ___UNSAT
STEP 7: Refer to Technical Specifications 3.4.13 and 3.4.15 and determine if NC System Leakage is >1gpm. STANDARD: Based on 1.753 gallons per minute calculated and T.S. 3.4.13 bases, the Containment Sump Level increases are considered Unidentified and Unit **1** enters Action A, Reduce Leakage in 4 hours. **EXAMINER NOTE: The initial previously known values of Unidentified Leakage would be added *to* this total but are not needed here to perform this step SAT.** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
JPM Complete	

TIME STOP: _____

CANDIDATE CUE SHEET
(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

Unit 1 is in Mode 3 and a loss of OAC has occurred. You are the Control Room SRO supervising the actions contained in PT/1/A/4600/009 **(Loss** of Operator Aid Computer).

The BOP has completed the initial data entries (0830 hrs) for:

Enclosure 13.4 (Ventilation Unit Condensate Drain Tank Input Rate Determination)
Enclosure 13.5 (Containment Floor and Equipment Sumps Input Rate Determination)
Enclosure 13.6 (I**EMF-38** Delta Count Rate Determination)
Enclosure 13.7 (1EMF-39 Delta Count Rate Determination)

Data from previously performed NC Leakage Calculation:

- Identified leakage = 0.2 gpm
- Unidentified leakage = 0.1 gpm

INITIATING CUE:

You are directed to gather the next set of readings (0930 hrs), evaluate the data collected in Enclosures 13.4 through Enclosure 13.7, and determine the applicable Technical Specification actions (if any).

Duke Power Company Catawba Nuclear Station	Procedure No. PT/1/A/4600/009
Loss of Operator Aid Computer	Revision No. 067
Continuous Use	Electronic Reference No. CN005GA4

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * *

(ISSUED) - PDF Format

FIRST DATA SET ENTERED PER INITIAL CONDITIONS FOR SRO

Loss of Operator Aid Computer

1. Purpose

To document Technical Specifications requirements normally performed by the Operator Aid Computer in the event that the unit Operator Aid Computer is out of service.

2. Reference

2.1 OP/1/A/6700/003 (Operation with the Operator Aid Computer Out of Service)

2.2 Catawba TS and SLC Requirements:

2.2.1 **TS** 3.1.4

2.2.2 TS 3.1.6

2.2.3 **TS** 3.2.3

2.2.4 TS 3.2.4

2.2.5 **TS** 3.3.1

2.2.6 TS 3.4.2

2.2.7 TS 3.7.5

2.2.8 TS 3.4.13

2.2.9 **TS** 3.4.15

2.2.10 SR 3.1.4.1

2.2.11 SR3.1.6.2

2.2.12 SR 3.2.3.1

2.2.13 SR 3.2.4.1

2.2.14 SR3.4.2.I

2.2.15 SLC 16.5-7

2.2.16 TS 3.6.3

2.2.17 TS 3.7.3

3. Time Required

3.1 Manpower - One Operator

3.2 Time - Until the Operator Aid Computer is restored to service.

3.3 Frequency - When the Operator Aid Computer is out of service.

4. Prerequisite Tests

None

5. Test Equipment

None

6. Limits and Precautions

6.1 If an acceptance criteria is **NOT** met, the Operations Shift Manager and the Operator at the Controls should be notified immediately.

6.2 **If** the unit status or system condition prevents the performance of a surveillance item, the item should be noted on the affected data sheet with an explanation and the Operations Shift Manager and the Operator at the Controls should be notified immediately.

7. Required Unit Status

None

8. Prerequisite System Condition

Verify the Operator Aid Computer is out of service.

9. Test Method

A visual inspection of various system instrumentation will be made until the computer is returned to service.

10. Data Required

Complete Enclosures as required.

11. Acceptance Criteria

No data taken shall exceed limits listed on the Enclosures.

12. Procedure

12.1 **IF** in Modes 5 **OR 6,** EVERY 15 MINUTES document the critical core parameters listed on Enclosure 13.1 (Critical Core Parameters Sheet) (Reference OEP).

12.2 **IF** Start Up Of ND System During Plant Cooldown (OP/1/A/6200/004) is in progress **AND** KCHX Maximized Cooling Temperature Monitoring is being performed, within 15 minutes and every 15 minutes thereafter record parameters on Enclosure 13.2 (KCHX Maximized Cooling Temperature Monitoring).

12.3 EVERY 15 MINUTES record on Enclosure 13.3 (Auxiliary Building Ventilation Supply Unit Status) the status of the Auxiliary Building Ventilation System supply units.

12.4 **IF** in Modes 1-4, within 30 minutes of Loss of OAC and once per hour thereafter, verify and record on Enclosure 13.4 (Ventilation Unit Condensate Drain Tank Input Rate Determination) that the rate of increase in VUCDT level is < 1% per hour. **(TS** 3.4.13 and 3.4.15)

12.5 **IF** in Modes 1-4, within 30 minutes of Loss of OAC, begin performing Enclosure 13.5 (Containment Floor and Equipment Sumps Input Rate Determination) to verify input to the Containment Floor and Equipment Sump is less than 1 gpm. (TS 3.4.13 and 3.4.15)

12.6 **IF** in Modes 1-4, within 30 minutes of Loss of OAC and once per hour thereafter, verify and record on Enclosure 13.6 (1EMF-38 Delta Count Rate Determination) that the change in count rate on 1EMF-38 is < 750 cpm in one hour. (TS 3.4.13 and 3.4.15)

12.7 **IF** in Modes 1-4, within 30 minutes of Loss of OAC and once per hour thereafter, verify and record on Enclosure 13.7 (1EMF-39 Delta Count Rate Determination) that the change in count rate on 1EMF-39 is < 6700 cpm in one hour. (TS 3.4.13 and 3.4.15)

12.8 **IF** ALL the following conditions exist (Reference SR 3.4.2.1):

- Reactor Critical
- T_{AVG} < 561°F
- T_{REF} - T_{AUCT} - Hi/Lo Alarm Present, Annunciator 1AD2 A/4

EVERY 30 MINUTES verify Reactor Coolant loops $T_{AVG} \geq$ 551°F by completing Enclosure 13.8 (T_{AVG} Data Sheet).

NOTE: The YC Operable But Degraded Condition is normally active during the winter months based on Lake Wylie and SNSWP temperatures.

12.9 **IF** the YC Operable But Degraded Condition is active, perform Enclosure 13.9 (YC Operable But Degraded Temperature Monitoring).

12.10 **IF** both trains of the plasma display monitor are inoperable in Modes 1-6, EVERY 60 MINUTES or after 10% change in power, complete Enclosure 13.10 (Subcooling Data Sheet) to monitor subcooling margin.

12.11 **IF** Unit 1 net generation **CANNOT** be obtained from the Unit 1 operator aid computer, perform the following:

12.11.1 At the top of the first hour during loss of OAC, notify SOC that they will not be getting station or unit MWH hourly values from both CNS units.
Person notified ED BRODIN

12.11.2 EVERY HOUR on the HOUR complete Enclosure 13.11 (Electrical Data Sheet).

NOTE: 1. If pressure (primary and secondary) are verified < 200 psig, then temperatures are **NOT** required to be taken nor recorded.

2. Use a calibrated pyrometer to obtain S/G shell temperatures.

12.12 **IF** NC T_C is > 80°F **AND** a NC pump is operating, then the secondary side temperature is > **80°F** and documentation of shell temps is **NOT** necessary. **IF** in Modes 5, 6 **OR** No Mode, EVERY 60 MINUTES complete Enclosure 13.12 (Steam Generator Data Sheet) (Reference SLC 16.5-7).

12.13 **IF** in Mode 1 **AND** less than 50% rated power, prior to exceeding 50% rated power and every 1 hour thereafter, with the AFD monitor alarm inoperable, monitor and log the indicated Axial Flux Difference for each operable excore channel on Enclosure 13.13 (Axial Flux Difference **(%A** Flux) Following Loss of AFD Monitor Alarm). (Reference SR 3.2.3.1 and **TS** 3.2.3).

12.14 **IF** in Mode 1 **AND** ≥ 50% rated power, once within 1 hour and every 1 hour thereafter with the AFD monitor alarm inoperable, monitor and log the indicated Axial Flux Difference for each operable excore channel on Enclosure 13.13 (Axial Flux Difference **(%A** Flux) Following Loss of AFD Monitor Alarm). (Reference SR 3.2.3.1 and TS 3.2.3).

12.15 **IF** in Modes 1 **OR** 2, EVERY 4 HOURS verify by signing off on Enclosure 13.14 (Rod Verification Checklist) that the Digital Rod Position indication for all rods are within ± 12 steps of their group step counter demand position and operable (Reference SR 3.1.4.1).

12.16 **IF** in Mode 1 **OR** 2 **AND** $K_{EFF} \geq$ **1.0,** EVERY 4 HOURS verify and record on Enclosure 13.15 (Rod Insertion Limit Checksheet) that each control bank of rods is above the rod insertion limit (Reference SR 3.1.6.2).

12.17 **IF** in Modes 1,2, 3, **OR** Mode 4, when steam generators are being used for heat removal, EVERY 4 HOURS record CA suction source temperatures measured locally using a calibrated Keithley 872 digital thermometer, Type J or its equivalent, as required, per Enclosure 13.16 (CA Suction Source Temperature Monitoring Data)

12.18 **IF** in Modes 1-4, within 4 HOURS and every 4 hours thereafter, monitor the CF containment isolation valves N2 accumulator pressures on Enclosure 13.17 (CF Containment Isolation Valve N2 Accumulator Pressure Monitoring).

12.19 **IF** in Modes 1-4, EVERY 6 HOURS, document data needed for primary to secondary leakage calculation on Enclosure 13.18 (Primary to Secondary Leakage Calculation Data) and provide data to Chemistry. Notify Secondary Chemistry to perform PT/1/B/4600/028 (Determination Of Steam Generator Tube Leak Rate For Unit 1).

12.20 **IF** Auxiliary Spray is being used for pressurizer pressure control, EVERY 12 HOURS complete Enclosure 13.19 (Pressurizer Spray **AT** Data Sheet).

12.21 **IF** in Mode 1 **AND** above 50% rated power, once within 12 hours and every 12 hours thereafter, document Quadrant Power Tilt Ratio, as calculated by PT/0/A/4600/08B (Man. Cal. of Quad. Tilt), in Enclosure 13.1 of PT/1/A/4600/002A (Mode 1 Periodic Surveillance Items). (Reference SR 3.2.4.1)

12.22 **IF** in Modes 1-3, within 12 HOURS of the Loss of OAC and every 12 hours thereafter, monitor the CA piping surface temperatures. Perform OP/1/A/6250/002, Enclosure 4.12 (Checking Pipe Surface Temperatures).

12.23 **IF** in Modes 1-2, within 12 HOURS of the Loss of OAC and every 12 hours thereafter, monitor the Overtemperature Delta T parameters and record on Enclosure 13.20 (Overtemperature Delta T Setpoint Channel Check). (Reference SR 3.3.1.1)

12.24 **IF** in Modes 1-4, EVERY 24 HOURS perform a manual leakage calculation of the NC System in accordance with PT/1/A/4150/001I (NC Manual Leakage Calculation). (Reference TS 3.4.15, Required Action A.1).

12.25 Update Enclosure 13.21 (Chemistry Data Sheet) as information becomes available from Chemistry.

12.26 **WHEN** the OAC is returned to service, notify Shift Work Manager to coordinate with Local IT and Reactor Group Duty Engineer to ensure OAC is updating properly.

12.26.1 Notify SOC that MWH data should be valid at the top of the next hour.
Person notified _____

12.26.2 Give a copy of Enclosure 13.11 to the **SSA** to assist them in editing the switch board logs.

12.27 Evaluate the acceptance criteria by performing one of the following:

_____ 12.27.1 Verify the acceptance criteria specified in Section 11 is met.

OR

_____ 12.27.2 **IF** the acceptance criteria is **NOT** met, perform the following:

☐ Notify the Unit/WCC SRO that the acceptance criteria is **NOT** met.

_____ ____/____
Unit/WCC SRO Contacted Date Time

☐ Initiate a PIP to document the test failure.

☐ Document all issues on a procedure discrepancy sheet.

_____ 12.28 **IF** any discrepancy is noted during the performance of this test that does **NOT** keep the test from meeting the acceptance criteria, it shall be given to the Unit/WCC SRO for evaluation via a discrepancy sheet.

_____ 12.29 Submit PT/1/A/4600/009 (Loss of Operator Aid Computer) to the Unit/WCC SRO.

13. Enclosures

13.1 Critical Core Parameters Sheet

13.2 KCHX Maximized Cooling Temperature Monitoring

13.3 Auxiliary Building Ventilation Supply Unit Status

13.4 Ventilation Unit Condensate Drain Tank Input Rate Determination

13.5 Containment Floor and Equipment Sumps Input Rate Determination

13.6 1EMF-38 Delta Count Rate Determination

13.7 1EMF-39 Delta Count Rate Determination

13.8 T_{AVG} Data Sheet

13.9 YC Operable But Degraded Temperature Monitoring

13.10 Subcooling Data Sheet

13.11 Electrical Data Sheet

13.12 Steam Generator Data Sheet

13.13 Axial Flux Difference (%A Flux) Following Loss of AFD Monitor Alarm

13.14 Rod Verification Checklist

13.15 Rod Insertion Limit Checksheet

13.16 CA Suction Source Temperature Monitoring Data

13.17 CF Containment Isolation Valve N2 Accumulator Pressure Monitoring

13.18 Primary to Secondary Leakage Calculation Data

13.19 Pressurizer Spray AT Data Sheet

13.20 Overtemperature Delta T Setpoint Channel Check

13.21 Chemistry Data Sheet

Enclosure 13.4

Ventilation Unit Condensate Drain Tank Input Rate Determination

Acceptance Criteria - Rate of increase must be < 1%/hour.

NOTE:
1. Either of the following instruments may be used to perform this surveillance, however, the same instrument should be used for the duration of time the procedure is in effect:
   - "UNIT 1 VUCDT LEVEL" on Auxiliary Waste Processing Control Panel (1ELCC0013) (AB-543, MM, 53-54) .
   - 1WLP5771 (AB-543, BB-CC, 50) CA Pump Room (Next to VUCDT)
2. If the rate of increase is ≥ 1%/hour, the VUCDT input rate is > 1 gpm. Refer to TS 3.4.13 and TS 3.4.15 and determine if NC System leakage is > 1 gpm.
3. Coordinate with Radwaste Chemistry as required when the VUCDT needs to be pumped down.

VUCDT INLEAKAGE RATE LOG SHEET

Gauge Used: "UNIT 1 VUCDT LEVEL"

Time	Level - %	Rate of Change %/Hour	Leakage Acceptable Initial/Date
0830	14	–	N/A

Containment Floor and Equipment Sumps Input Rate Determination

1. Procedure

NOTE: If any containment floor and equipment sump pump starts during the 10 minute test period the test results will **NOT** be valid. The test should be repeated until valid results are obtained. (i.e. no pump start during test period)

1.1 Stop the following sump pumps and place in "Manual":

- "Pump 1A1 Cont Floor & Equip Sump"
- "Pump 1A2 Cont Floor & Equip Sump"
- "Pump 1B1 Cont Floor & Equip Sump"
- "Pump 1B2 Cont Floor & Equip Sump"

NOTE: The Containment Floor and Equipment Sumps may be pumped down as necessary, however, a new initial sump level reading should be recorded after the pumps are returned to the "Manual" position.

1.2 **IF** at any time during the performance of this test the sump level reaches ≥ 15", perform the following:

1.2.1 Place the following sump pumps in "AUTO":

- "Pump 1A1 Cont Floor & Equip Sump"
- "Pump 1A2 Cont Floor & Equip Sump"
- "Pump 1B1 Cont Floor & Equip Sump"
- "Pump 1B2 Cont Floor & Equip Sump"

NOTE: A level less than **4"** is below the calibration range of the Containment Floor and Equipment Sump level instrumentation, therefore the Leakage Detection Systems must be declared inoperable at sump level less than 4".{PIP 95-0878}

1.2.2 Verify the affected sump level is lowered to 10" as indicated on 1WLP5740 (Cont Floor and Equipment Sump **A** Level) or 1WLP5750 (Cont Floor and Equipment Sump B Level).

1.2.3 Return the following sump pumps to "Manual" and stopped:

- "Pump 1A1 Cont Floor & Equip Sump"
- "Pump 1A2 Cont Floor & Equip Sump"
- "Pump 1B1 Cont Floor & Equip Sump"
- "Pump 1B2 Cont Floor & Equip Sump"

1.3 Record initial sump readings on the "Containment Floor and Equipment Sump Inleakage Rate Log Sheet".

1.4 Once per hour, record sump level readings on the "Containment Floor and Equipment Sump Inleakage Rate Log Sheet".

1.5 Calculate the leakage rate using the "Sump Volume vs. Level Indication Table".

1.6 Verify leakage is < 1 gpm.

1.7 **IF** the input to the Containment Floor and Equipment Sumps is > 1 gpm, perform the following:

- Refer to TS 3.4.13 and TS 3.4.15.
- Determine if NC System leakage is > 1 gpm.

_____ 1.8 **WHEN** the OAC is returned to service, place the following sump pumps in "AUTO":

- "Pump 1A1 Cont Floor & Equip Sump"
- "Pump 1A2 Cont Floor & Equip Sump"
- "Pump 1B1 Cont Floor & Equip Sump"
- "Pump 1B2 Cont Floor & Equip Sump"

Containment Floor and Equipment Sumps Input Rate Determination

Containment Floor and Equipment Sump Inleakage Rate Log Sheet

Date Time/Initials	1WLP5740 CFE Sump A Level – Inches	1WLP5750 CFE Sump B Level - Inches	Leakage Rate gpm	Leakage Acceptable Initial/Date
TODAY/0830/RR	8.5	7.2	–	N/A

SUMP VOLUME VS. LEVEL INDICATION TABLE

Level Indication	Water Volume		Level Indication	Water Volume		Level Indication	Water Volume
4.0	126.5		9.0	383.2		14.0	510.3
4.1	131.9		9.1	386.5		14.1	512.5
4.2	137.3		9.2	389.7		14.2	514.8
4.3	142.6		9.3	393.0		14.3	517.0
4.4	148.0		9.4	396.2		14.4	519.3
4.5	153.4		9.5	399.5		14.5	521.5
4.6	158.8		9.6	402.7		14.6	523.7
4.7	164.2		9.7	406.0		14.7	526.0
4.8	169.5		9.8	409.2		14.8	528.2
4.9	174.9		9.9	412.5		14.9	530.5
5.0	180.3		10.0	415.1		15.0	532.7
5.1	185.6		10.1	417.8		15.1	534.9
5.2	190.8		10.2	420.6		15.2	537.2
5.3	196.1		10.3	423.3		15.3	539.4
5.4	201.3		10.4	426.0		15.4	541.7
5.5	206.6		10.5	428.7		15.5	543.9
5.6	211.8		10.6	431.4		15.6	546.1
5.7	217.1		10.7	434.2		15.7	548.4
5.8	222.3		10.8	436.9		15.8	550.6
5.9	227.6		10.9	439.6		15.9	552.9
6.0	232.8		11.0	442.3		16.0	555.1
6.1	238.1		11.1	444.6		16.1	557.4
6.2	243.3		11.2	446.9		16.2	559.6
6.3	248.6		11.3	449.2		16.3	561.8
6.4	253.8		11.4	451.5		16.4	564.1
6.5	259.1		11.5	453.8		16.5	566.3
6.6	264.4		11.6	456.1		16.6	568.6
6.7	269.6		11.7	458.4		16.7	570.8
6.8	274.9		11.8	460.7		16.8	573.1
6.9	280.1		11.9	463.0		16.9	575.3
7.0	285.4		12.0	465.3		17.0	577.6
7.1	290.7		12.1	467.6		17.1	579.8
7.2	296.0		12.2	469.8		17.2	582.0
7.3	301.3		12.3	472.1		17.3	584.3
7.4	306.6		12.4	474.3		17.4	586.5
7.5	311.9		12.5	476.6		17.5	588.8
7.6	317.1		12.6	478.8		17.6	591.0
7.7	322.4		12.7	481.1		17.7	593.3
7.8	327.7		12.8	483.3		17.8	595.5
7.9	333.0		12.9	485.6		17.9	597.8
8.0	338.3		13.0	487.8		18.0	600.0
8.1	342.8		13.1	490.1			
8.2	347.3		13.2	492.3			
8.3	351.8		13.3	494.6			
8.4	356.3		13.4	496.8			
8.5	360.8		13.5	499.1			
8.6	365.2		13.6	501.3			
8.7	369.7		13.7	503.6			
8.8	374.2		13.8	505.8			
8.9	378.7		13.9	508.1			

To calculate the Rate of volume increase in the Sump, perform the following calculation:

$$\frac{(\text{Sump A Gals.(T2)} - \text{Sump A Gals.(T1)}) + (\text{Sump B Gals.(T2)} - \text{Sump B Gals.(T1)})}{(\text{Time at T2} - \text{Time at T1})}$$

NOTE:
1. T1 is the data from the previous reading.
2. T2 is the data from the current reading.

Enclosure 13.6

1EMF-38 Delta Count Rate Determination

Time	Counts/Min	Change in Counts Rate/Hour	Leakage Acceptable Initial/Date
0830	76	–	N/A

Acceptance Criteria - Change in count rate < 750 cpm per hour.

NOTE:
1. If the change in count rate per hour is ≥ 750 cpm, refer to **TS** 3.4.13 and TS 3.4.15 and determine if NC System leakage **is** > 1 gpm.
2. A digital readout of 1EMF-38 may be obtained from recorder 1MICR6640.

EMF39 Count Rate Log Sheet			
Time	Counts/Min	Change in Counts Rate/Hour	Leakage Acceptable Initial/Date
0830	476	-	N/A

Acceptance Criteria - Change in count rate < 6700 cpm per hour.

NOTE: If the change in count rate per hour is ≥ 6700 cpm, refer to TS 3.4.13 and TS 3.4.15 and determine if NC System leakage is > 1 gpm.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS Operational LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE;

b. 1 gpm unidentified LEAKAGE;

c. 10 gpm identified LEAKAGE;

d. 576 gallons per day total primary to secondary LEAKAGE through all steam generators (SGs); and

e. 150 gallons per day primary to secondary LEAKAGE through any one SG.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCS LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE.	A.1 Reduce LEAKAGE to within limits.	4 hours
B. Required Action and associated Completion Time of Condition A not met. OR Pressure boundary LEAKAGE exists.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.13.1	----------NOTE---------- Not required to be performed in MODE 3 or 4 until 12 hours of steady state operation. ----------	------NOTE------ Only required to be performed during steady state operation
	Verify RCS Operational LEAKAGE within limits by performance of RCS water inventory balance.	72 hours
SR 3.4.13.2	Verify steam generator tube integrity is in accordance with the Steam Generator Tube Surveillance Program.	In accordance with the Steam Generator Tube Surveillance Program

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.13 RCS Operational LEAKAGE

BASES

BACKGROUND

Components that contain or transport the coolant to or from the reactor core make up the RCS. Component joints are made by welding, bolting, rolling, or pressure loading, and valves isolate connecting systems from the RCS.

During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. The purpose of the RCS Operational LEAKAGE LCO is to limit system operation in the presence of LEAKAGE from these sources to amounts that do not compromise safety. This LCO specifies the types and amounts of LEAKAGE.

10 CFR 50, Appendix A, GDC 30 (Ref. 1), requires means for detecting and, to the extent practical, identifying the source of reactor coolant LEAKAGE. Regulatory Guide **1.45** (Ref. 2) describes acceptable methods for selecting leakage detection systems.

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring reactor coolant LEAKAGE into the containment area is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE is necessary to provide quantitative information to the operators, allowing them to take corrective action should a leak occur that is detrimental to the safety of the facility and the public.

A limited amount of leakage inside containment is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected, located, and isolated from the containment atmosphere, if possible, to not interfere with RCS leakage detection.

This LCO deals with protection of the reactor coolant pressure boundary (RCPB) from degradation and the core from inadequate cooling, in addition to preventing the accident analyses radiation release assumptions from being exceeded. The consequences of violating this LCO include the possibility of a loss of coolant accident (LOCA).

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is related to the safety analyses for LOCA; the amount of leakage can affect the probability of such an event.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The safety analysis (Ref. 3) for an event resulting in steam discharge to the atmosphere assumes a 576 gpd primary to secondary leakage as the initial condition (limited to 150 gpd per SG). Any event in which the reactor coolant system will continue to leak water inventory to the secondary side, and in which there will be a postulated source term associated with the accident, utilizes this leakage value as an input in the analysis. These accidents include the rod ejection accident, locked rotor accident, main steam line break, steam generator tube rupture and uncontrolled rod withdrawal accident. The rod ejection accident, locked rotor accident and uncontrolled rod withdrawal accident yield a source term due to postulated fuel failure as a result of the accident. The main steam line break and the steam generator tube rupture yield a source term due to perforations in fuel pins causing an iodine spike. Primary to secondary side leakage may escape the secondary side due to flashing or atomization of the coolant, or it may mix with the secondary side SG water inventory and be released due to steaming of the SGs. The rod ejection accident is limiting compared to the remainder of the accidents with respect to dose results. The dose results for each of the accidents delineated above are well within 10 CFR 100 limits for the rod ejection accident, and below a small fraction of 10 CFR 100 limits for the remainder of the accidents.

The RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36 (Ref. 4).

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

No pressure boundary LEAKAGE is allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable as the leak itself could cause further deterioration, resulting in higher LEAKAGE.

Violation *of* this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.

b. Unidentified LEAKAGE

One gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring and containment sump level monitoring equipment

BASES

LCO (continued)

can detect within a reasonable time period. Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with detection of unidentified or total LEAKAGE and is well within the capability of the RCS Makeup System. Identified LEAKAGE includes LEAKAGE captured by the pressurizer relief tank and reactor coolant drain tank, as well as quantified LEAKAGE to the containment from specifically known and located sources, but does not include pressure boundary LEAKAGE or controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). Violation of this LCO could result in continued degradation of a component or system.

d. Primaw to Secondaw LEAKAGE throuoh All Steam Generators (SGs)

Total primary to secondary LEAKAGE amounting to 576 gpd through all SGs produces acceptable offsite doses in the accident analysis. Violation of this LCO could exceed the offsite dose limits for the previously described accidents. Primary to secondary LEAKAGE must be included in the total allowable limit for identified LEAKAGE.

e. Primaw to Secondaw LEAKAGE through Anv One SG

The 150 gallons per day limit on one SG is based on the assumption that a single crack leaking this amount would not propagate to a SGTR under the stress conditions of a LOCA or a main steam line rupture. If leaked through many cracks, the cracks are very small, and the above assumption is conservative.

APPLICABILITY In MODES 1, 2, 3, and 4, the potential for RCPB LEAKAGE is greatest when the RCS is pressurized.

In MODES 5 and 6, LEAKAGE limits are not required because the reactor coolant pressure is far lower, resulting in lower stresses and reduced potentials for LEAKAGE.

BASES

APPLICABILITY (continued)

LCO 3.4.14, "RCS Pressure Isolation Valve (PIV) Leakage," measures leakage through each individual PIV and can impact this LCO. Of the two PIVs in series in each isolated line, leakage measured through one PIV does not result in RCS LEAKAGE when the other is leak tight. If both valves leak and result in a loss of mass from the RCS, the loss must be included in the allowable unidentified LEAKAGE.

ACTIONS

A.1

Unidentified LEAKAGE, identified LEAKAGE, or primary to secondary LEAKAGE in excess of the LCO limits must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

B.1 and B.2

If any pressure boundary LEAKAGE exists, or if unidentified LEAKAGE, identified LEAKAGE, or primary to secondary LEAKAGE cannot be reduced to within limits within 4 hours, the reactor must be brought to lower pressure conditions to reduce the severity of the LEAKAGE and its potential consequences. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. The reactor must be brought to MODE 3 within 6 hours and MODE 5 within 36 hours. This action reduces the LEAKAGE and also reduces the factors that tend to degrade the pressure boundary.

The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. In MODE 5, the pressure stresses acting on the RCPB are much lower, and further deterioration is much less likely.

SURVEILLANCE REQUIREMENTS

SR 3.4.13.1

Verifying RCS LEAKAGE to be within the LCO limits ensures the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. Unidentified LEAKAGE and identified

BASES

SURVEILLANCE REQUIREMENTS (continued)

LEAKAGE are determined by performance of an RCS water inventory balance. Primary to secondary LEAKAGE is also measured by performance of an RCS water inventory balance in conjunction with effluent monitoring within the secondary steam and feedwater systems. For this SR, the volumetric calculation of unidentified LEAKAGE and identified LEAKAGE is based on a density at room temperature of 77 degrees F. The volumetric calculation of primary to secondary LEAKAGE is based on a density at operating RCS temperature of **585** degrees **F.**

In order to provide enhanced assurance that the primary to secondary LEAKAGE limit of LCO 3.4.13 is met in MODE 1, a continuous calculation is performed via an Operator Aid Computer program that utilizes the ratio of primary and secondary system activities to determine a LEAKAGE rate. This verification methodology is based on guidance contained in Ref. **5.** In addition, on a monthly basis, primary to secondary LEAKAGE is determined based on grab samples.

The RCS water inventory balance must be performed with the reactor at steady state operating conditions and near operating pressure. Therefore, this SR is not required to be completed in MODES 3 and 4 until 12 hours of steady state operation near operating pressure have been established.

Steady state operation is required to perform a proper inventory balance; calculations during maneuvering are not useful and **a** Note requires the Surveillance to be met when steady state is established. For RCS operational LEAKAGE determination by water inventory balance, steady state is defined **as** stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

An early warning of pressure boundary LEAKAGE or unidentified LEAKAGE is provided by the automatic systems that monitor the containment atmosphere radioactivity and the containment sump level. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. These leakage detection systems are specified in LCO 3.4.15, "RCS Leakage Detection Instrumentation."

The 72 hour Frequency is a reasonable interval to trend LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. A Note under the Frequency column states that this SR is required to be performed during steady state operation.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.13.2

This SR provides the means necessary to determine SG OPERABILITY in an operational MODE. The requirement to demonstrate SG tube integrity in accordance with the Steam Generator Tube Surveillance Program emphasizes the importance of SG tube integrity, even though this Surveillance cannot be performed at normal operating conditions.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 30.
2. Regulatory Guide 1.45, May 1973.
3. UFSAR, Section 15.
4. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).
5. EPRI TR-104788-R2, "PWR Primary-to-Secondary Leak Guidelines," Revision 2.

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3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.15 RCS Leakage Detection Instrumentation

LCO **3.4.15** The following RCS leakage detection instrumentation shall be OPERABLE:

a. One containment floor and equipment sump level monitor;

b. One containment atmosphere radioactivity monitor (gaseous or particulate); and

c. One containment ventilation unit condensate drain tank level monitor.

APPLICABILITY: MODES **1,** 2, 3, and **4.**

ACTIONS

----------NOTE----------
LCO 3.0.4 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required containment floor and equipment sump level monitor inoperable.	A.**1** Perform SR 3.4.13.1.	Once per 24 hours
	AND	
	A.2 Restore required containment floor and equipment sump level monitor to OPERABLE status.	30 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required containment atmosphere radioactivity monitor inoperable.	B.1 Analyze grab samples of the containment atmosphere. OR 8.2 Perform **SR** 3.4.13.1.	Once per 24 hours Once per 24 hours
C. Required containment ventilation unit condensate drain tank level monitor inoperable.	C.1 Perform SR 3.4.15.1. OR C.2 Perform SR 3.4.13.1.	Once per 8 hours Once per 24 hours
D. Required containment atmosphere radioactivity monitor inoperable. AND Required containment ventilation unit condensate drain tank level monitor inoperable.	D.1 Restore required containment atmosphere radioactivity monitor to OPERABLE status. OR D.2 Restore required containment ventilation unit condensate drain tank level monitor to OPERABLE status.	30 days 30 days
E. Required Action and associated Completion Time not met.	E.1 Be in MODE 3. AND E.2 Be in MODE 5.	6 hours 36 hours
F. All required monitors inoperable.	F.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of the required containment atmosphere radioactivity monitor.	12 hours
SR 3.4.15.2	Perform COT of the required containment atmosphere radioactivity monitor.	92 days
SR 3.4.15.3	Perform CHANNEL CALIBRATION of the required containment floor and equipment sump level monitor.	18 months
SR 3.4.15.4	Perform CHANNEL CALIBRATION of the required containment atmosphere radioactivity monitor.	18 months
SR 3.4.15.5	Perform CHANNEL CALIBRATION of the required containment ventilation unit condensate drain tank level monitor.	18 months

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.15 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of Appendix A to 10 CFR 50 (Ref. I) requires means for detecting and, to the extent practical, identifying the location of the source of RCS LEAKAGE. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting leakage detection systems.

Leakage detection systems must have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE.

The primary method of detecting leakage into the Containment is measurement of the Containment floor and equipment sump level. There are small sumps located on either side of the containment outside the crane wall. Any leakage would fall to the floor inside the crane wall and run by a sump drain line to one of the two sumps. Any leakage outside the crane wall would fall to the floor and gravity drain to these sumps. The sump level rate of change, as calculated by the plant computer, would indicate the leakage rate. This method of detection would indicate in the Control Room a water leak from either the Reactor Coolant system or the Main Steam and Feedwater Systems. A 1 gpm leak (cumulative in both sump A and B) is detectable in 1 hour.

The containment ventilation unit condensate drain tank level change offers another means of detecting leakage into the containment. An abnormal level increase would indicate removal of moisture from the containment by the containment air coolers. The plant computer calculates the rate of change in level to detect a leak of 1 gpm.

The reactor coolant contains radioactivity that, when released to the containment, can be detected by radiation monitoring instrumentation. Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter, until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects.

Instrument sensitivities of 10^{-10} μCi/cc radioactivity for particulate monitoring and of 10^{-7} μCi/cc radioactivity for gaseous monitoring are practical for these leakage detection systems. Radioactivity detection

BASES

BACKGROUND (continued)

systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE.

An increase in humidity of the containment atmosphere would indicate release of water vapor to the containment. Dew point temperature measurements can thus be used to monitor humidity levels of the containment atmosphere as an indicator of potential RCS LEAKAGE. A 1°F increase in dew point is well within the sensitivity range of available instruments.

Since the humidity level is influenced by several factors, a quantitative evaluation of an indicated leakage rate by this means may be questionable and should be compared to observed increases in liquid level into the containment floor and equipment sump and condensate level from air coolers. Humidity level monitoring is considered most useful as an indirect alarm or indication to alert the operator to a potential problem. Humidity monitors are not required by this LCO.

Air temperature and pressure monitoring methods may also be used to infer unidentified LEAKAGE to the containment. Containment temperature and pressure fluctuate slightly during plant operation, but a rise above the normally indicated range of values may indicate RCS leakage into the containment. The relevance of temperature and pressure measurements are affected by containment free volume and, for temperature, detector location. Alarm signals from these instruments can be valuable in recognizing rapid and sizable leakage to the containment. Temperature and pressure monitors are not required by this LCO.

APPLICABLE SAFETY ANALYSES

The need to evaluate the severity of an alarm or an indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary. The system response times and sensitivities are described in the UFSAR (Ref. 3). Multiple instrument locations are utilized, if needed, to ensure that the transport delay time of the leakage from its source to an instrument location yields an acceptable overall response time.

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring RCS LEAKAGE into the containment area is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE provides quantitative

BASES

APPLICABLE SAFETY ANALYSES (continued)

information to the operators, allowing them to take corrective action should a leakage occur detrimental to the safety of the unit and the public. RCS leakage detection instrumentation satisfies Criterion 1 of 10 CFR 50.36 (Ref. 4).

LCO

One method of protecting against large RCS leakage derives from the ability of instruments to rapidly detect extremely small leaks. This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide a high degree of confidence that extremely small leaks are detected in time to allow actions to place the plant in a safe condition, when RCS LEAKAGE indicates possible RCPB degradation.

The LCO is satisfied when monitors of diverse measurement means are available. Thus, the containment floor and equipment sump level monitor, in combination with a gaseous or particulate radioactivity monitor and a containment ventilation unit condensate drain tank level monitor, provides an acceptable minimum.

APPLICABILITY

Because of elevated RCS temperature and pressure in MODES 1, 2, 3, and 4, RCS leakage detection instrumentation is required to be OPERABLE.

In MODE 5 or 6, the temperature is to be $\leq$200°F and pressure is maintained low or at atmospheric pressure. Since the temperatures and pressures are far lower than those for MODES 1, 2, 3, and 4, the likelihood of leakage and crack propagation are much smaller. Therefore, the requirements of this LCO are not applicable in MODES 5 and 6.

ACTIONS

The Required Actions are modified by a Note that indicates that the provisions of LCO 3.0.4 are not applicable. As a result, a MODE change is allowed when the containment floor and equipment sump level monitor and required radiation monitors are inoperable. This allowance is provided because other instrumentation is available to monitor RCS leakage.

A.l and A.2

With the required containment floor and equipment sump level monitor inoperable, no other form of sampling can provide the equivalent information; however, the containment atmosphere radioactiuty monitor

BASES

ACTIONS (continued)

will provide indications of changes in leakage. Together with the atmosphere monitor, the periodic surveillance for RCS water inventory balance, SR 3.4.13.1, must be performed at an increased frequency of 24 hours to provide information that is adequate to detect leakage.

Restoration of the required containment floor and equipment sump level monitor to OPERABLE status within a Completion Time of 30 days is required to regain the function after the monitor's failure. This time is acceptable, considering the Frequency and adequacy of the RCS water inventory balance required by Required Action A.1.

B.1 and B.2

With both gaseous and particulate containment atmosphere radioactivity monitoring instrumentation channels inoperable, alternatiw action is required. Either grab samples of the containment atmosphere must be taken and analyzed or water inventory balances, in accordance with SR 3.4.13.1, must be perbrmed to provide alternate periodic information.

With a sample obtained and analyzed or water inventory balance performed every 24 hours, continued operation is allowed if the containment ventilation unit condensate drain tank level monitor is OPERABLE.

The 24 hour interval provides periodic information that is adequate to detect leakage.

C.1 and C.2

With the required containment ventilation unit condensate drain tank level monitor inoperable, alternative action is again required. Either SR 3.4.15.1 must be performed or water inventory balances, in accordance with SR 3.4.13.1, must be performed to provide alternate periodic information. Provided a CHANNEL CHECK is performed every 8 hours or a water inventory balance is performed every 24 hours, reactor operation may continue while awaiting restoration of the containment ventilation unit condensate drain tank level monitor to OPERABLE status.

The 24 hour interval provides periodic information that is adequate to detect RCS LEAKAGE.

BASES

ACTIONS (continued)

D.1 and D.2

With the required containment atmosphere radioactiuty monitor and the required containment ventilation unit condensate drain tank level monitor inoperable, the only means of detecting leakage is the containment floor and equipment sump level monitor. This Condition does not provide the required diverse means of leakage detection. The Required Action is to restore either of the inoperable required monitors to OPERABLE status within 30 days to regain the intended leakage detection diversity. The 30 day Completion Time ensures that the plant will not be operated in a reduced configuration for a lengthy time period.

E.1 and **E.2**

If a Required Action of Condition A, **B,** C, or D cannot be met, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

F.1

With all required monitors inoperable, no automatic means of monitoring leakage are available, and immediate plant shutdown in accordance with LCO 3.0.3 is required.

SURVEILLANCE REQUIREMENTS

SR 3.4.15.1

SR 3.4.15.1 requires the pehrmance of a CHANNEL CHECK of the required containment atmosphere radioactivity monitor. The check gives reasonable confidence that the channel is operating properly The Frequency of **12** hours is based on instrument reliability and is reasonable for detecting off normal conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a COT on the required containment atmosphere radioactivity monitor. The test ensures that the monitor can perform its function in the desired manner. The test verifies the alarm setpoint and relative accuracy of the instrument string. The COT is relative to the detection of radioactivity indicative of a 1 gpm RCS leak, within one hour of leakage onset. The COT does not verify automatic actions associated with high radioactivity on the applicable channels. The Frequency of 92 days considers instrument reliability, and operating experience has shown that it is proper for detecting degradation.

SR 3.4.15.3, SR 3.4.15.4, and SR 3.4.15.5

These SRs require the performance of a CHANNEL CALIBRATION for each of the RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of 18 months is a typical refueling cycle and considers channel reliability. Again, operating experience has proven that this Frequency is acceptable.

REFERENCES

1. 10 CFR 50, Appendix A, Section IV, GDC 30.
2. Regulatory Guide 1.45.
3. UFSAR, Section 5.2.5.
4. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM 3S/ADMIN

Perform a Review of a R&R Procedure

CANDIDATE _____

EXAMINER _____

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Perform a review of a R&R procedure.

Alternate Path:

N/A

Facility JPM #:

NIA)

K/A Rating(s):

GKA 2.2.13 (3.613.8)

Task Standard:

The R&R is reviewed for technical correctness. The candidate corrects "wrong unit" tag and the sequence.

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator ____ In-Plant __X__ Perform __**X**__ Simulate _____

References:

OMP 2-18 (Tagout Removal and Restoration Procedure) Revision 62
CN-1570-1.0 (Flow Diagram of the KF System) Revision 19

Validation Time: 8 min **Time Critical:** No

==========

Candidate: _____ Time Start : _____
NAME Time Finish: _____

Performance Rating: SAT _____ UNSAT _____ Performance Time _____

Examiner: _____ _____/_____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

Simulator Setup

N/A.

READ TO OPERATOR

DIRECTION TO TRAINEE:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

Unit 1 is operating at 100% power.
1A KF Pump indicated no flow with the pump running and has been removed from service.
1B KF pump has been placed in service.
The Safety Tagging Computer program is not available.
An NLO has manually generated a tag out of the 1A KF pump for maintenance to investigate.

INITIATING CUE:

You are directed to review the R&R that will be used to tag out the 1A KF pump.

EXAMINER NOTE: Provide student with a copy of flow diagram CN-1570-1.0.	
STEP 1: Verify all required blanks in the top two sections on page 1 of the Removal Enclosure are completed. (Down to Pre-Execution Sign Off Block). STANDARD: Department, Page Number, Tagout ID, Enclosure Type, Date, Unit, Isolation Tagged, Reason, Prepared By, Date and Time prepared are entered. COMMENTS:	___SAT ___UNSAT
STEP 2: Verify all tag information blocks are completed as follows: STANDARD: Verifies the following information on pages 2 and 3 of the Removal Enclosure. • Sequence Number and Tag ID. • Equipment tag, Equipment Description and Location. • Position and Label. **EXAMINER NOTE: It is not necessary for the candidate to review the Enclosure Summary Report in the Removal Enclosure in order to properly complete the review of the Removal.** COMMENTS:	___SAT ___UNSAT

STEP 3: Component verified to be completely isolated and that all components are tagged in the proper position STANDARD: The pump is verified to be completely isolated. The candidate recognizes that the motor breaker for the 2A KF Pump is to be racked out and tagged and corrects the Removal Enclosure to rackout and tag 1A KF Pump motor breaker. EXAMINER CUE: After the candidate identifies an error on the Removal Enclosure, instruct him to correct the error on the Removal Enclosure and any other errors that may be present. When complete with his review, the Removal Enclosure will be returned to the preparer so that a new Removal Enclosure can be made. COMMENTS:	CRITICAL STEP ___SAT ___UNSAT
STEP **4:** Verify proper sequence. STANDARD: Candidate determines that the sequence is incorrect and should be re-ordered as follows • Pump Breaker racked out • Discharge Isolation valve closed • Suction Isolation Valve closed • Vents and drains opened. EXAMINER NOTE: The items that are out of sequence are isolation of the suction and discharge valves. COMMENTS:	CRITICAL STEP ___SAT ___UNSAT

STEP **5:** Return the Removal Enclosure to the NLO to make identified corrections. STANDARD: N/A **EXAMINER CUE: NLO will take the Removal Enclosure and make required corrections.** COMMENTS:	___SAT ___UNSAT

TIME STOP: _____

CANDIDATE CUE SHEET
(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

Unit 1 is operating at 100% power.
1A KF Pump indicated no flow with the pump running and has been removed from service.
1B KF pump has been placed in service.
The Safety Tagging Computer program is not available.
An NLO has manually generated a tag out of the 1A KF pump for maintenance to investigate.

INITIATING CUE:

You are directed to review the R&R that will be used to tag out the 1A KF pump.

Attachment 9.1
Removal/Removal Addendudpartial Restoration/Restoration Enclosures

Catawba Nuclear Station | Dept: OPS		Page 1 of -..-	Tagout ID: 003-M007
Enclosure Type: REMOVAL		Date: APRIL 14, 2003	
		Unit : 1	BTO:
Isolation Tagged:	KF - SPENT FUEL COOLING SYSTEM		
Reason:	INSPECT KF PUMP		
Remarks:			
Modification:			
Prepared By: ED REESE	at: 4/14/03 0930	Reviewed By:	at:
Cross Disciplinary Rev By:	at:	Approved By:	at:
Technical Specifications / SLC	Unit 1	Unit 2	
Control Room OATC Acknowledge:	Unit 1	Unit 2	
Control Room Logs Updated by:	Unit 1	Unit 2	
1.47 Panel Reviewed By:	Unit 1	Unit 2	
OAC Points RemovedlRestored To/From Service By:	Unit 1	Unit 2	
R&R and Copies Filed By:		Safety Tag Program Updated By:	

Attachment 9.1
Removal/Removal Addendudpartial Restoration/Restoration Enclosures

Catawba Nuclear Station	**Dept:** OPS	**Page** 2 **of** 3	**Tagout ID:** 0-03-M007
Enclosure Type REMOVAL		**Date:** APRIL 14, 2003	
		Unit:	**BTO:**

Enclosure Execution Start Datemime: _____

Seq#:	Equip Tag:	Position:	Placed By:
1	XETA-15	RACKED OUT	
Tag ID: 1	Equipment Description: FUEL POOL COOLING PUMP MOTOR 1A	As found:	LBL:
	Location: AUX		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
3	1KF-2	CLOSED	
Tag ID: 2	Equipment Description: 1A KF PUMP SUCTION ISOL	As found:	LBL:
	Location: AUX418 E581+00 QQ52		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
2	1KF-4	CLOSED	
Tag ID: 3	Equipment Description: KF PUMP 1A DISCH ISOL	As found:	LBL:
	Location: AUX418 E588+00 QQ52		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
4	1KF-12-1	OPEN	
Tag ID: 4	Equipment Description: 1A KF PUMP DRAIN	As found:	LBL:
	Location: AUX418 E581+00 QQ51		IV By:

Enclosure Execution Completion Date/Time: _____

Attachment 9.1
Removal/Removal Addendudpartial Restoration/Restoration Enclosures

OPS	
Enclosure Type: REMOVAL	**Date:** APRIL 14, 2003
	Unit: 1 BTO:

Seq# 1	**Equip Tag:** 1KF9	**Position:** OPEN	**Placed By:**
Tag ID: 2	**Equipment Description:** 1A KF PUMP VENT	**As found:**	**LBL:**
	Location:		**IV By:**

Seq#: 4	**Equip Tag:** 1KF-17	**Position:** OPEN	**Placed By:**
Tag ID: 6	**Equipment Description:** 1A KF PUMP DRAIN TO WEFT	**As found:**	LBL:
	Location:		**IV By:**

Seq#: 4	**Equip Tag:** 1KF-12	**Position:** OPEN	**Placed By:**
Tag ID: 7	**Equipment Description:** 1A KF PUMP DRAIN	**As found:**	**LBL:**
	AUXBLDG 78 ft ops		**IV By:**
Special info:			

Seq#: 4	**Equip Tag:** 1KF-10	**Position:**	**Placed By:**
Tag ID: 8	**Equipment Description:**	**As found:**	**LBL:**
	Location: 1A PUMP VENT TO 11' EFT		**IV By:**

Enclosure Execution Completion Date/Time: _____

Attachment 9.1
RemovaURemoval Addendudpartial Restoration/Restoration Enclosures

Enclosure Summary Report

Applicable Work Orders:	Q8147961-01
Affected Procedures:	OP/1/A/6200/005 SPENT FUEL COOLING SYSTEM REV #70

Attachment 9.1
RemovaVRemoval Addendudpartial Restoration/Restoration Enclosures

Catawba Nuclear Station | Dept: OPS		Page 1 of 3	Tagout ID: 2003-0007
Enclosure Type: REMOVAL		Date: APRIL 14, 2003	
		Unit: 1	**BTO:**
Isolation Tagged:	KF - SPENT FUEL COOLING SYSTEM		
Reason:	INSPECT KF PUMP		
Remarks:			
Modification:			
Prepared By: ED REESE	at: 4/14/03 0930	Reviewed By:	at:
Cross Disciplinary Rev By:	at:	Approved By:	at:
Technical Specifications / SLC	Unit 1	Unit 2	
Control Room OATC Acknowledge:	Unit 1	Unit 2	
Post-execution Signoffs:			
Control Room Logs Updated by:	Unit 1	Unit 2	
1.47 Panel Reviewed By:	Unit 1	Unit 2	
OAC Points Removed|Restored To/From Service By:	Unit 1	Unit 2	
R&R and Copies Filed By:		Safety Tag Program Updated By:	

Attachment 9.1
Removal/Removal Addendum/Partial Restoration/Restoration Enclosures

Catawba Nuclear Station , **Dept:** OPS Page 2 of 3 **Tagout** ID: 0-03 M007
Enclosure Type REMOVAL **Date:** APRIL 14, 2003
Unit : 1 **BTO:**

Enclosure Execution Start Date/Time: _____

Seq#:	Equip Tag:	Position:	Placed By:
1	2ETA-15	RACKED OUT	
Tag ID:	Equipment Description:	As found:	LBL:
1	FUEL POOL COOLING PUMP MOTOR 1A		
	Location: AUX BLDG ELEV 577 f 00 COLAA-49		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
2	1KF-2	CLOSED	
Tag ID:	Equipment Description:	As found:	LBL:
2	1A KF PUMP SUCTION ISOL		
	Location: AUX418 ES81+00 QQ52		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
3	1KF-4	CLOSED	
Tag ID:	Equipment Description:	As found:	LBL:
3	KF PUMP 1A DISCH ISOL		
	Location: AUX418 ES88+00 QQ52		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
4	1KF-12-1	OPEN	
Tag ID:	Equipment Description:	As found:	LBL:
4	1A KF PUMP DRAIN		
	Location: AUX418 ES81+00 QQ51		IV By:

Enclosure Execution Completion Date/Time: _____

1

Attachment 9.1
Removal/Removal Addendudpartial Restoration/Restoration Enclosures

03-M007

Seq#	Equip Tag:	Position:	Placed By:
1	1KF9	OPEN	
Tag ID:	Equipment Description:	As found:	LBL:
	1A KF PUMP VENT		
	Location: AUX418 E580+00 Q057		IV By:
Special info:			

Seq#:	Equip Tag:	Position:	Placed By:
4	1KF-13	OPEN	
Tag ID:	Equipment Description:	As found:	LBL:
	1A KF PUMP DRAIN TO W[illegible]		
	Location:		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
4	1KF-12	OPEN	
Tag ID: 7	Equipment Description:	As found:	LBL:
	1A KF PUMP DRAIN		
	Location: AUX4ME578+00 Q057		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
4	1KF-10		
Tag ID: 8	Equipment Description:	As found:	LBL:
	1A KF PUMP [illegible] TO [illegible]		
	Location:		IV By:

Enclosure Execution Completion Date/Time: _____

Attachment 9.1
Removal/Removal Addendudpartial Restoration/Restoration Enclosures

Enclosure Summary Report

Applicable Work Orders:	98147961-01
Affected Procedures:	OP/1/A/6200/055 SPENT FUEL COOLING SYSTEM REV #70

Duke Power Company Catawba Nuclear Station	Document No. **OMP 2-18**
	Revision No. **062**
Tagout Removal and Restoration Procedure	
Information Use	Electronic Reference No. **CP0094IJ**

Operations Management Procedure 2-18 (Tag Crew)

Approval _____ (OPS)

Approval _____ (CHEM)

Rev 62 Date _____

DUKE POWER COMPANY

CATAWBA NUCLEAR STATION

TAGOUT REMOVAL AND RESTORATION PROCEDURE

NOTE:	It is not intended that the guidance in the OMP will duplicate information in NSD 500 (Red Tags/Configuration Control Tags) or the Safety Tagging Program Help screens.

1. Purpose

1.1. To provide clarifying guidance for the Tagout Removal and Restoration process as is required by NSD 500.

1.2. To provide a means for identifying how functional requirements are to be accomplished in the Maintenance process when Red Tags are involved.

1.3. To provide guidance for the use of Equipment Protection **CAUTION** placards and zones[pev1].

2. References

2.1. Nuclear System Directive 500, Red Tags/Configuration Control Tags

2.2. Operations Management Procedure 1-5, Verification Methods

2.3. Site Directive 3.10.1, Operational Control of Systems and Components

2.4. CNS Modification Manual

2.5. INPO Document 01-002 (Guidelines for the Conduct of Operations at Nuclear Power Stations)

3. Description

3.1. Removal

Tagouts are NOT to be utilized for the addition or removal of components from an operable system where a procedure or the use of a Temporary Modification is more appropriate. Refer to the CNS Modification Manual and contact the system or component engineer in question for additional guidance.

3.2. Restoration

- The process of restoration shall take into account plant conditions at the time that component is to be restored to service.
- The operability as well as the functionality of a component shall be evaluated when determining how a component is to be returned to service.

3.3. Removal Preparation Checklist[pev11]

The checklist is a document maintained by OPS and Chemistry to assist personnel in preparing, reviewing and approving tag out removals. The checklist can be found on the OPS and CHEM WEB Page.

The checklist is required to be completed for all tag out removal preparations. All spaces on the checklist shall either be checked off, initialed or N/A'd and shall be included as part of the removal package.

Proposed changes to the checklist shall be submitted through the OWPM (OPS) or OPS Practices Team Representatives (Chem).

3.4. Use of Red Tag Exception

When a Red Tag Exception is required, an OSM/designee shall approve the use of an exception.

The position of a component that has an exception tag shall be the position that it is administratively known to be in (procedure or valve checklist). This position shall be used for both removal and restoration enclosures.

The previous practice of using "Sticker Placed Tag Not Hung" will now fall under the exception process of NSD 500.

3.5. Correcting Tag Errors

A. Handwritten changes shall **not** be made to a tag or enclosure.

B. If an error is identified (position, equipment, etc.) it shall be corrected as follows:

1. The affected enclosure shall be returned to Draft status.

2. Any printed tags and enclosures shall be discarded.

3. The enclosure and/or tag shall be revised to correct the error.

4. The tagout then undergoes the remainder of the review and approval process as described in Section **4** of this ***OMP.***

4. Responsibilities

4.1. The person preparing a:

- Removal/Removal Addendum
- Restoration/Partial Restoration
- **Work** Order Task Assignment (WOTA)
- Tag Lift/Rehang

shall be qualified to the Safety Tagging program and is responsible for ensuring the above are technically correct. This person will normally be an NLO or Chemistry Technician.

4.2. The person reviewing a:

- Removal/Removal Addendum
- Restoration/Partial Restoration
- Work Order Task Assignment (WOTA)
- Tag Lift/Rehang

shall be qualified to the Safety Tagging program and is responsible for independently determining that the above are technically correct. The Ops Reviewer shall be an SRO or knowledgeable Operations Staff personnel. The Chemistry reviewer shall be a Chemistry Staff member or an SRO.

4.3. The person approving a:

- RemovaVRemoval Addendum
- Restoration/Partial Restoration
- Work Order Task Assignment (WOTA)
- Tag Lift/Rehang

shall be qualified to the Safety Tagging program and is responsible for determining the compatibility of the above with overall plant conditions. The OPS approver shall be an SRO. The CHM approver shall be a Chemistry Staff member.

The approver is also responsible for sequencing enclosure item.

An OSM or a designated SRO (WCC SRO or Unit Supervisor) shall approve the removal from service of any engineered safeguards equipment.

4.4. The person performing a cross disciplinary review of a:

- Removal/Removal Addendum
- Restoration/Partial Restoration

shall be a knowledgeable person from the group releasing operational control of the component(s). Normally, that person in Operations will be a Unit Lead. In Chemistry, that person will be a Chemistry Staff member. This review is required when Operational Release Tags are involved.

4.5. The person determining that a Work Order Task Assignment is "Ready For Work" shall be qualified to the Safety Tagging program and is responsible for determining that safe working conditions have been established. For OPS, that person shall be an SRO. For CHM, that person shall be a Chemistry Staff member.

4.6. The person executing a:

- RemovaVRemoval Addendum
- Restoration/Partial Restoration
- Tag Limehang

shall be a qualified to the Safety Tagging program and is responsible for reviewing the procedures affected and any tagouts that are currently placed in order to determine if there are any adverse affects and executing the tagout instructions as written.

If an inadequate boundary is discovered during removal or an incorrect restoration position is indicated, the evolution shall be stopped, supervision shall be involved in resolving the problem and a PIP shall be written.

4.7. Whenever a:

- RemovaVRemoval Addendum
- Restoration/Partial Restoration
- Tag Lift/Rehang

must be turned over to a new shift, the new shift does not have to re-verify that the components' positions are correct if approval has been given for the above. However, a pre-job brief shall be conducted with the new shift to cover details of the evolution.

4.8. The OSM, SS, Work Control Center SRO (WCC SRO) or Chemistry Staff member or designee shall be responsible for coordinating functionals or testing with the work group when realigning or restoring a component or system. Work groups shall be readily available to support this process, and in particular when a component/system has a hazardous substance that could leak from a component/system.

4.9. The person preparing/reviewing/approving a restoration/partial restoration shall ensure a sufficient number of vents in the proper sequence have been utilized. Isometrics or a system walkdown should be used when required on closed loop systems such as KC, ensure adjacent components to a depressurized portion of a system are vented to ensure inadvertently drained portions of a system are properly vented.

4.10. The Safety Tagging Program Administrator shall be an Operations Tag Team member and will serve that administrative function for both Operations and Chemistry with respect to the Safety Tagging program. Requests for information about or changes to the Safety Tagging program should be directed to the Tagout Administrator.

5. Reporting Requirements

As described in NSD 500.

6. Procedure

6.1. Tagouts shall be developed using the Safety Tagging computer program, the Work Management System **(WMS)** and the Removal Preparation Checklist.

CAUTION: If the Safety Tagging computer program or WMS is unavailable:

- Complex tagging evolutions should not be attempted. **Only** simple tagouts should be developed, hung or cleared based on emerging plant conditions or emergency conditions.
- Tag Lift/Rehang evolutions shall not be performed if the Safety Tagging computer program or WMS is unavailable.

6.2. In the event that the Safety Tagging computer program or WMS is unavailable, Removals/Removal Addendums and Restoration/Partial Restorations shall be developed using the copies of the blank Removal/Removal, Addendums **and** Restoration/Partial Restoration Forms in Attachment 9.1. Blank tags for use by Operations or Chemistry are available in the OPS tagout room.

A. Tagouts that are developed using the blank forms shall be logged in the OCGs R&R Logbook. Using the following sequential numbering scheme:

- Chemistry:

  (C) (Chemistry Group) - YEAR-M (Sequential Number)

  Chemistry Group: P - Primary
  R - Radwaste
  E - Environmental
  S - Secondary

  i.e. CP-02-MOO1

- Operations: **O** -YEAR-M (Sequential Number)

  i.e. 0-02-MOO1

B. Tags shall be sequentially numbered in each tagout.

C. Manual tagout numbers shall be tracked in the OCG's R&R Logbook using the OPS/CHEM Manual Tagout Index. The index will determine the next Manual R&R number to be generated. Refer to Attachment 9.5.

D. The OPS/CHEM Manual Tagout Index shall be updated as Manual R&Rs are placed or cleared.

E. Active Manual R&R Record Sheets shall be filed in the OCG's R&R Logbook.

F. The OPS/CHEM Manual Tagout Index will be the official record maintained for the purposes of determining whether a:

- WOTA is ready for work
- WOTA is Signed Into or Signed Out by the Work Group Supervisor
- Tagout cleared.

G. The Operations Work Process Manager/designee or a Chemistry Staff member determines whether a Manual R&R will be converted into a computer generated R&R.

6.3. When multiple OCGs are involved in a tagout, the lead group will use the RemovaVRemoval Addendum and Restoration Sheets and the support group will use the Removal Addendum and Partial Restoration sheets. The support group shall <u>not</u> change or remove their portion of the tagouts without direction from the lead group.

6.4. Work Scope Changes

A. Once a Work Order Task is assigned to a tagout boundary, the task becomes "locked" in WMS.

B. If changes to the work order task need to be made following the placement of the lock, the person requesting the change shall notify the OCG so that the task can be "unlocked".

C. Once the changes are made, the OCG shall lock the work order task and determine the effect of the change.

D. If the tagging boundaries shall be altered to ensure that safe tagging boundaries still exist once changes are made, the revised tagout undergoes the remainder of the review and approval process as described in Section **4** of this OMP.

6.5. Voiding Tags/Tag outs

A. Only the OCG may void a tag or tag out.

B. When voiding tag outs that were not placed, discard them. We do not retain voided tag outs[pev16]. Void the tag out in the Safety Tagging Program. Remove the tag out number on the R362 screen for the Applicable Work Order Tasks on WMS and unlock the work order task on the R362 screen.

C. When voiding tags that were not placed, discard them. We do not retain voided tags. Void the tag from the applicable tag out in the Safety Tagging Program. If the tag is voided after the removal sheets are printed, a new set of sheets will have to be printed.

D. When clearing tags that were placed but not used, Restoration of the system or component will be per the normal restoration process.

6.6. Use of Tag Stickers

A. When a control panel switch or other device is to be tagged but the motive force for the device is to remain operable the position on the sticker is the status of the component. For example if a fan breaker is to remain energized the position on the sticker would be the status of the fan, OFF or ON as appropriate. For a valve the position would be OPEN or CLOSED as appropriate.

B. When the motive force (breaker, air supply or other force) for **a** control panel switch or other device is to be tagged rendering the switch inoperable the position on the sticker should be the status of the component and NOT the motive force. For example the position for a valve would be OPEN or CLOSED as appropriate.

NOTE:	Stickers should be placed on the edges of the red guard so that the switch indicating lights remain visible.

C. For all Cutler-Hammer E-30 Type switches without a water protective cover a red guard should be placed around the switch to indicate the use of a tag sticker. For switches with a water protective cover the sticker may be placed on the panel adjacent to the switch but so as not to obscure any indications.

D. Controlling Sticker (Operations only)

1. When more than two tag stickers are required for a control panel switch or other device a Controlling Sticker shall be placed on the device. The individual red or white tag stickers will be placed in the Control Room Sticker Log. All stickers for a particular device should be on the same page of the Sticker Log.

2. The controlling sticker shall show the position of the componentjust as if it were an individual sticker as per 6.6.A or 6.6.B.

3. The individual stickers shall be removed from the Sticker Log as tags are lifted or cleared and when two or less stickers remain the Controlling Sticker removed and individual stickers implemented as appropriate.

7. Pre-Planned Tagouts and Copying Previous Tagouts

Pre-Planned tagouts and previous tagouts are not controlled documents.

If it is desired to develop a tagout from a pre-planned tagout or copied from a previous tagout, the requirement for preparation, review and approval shall be to the same standards described in NSD 500 and Section 4 of this OMP.

8. Protection of Components Critical to Safe Unit Operation

8.1. CAUTION Placards

A. If the component that is being removed from service is critical to safe unit operation or places the unit in an ORAM Sentinel "ORANGE" or "RED" condition, then a "**CAUTION**" placard shall be placed on the breaker of the related component on the opposite train.

B. Examples of systems/components that require these placards to be hung include the following: LH, KC, KG, **ND,** NV, RN, VC/YC, MG sets, HWPs, CBPs, Xfmer power and VI compressors.

C. The "**CAUTION**" placards will be stored in the WCC and placed on the appropriate breaker as the R&R is being hung. **A** note in the remarks section of the R&R should be made to ensure the placard is placed and removed with the tagout.

8.2. Caution Zones

A. A Caution Zone should be set up around components or equipment rooms that are critical to safe unit operation when redundant components are out of service or inoperable.

B. A Caution Zone shall be set up around components or equipment rooms that are critical to safe unit operation when redundant components/equipment are out of service or inoperable that places a unit in an ORAM Sentinel "ORANGE" or "RED" condition.

C. Caution Zones shall be marked by any combination of the following devices:

- White and Red "PROTECTED EQUIPMENT" tape
- Brady Boy "RESTRICTED AREA" barricades
- "CAUTION" placards

D. Examples of components/areas that are required to be protected when the unit is at power are the Diesel Generator rooms, VCNC chiller rooms, NV pump rooms, LXC & LXD, Hotwell pumps, Condensate Booster pumps, Motor Generator sets and RN pumphouse of the only operable train when an RN header is out of service.

E, During outages the protected equipment should include the following:

When only 1 Train on the outage unit is available or operable, then:

- VC/YC Chiller Rooms,
- ND Pump Rooms,
- Essential Switchgear Rooms, and
- D/G Rooms
- Transformer Yard

When only 1 RN header is available or operable, then:

- RN Pump House

When SSPS is in NORMAL, then:

- Work shall be limited to one (1) channel (cabinet*) and
- The other (3) channels (cabinets*) shall be protected equipment.

*Cabinet(s) is defined as the Safety Related Process Protection Cabinets (i.e., Process Cabinets 1, 2, 3, and 4 for Protection Channels I, II, III, and IV).

F. No work shall be permitted in these areas until the opposite train has been returned to an available status. Examples of work that are not allowed include scaffold building and other preliminary work such as hanger removals.

G. When equipment is required to be protected, the Removal and Restoration shall contain sufficient information to ensure that a Caution Zone is established and removed when required. This may be accomplished using the Remarks section or as part of the Removal or Restoration sequence.

H. The "CAUTION" placards and "PROTECTED EQUIPMENT" tape are kept in the WCC in a labeled file cabinet drawer.

I. Brady Boy "RESTRICTED AREA" barricades are stored in the following locations:

- Unit 1 Turbine Bldg in the OPS Fire Hose Storage Room.
- Aux Bldg 577' OPS storage cage, located near glycol mixing & storage tank.

9. Attachments

9.1. RemovaVRemoval Addendum/Partial Restoration/Restoration Enclosures

9.2. Lime-Hang Enclosures

9.3. Functional Request Form

9.4. Protected Equipment Posting (Cns 1f3/Op-lib/All_UMG)

9.5. OPS/CHEM Manual Tagout Index

9.6. Tagout Details

Attachment 9.1
RemovaVRemoval Addendum/Partial Restoration/Restoration Enclosures

NOTE:
1. This attachment describes how the individual spaces in the enclosures are to be filled out, and whether signatures are computer generated, require an individual to initial the form or put information in the space.
2. In the event that the Safety Tagging program or WMS is not available, the blank form in this attachment can serve as a template for developing the enclosures described in the title. The computer generated entries would have to be manually entered.
3. There may be some differences between the computer generated form in the Safety Tagging program and the forms in this attachment.

A. **Dept.** - The OCG developing the enclosure.

B. **Page __ of __** - Computer generated based on length.

C. **Tagout** ID - Computer generated number. (See Section 6.2 for manual R&Rs).

D. **Enclosure** - Computer generated based on enclosure selected.

E. **Date** - The date that the computer generated form is printed.

F. **Unit** - The unit number of the equipment that is to be tagged or isolated.

G. **BTO** - Block Tagout Identifier (DGA for example)

H. **Isolation Tagged** - Equipment being isolated or tagged.

I. **Reason** - Purpose of the enclosure.

J. **Remarks** - Any information determined to be pertinent during the development of the enclosure.

K. **Modification** - The MOD number will be listed for reference. Otherwise, the space will be left blank.

L. **Prepared By at** - The Computer ID of the qualified individual preparing the enclosure with the date/time the enclosure was prepared.

M. **Reviewed By at** - The Computer ID of the qualified individual reviewing the enclosure with the date/time the enclosure was reviewed.

N. **Cross Disciplinary Rev By at** - The Computer ID of the knowledgeable individual of the OCG releasing operational control of the component/system.

O. **Approved By at** - The Computer ID of the qualified individual approving the enclosure with the datehime the enclosure was approved.

Attachment 9.1
Removal/Removal Addendum/Partial Restoration/Restoration Enclosures

NOTE: 1. The following spaces do not required computer entries.

2. The OCG Supervisor/designee shall N/A all spaces on the enclosure that do not apply.

Pre-Execution Signoffs

P. **Technical Specifications/SLC Unit 1/Unit 2 -** For Removal, the SRO shall place the TSAIL number of the component/training/system being removed from service here. For Restoration, the SRO shall initial that the enclosure has been cleared from the TSAIL.

Q. **ORAM Sentinel Evaluation By -** Scheduled work receives an ORAM Sentinel evaluation and can be N/A'd. If the component/train/system is being removed from service for emergent work, the **Shift** Work Manager shall perform an ORAM Sentinel evaluation per OMP 2-38 **(Shift** Work Manager Turnover Process). Systems under Chemistry control per Site Directive 3.10.1 (Operational Control of Plant Systems) do not require an evaluation. For restoration, an evaluation is not required

R. **Fire Impairment By -** For Removal, the number of the Fire Impairment shall be listed. For Restoration, the initials of the SRO clearing the R&R From the Fire Impairment.

S. **SSF Degrade -** For Removal/Restoration, the initials of the individual reporting **to** Security that the SSF is degraded/not degraded.

T. **Containment Closure Evaluation By -** The initials of the individuals performing an evaluation of the effects of the enclosure on Containment Closure. Only required when Containment Closure is in effect.

U. Pre-Job Briefing Received By - The initials of the individual receiving a pre-job briefing on performing the enclosure. Only one individual is required to initial the space, but all personnel performing the enclosure are required to participate in the briefing. Control Room personnel should participate in a briefing as necessary for components/systems under OPS operational control.

V. **Control Room SRO Acknowledge -** The initials of the Control Room SRO determining that plant conditions support the performance of this enclosure. For Chemistry enclosures that do not affect Operations controlled equipment, the space may be N/A'd.

W. **Control Room OATC Acknowledge Unit 1/Unit 2 -** The initials of the RO acknowledging that plant conditions support the performance of this enclosure. For Chemistry enclosures that do not affect Operations controlled equipment, the space may be N/A'd.

Post-Execution Signoffs

X. **Parameter Report Updated By -** The initials of the individual (typically an NLO) that has printed the Parameter Report once the enclosure is completed and has delivered the report to the Control Room SRO and OATC for review. For Chemistry, this space may be N/A'd.

Y. Control Room Logs Updated By Unit 1/Unit 2 - The initials of the RO logging the performance of the enclosure in the Unified Plant Logbook. This space may by N/A'd by the OCG Supervisor designee or RO.

Attachment 9.1
RemovaVRemoval Addendudpartial Restoration/Restoration Enclosures

Z. **1.47 Panel Reviewed By Unit 1/Unit 2 -** The initials of the Control Room SRO or RO determining that the status of the 1.47 Panel is acceptable based on plant status. If operability is not affected, this space shall be N/A'd.

AA. **OAC Points Removed From Service/Restored To Service - A** list of the OAC Points removed from service/restored to service as a result of the performance of this enclosure. If no OAC Points are removed from service/restored to service, the space shall be N/A'd.

BB. **R&R and Copies Filed By -** The initials of the individual filing the enclosure in the R&R Logbook and copies in any applicable procedures. For Chemistry, enclosures are filed in the affected Chemistry Section R&R Logbook. Chemistry does not file copies with any applicable procedures.

c c. **Safety Tag Program Updated By -** The initials of the individual updating the status of the enclosure in the Safety Tagging Program.

NOTE: The following spaces are normally populated by computer entries made when developing an enclosure except where noted.

DD. **Enclosure Execution Start Date/Time -** The handwritten datehime that the individual begins performing the enclosure.

EE. **Seq #** - The sequence numbers indicate the order in which the enclosure is to be performed. Steps in the sequence can be performed in parallel if the sequence is not important.

FF. **Tag ID** - Sequential number of the tag that is to be placed/removed. (For manual R&Rs, see Section 6.2.)

GG. **Equip Tag -** The Electronic Data Base (EDB) identifier of the component being manipulated.

HH. **Equip Description -** The description of the component being manipulated as listed in EDB. If the component is temporary in nature or has no description, a temporary ZZ file can be created with EDB. However, a PIP shall be written to address the lack of description for permanent plant equipment.

II. **Location -** The physical location of the component listed in EDB.

JJ. **Position -** The position that a component is to be placed in per the enclosure. Components that will have maintenance performed on them or are being modified shall be tagged VAR to ensure that they are returned to their proper position.

KK. **As Found Position -** The use of this space to document the as found position of a component is at the discretion of the approver of the enclosure and is not required to be filled in. These entries will be handwritten entries.

LL. **Placed/Cleared By -** The handwritten initials of the individual completing the specific enclosure action.

Attachment 9.1
Removal/Removal Addendum/Partial Restoration/Restoration Enclosures

MM. **LBL** - The number of stickers attached/removed from a switch that remotely controls the position of component. If none are required, enter zero.

NN. **IV By** - The handwritten initials of the individual performing IV on the requirements. If IV is not required, this space may be left blank. In the event that the Safety Tagging Program is not available, the requirements for IV can be determined from EDB or procedures.

OO. **Special Info** - Information in EDB that may affect the determination of how a component is to be positioned or tagged. The tag has a limited number of lines to describe special information. The special information on the enclosure is the complete instructions associated with the component and shall be followed.

PP. **Enclosure Execution Completion Date/Time** - The handwritten date/time that the individual completes the enclosure.

Enclosure Summary Report

QQ. **Applicable Work Orders - A** list of work orders associated with the performance of this enclosure. If the Safety Tagging program is unavailable, these entries will be handwritten.

RR. **Affected Procedures - A** list of the procedures affected by the performance of this enclosure. If the Safety Tagging program is unavailable, these entries will be handwritten.

Attachment 9.1
Removal/Removal Addendum/Partial Restoration/Restoration Enclosures

Catawba Nuclear Station	Dept:	Page ___ of ___	Tagout ID:
		Unit:	BTO:

Isolation Tagged:	
Reason:	
Remarks:	
Modification:	

Prepared By:	at:	Reviewed By:	at:
Cross Disciplinary Rev By:	at:	Approved By:	at:

Technical Specifications / SLC	Unit 1	Unit 2
Control Room OATC Acknowledge:	Unit 1	Unit 2

Post-execution Signoffs:

Parameter Report Updated By:		
Control Room Logs Updated by:	Unit 1	Unit 2
1.47 Panel Reviewed By:	Unit 1	Unit 2
OAC Points Removed/Restored To/From Service By:	Unit 1	Unit 2
R&R and Copies Filed By:	Safety Tag Program Updated By:	

Attachment 9.1
Removal/Removal Addendum/Partial Restoration/Restoration Enclosures

Catawba Nuclear Station	Dept:	Page ___ of ___	Tagout ID:	
Enclosure Type:		Date:		
		Unit :	BTO:	

Seq#:	Equip Tag:	Position:	Placed By:
Tag ID:	Equipment Description:	As found:	LBL:
	Location:		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
lag ID:	Equipment Description:	As found:	LBL:
	Location:		IV By:

Seq#:	Equip Tag:	Position:	Placed By:
Tag ID:	Equipment Description:	As found:	LBL:
	Location:		IV By:
Special info:			

Seq#:	Equip Tag:	Position:	Placed By:
Tag ID:	Equipment Description:	As found:	LBL:
	Location:		IV By:
Special info:			

Enclosure Execution Completion Date/Time: _____

Attachment 9.1
RemovaVRemoval Addendum/Partial Restoration/Restoration Enclosures

Applicable Work Orders:	
Affected Procedures:	

Attachment 9.2
Lift/Re-Hang Enclosures
* MERGEFORMAT

CAUTION: This enclosure is to be used only when the Safety Tagging program or WMS is available.

NOTE: This attachment describes how the individual spaces in the enclosures are to be filled out, and whether signatures are computer generated, require an individual to initial the space or put information in the space.

A. **Dept. -** The OCG developing the enclosure.

B. **Page __ of __ -** Computer generated based on length.

C. **Tagout ID -** Computer generated number.

D. **Enclosure -** Tag Lift/Rehang

E. **Date -** The date that the computer generated form is printed.

F. **Unit -** The unit number of the equipment to be tagged or isolated.

G. **BTO -** Block Tagout Identifier (DGA for example)

H. **Isolation Tagged -** Equipment being isolated or tagged.

I. **Reason -** Purpose of the enclosure.

J. **Remarks -** Any information determined to be pertinent during the development of the enclosure.

K. **Modification -** The MOD number will be listed for reference. Otherwise, the space will be left blank.

L. **Prepared By at -** The Computer ID of the qualified individual preparing the enclosure with the datehime the enclosure was prepared.

M. **Reviewed By at -** The Computer ID of the qualified individual reviewing the Tag Lift enclosure with the datehime the enclosure was reviewed.

N. **Cross Disciplinary Rev By at -** Not required for Tag Lift enclosure and may be left blank.

O. **Work Group Approval To Lift By at -** The Computer ID of the Work Group Supervisor/designee granting approval to lift tags with the date/time approval was granted.

P. **Approved By at -** The Computer ID of the qualified individual approving the Tag Lift enclosure with the date/time the enclosure was reviewed.

NOTE: 1. The following spaces do not require computer entries.

2. The OCG Supervisor/designee shall N/A all spaces on the enclosure that do not apply.

Attachment 9.2
Lift/Re-Hang Enclosures
* MERGEFORMAT

Pre-Lift Signoffs

Q. **Pre-Job Brief Received By** - The initials of the individual receiving a pre-job brief associated with this Tag Lift enclosure. Only one individual is required to initial the space, but all personnel performing the enclosure are required to participate in the briefing. Control Room personnel should participate in a briefing as necessary for components/systems under OPS operational control. The brief may require a discussion of how to drain/fill components.

R. **Containment Closure Evaluation By** - The initials of the individuals performing an evaluation of the effects of the performance of this Tag Lift enclosure on Containment Closure.

S. **Control Room SRO Acknowledge** - The initials of the Control Room SRO determining that plant conditions support the performance of this Tag Lift enclosure. For Chemistry enclosures that do not affect Operations controlled equipment, the space shall be N/A'd.

T. **Control Room OATC Acknowledge Unit 1/Unit 2** - The initials of the RO acknowledging that plant conditions support the performance of this Tag Lift enclosure. For Chemistry enclosures that do not affect Operations controlled equipment, the space shall be N/A'd.

Post-Lift Signoffs

U. **R&R and Copies Filed By** - The initials of the individual filing the enclosure in the R&R Logbook and copies in any applicable procedures. For Chemistry, enclosures are filed in the affected Chemistry Section R&R Logbook. Chemistry does not file copies with any applicable procedures.

V. **Safety Tag Program Updated By** - The initials of the individual updating the status of the Tag Lift enclosure in the Safety Tagging Program.

Pre-Rehang Signoffs

W. **OCG Approval to Re-Hang Tags** - The initials of the OCG Supervisor/designee approving the Re-Hang enclosure.

X. **Containment Closure Evaluation By** - The initials of the individual performing an evaluation of effects of the performance of this Re-Hang enclosure on Containment Closure.

Y. **Control Room SRO Acknowledge** - The initials of the Control Room SRO determining that plant conditions support the performance of this enclosure.

Z. **Control Room OATC Acknowledge Unit 1/Unit 2** - The initials of the RO acknowledging that plant conditions support the performance of this enclosure. For Chemistry enclosures that do not affect Operations controlled equipment, the space shall be N/A'd.

Post-Re-Hang Signoffs

AA. **R&R and Copies Filed By** - The initials of the individual filing the enclosure in the R&R Logbook and copies in any applicable procedures. For Chemistry, enclosures are filed in the affected Chemistry Section R&R Logbook. Chemistry does not file copies with any applicable procedures.

Attachment 9.2
Lift/Re-Hang Enclosures
* MERGEFORMAT

BB. **Safety Tag Program Updated By -** The initials of the individual updating the status of the enclosure in the Safety Tagging Program.

NOTE:	The following spaces are normally populated by computer entries made when developing an enclosure except where noted.

CC. **Enclosure Execution Start Date/Time -** The handwritten date/time that the individual begins performing the enclosure.

DD. **Seq # -** The sequence numbers indicate the order in which the enclosure is to be performed. Steps in the sequence can be performed in parallel if the sequence is not important.

EE. **Tag** ID - Sequential number of the tag that is to be placed/removed.

FF. **Equip Tag -** The Electronic Data Base (EDB) identifier of the component being manipulated.

GG. **Equip Description -** The description of the component being manipulated as listed in EDB. If the component is temporary in nature or has no description, a temporary ZZ file can be created with EDB. However, a PIP shall be written to address the lack of description for permanent plant equipment.

HH. **Location -** The physical location of the component listed in EDB.

II. **Lift Position/Re-Hang Position -** The position that a component is to be placed in per the enclosure.

JJ. **As Found Position -** The use of this space to document the as found position of a component is at the discretion of the approver of the enclosure and is not required to be filled in. These entries will be handwritten entries.

KK. **Lifted Byme-Hung By -** The handwritten initials of the individual completing the specific enclosure action.

LL. **LBL -** The number of stickers attachedremoved from a switch that remotely controls the position of a component. If none are required, enter zero.

MM. **IV By -** The handwritten initials of the individual performing IV on the requirements. If IV is not required, this space may be left blank.

NN. Special Info - Information in EDB that may affect the determination of how a component is to be positioned or tagged. The tag has a limited number of lines to describe special information. The special information on the enclosure is the complete instructions associated with the component and shall be followed.

OO. **Enclosure Execution Completion Datemime -** The handwritten date/time that the individual completes the enclosure.

Attachment 9.2
Lift/Re-Hang Enclosures
*** MERGEFORMAT**

PP. **Applicable Work Orders - A** list of work orders associated with the performance of this enclosure.

QQ. **Affected Procedures - A** list of the procedures affected **by** the performance of this enclosure.

Attachment 9.4
Safety Concerns With VP And VQ Systems

unit: 0 ☐ 1 ☐ 2 ☐ Component: _____

R&R # _____ WO# _____

OCG OOPS ☐ CHM

Clear Tags ☐ Perform Tag Lift ☐

List Tag Numbers

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

NOTE: If the answer is **"Yes"** to *ANY* of the below questions, then form must be handed to WCCSRO. If "No" is the answer to ALL of the questions, complete MNT contact information and leave form in the "Functional **Box**" on the WCC counter. Thanks.

Tech. Spec. Related Equipment. Yes ☐ No ☐

Is continuous Maintenance coverage required until functional is complete. Yes ☐ No ☐

OCG to perform this functional when returning equipment to service. Yes ☐ No ☐

Requested time for OCG to place equipment in service. Date: _____ Time: _____

MNT Contact Name: _____ Phone # _____ Pager # _____ Crew # _____

OCG Rep Contacted: _____ Date: _____ Time: _____

Type of Functional Required. Note: Initial ALL that apply and fill out MNT supervisor name and contact information.

____ Visual inspection for leakage. Acceptable ☐ Not Acceptable ☐

____ Valve cycled, ☐ 1 cycle, ☐ 2 cycles required. Acceptable ☐ Not Acceptable ☐

____ **Any** unusual noises during equipment operation. None noted ☐ Needs MNT Evaluation ☐

____ Oil level Acceptable ☐ Not Acceptable ☐

____ Component started Yes ☐ Date: ____ Time: _____

MNT Supervisor Name: _____ Phone # _____ Pager # _____

Equipment Returned to Service, OCG Signature _____

MNT Supervisor Notified: ☐ Yes, ☐ No, ☐ N/A

Attachment 9.3
Functional Request Form

* MERGEFORMAT

Comments: _____

_____

Place completed form in Maintenance Supervisor's box in the WCC.

Attachment 9.4
Protected Equipment Posting (Cns1f3/Op-lib/All_UMG) * MERGEFORMAT

1.Pr otected Equipment: _____

2.Pr epared By: _____ Date: _____

3.P lace note on Turnover Sheet identifying Protected Equipment.

4.Note equipment protection in Remarks Section of applicable R&R.

5.Ma intain in "In Progress File" in WCC until all placards are removed.

6.Multi ple copies of this attachment may be used if necessary.

7.Disc ard after all placards are removed.

EQUIPMENT/LOCATION	TYPE OF POSTING PLACARD/BARRICADE/TAPE	PLACED BY INITIAL	REMOVED BY INITIAL

Attachment 9.5
OPS/CHEM Manual Tagout Index * MERGEFORMAT

Catawba Nuclear Station

OPS/CHEM Manual Tagout Index

NOTE: This index is to be used **only** in the event that safety tags cannot be generated via the ST2 Program.

R&R Number Number (Refer to Section 6.2)	Work Order Task #	Task Description	OCG Ready for Work Datemime	Work Grp Supv Sign In Date/Time	Work Grp Supv Sign Out Date/Time	Tagout Cleared Date/Time

Attachment 9.6
Tagout Details * MERGEFORMAT

A. Unit - Select the appropriate unit.

B. Dept. - Computer program defaults to the OCG of the person logged onto the program.

C. Pre-Job Brief - This field is not used at CNS.

D. Block Tagout - Enter the BTO Identifier for the tagout.

E. Status - Determined by the computer program.

F. Flags

- Fire Impair - Entered when the fire protection equipment is to be removed from service.
- SSF Degrade/Radiation Release/Safety Related/Containment Closure/Independent Verif - This field is not used at CNS.

G. Isolation Type - Typically "System" is used at CNS. However, component or procedure can be used if required.

H. Isolation ID - Select system affected

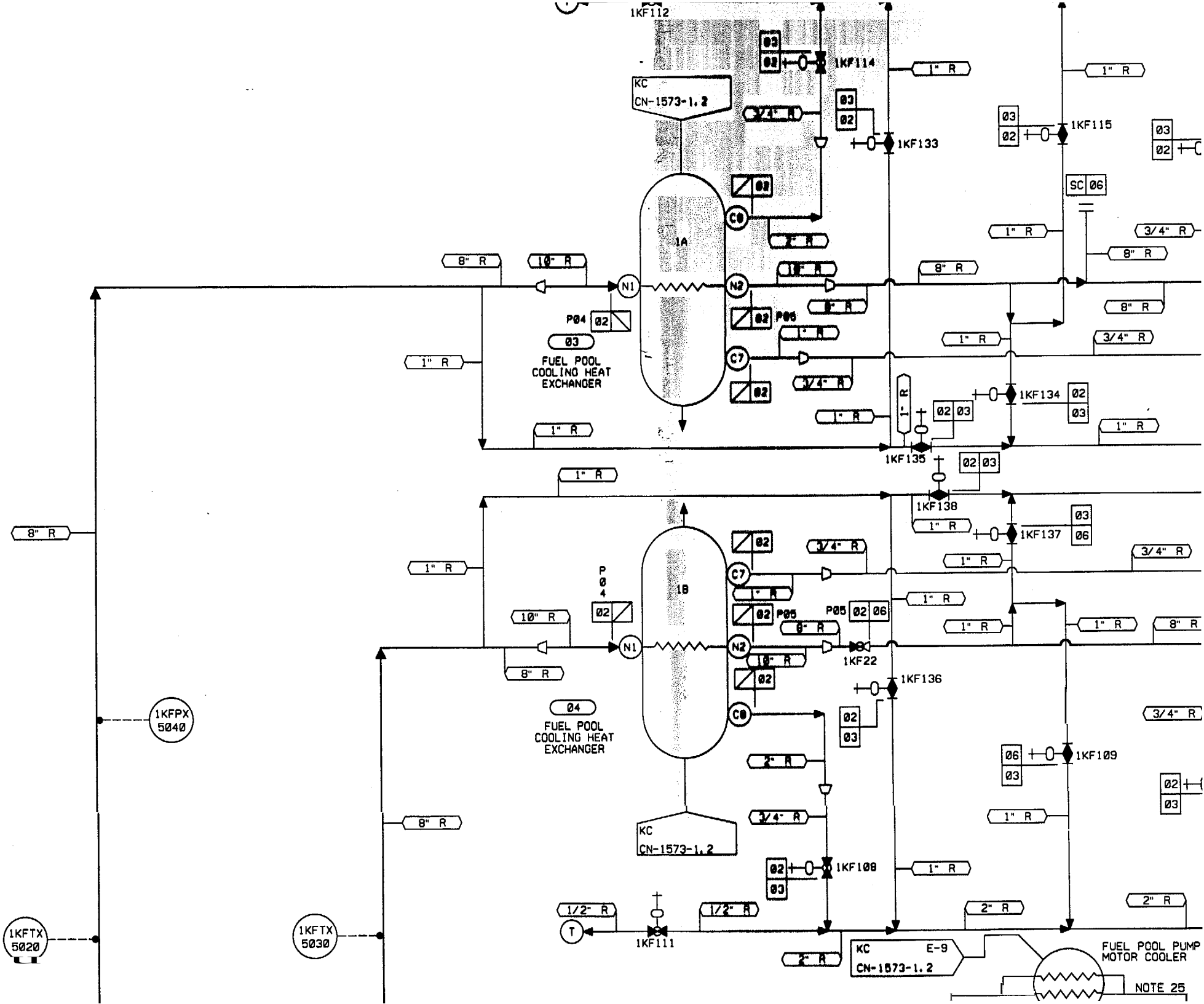
I. Isolation Desc - Computer generated based on Isolation ID selected.

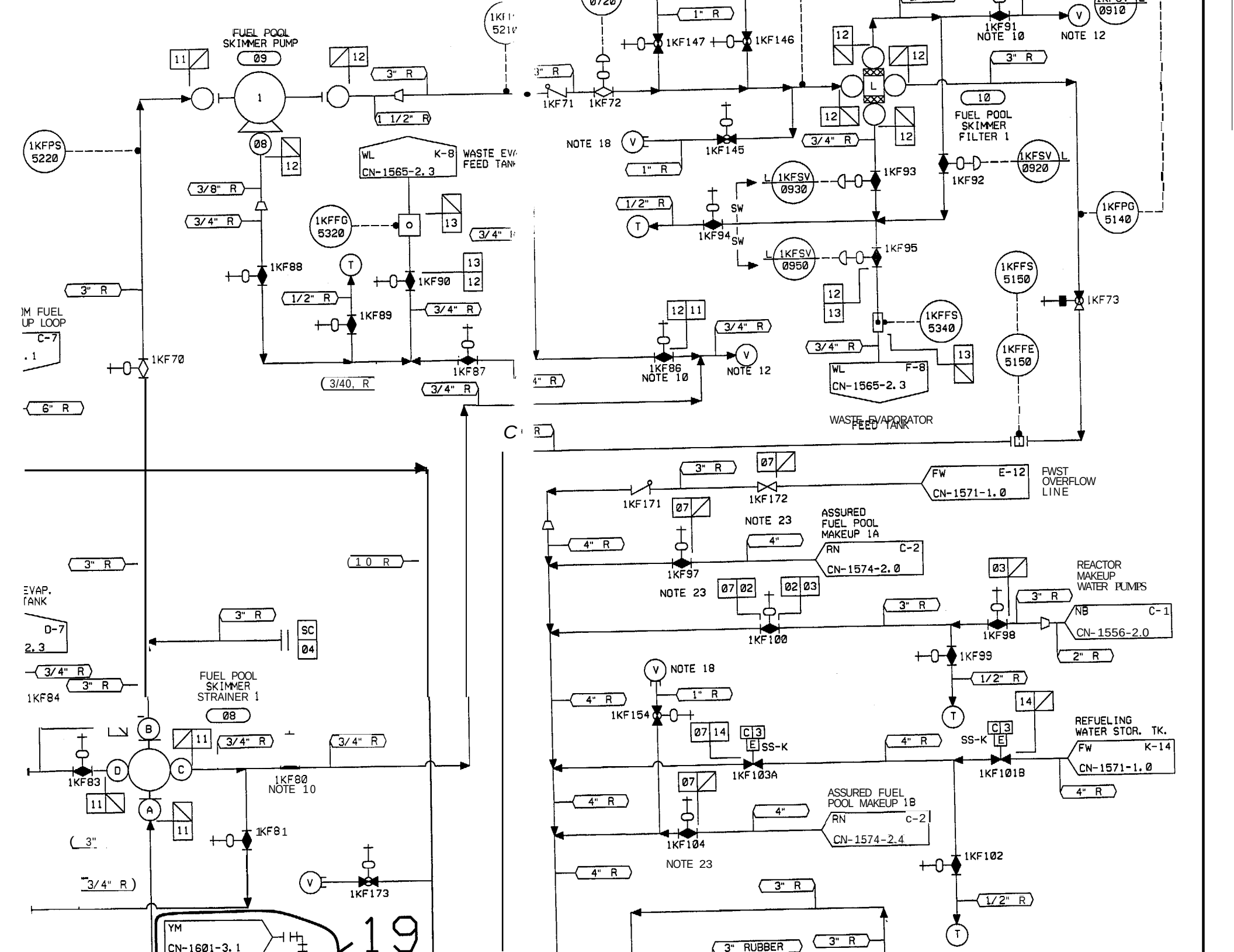
J. Modification - An optional field and only populated by the OCG.

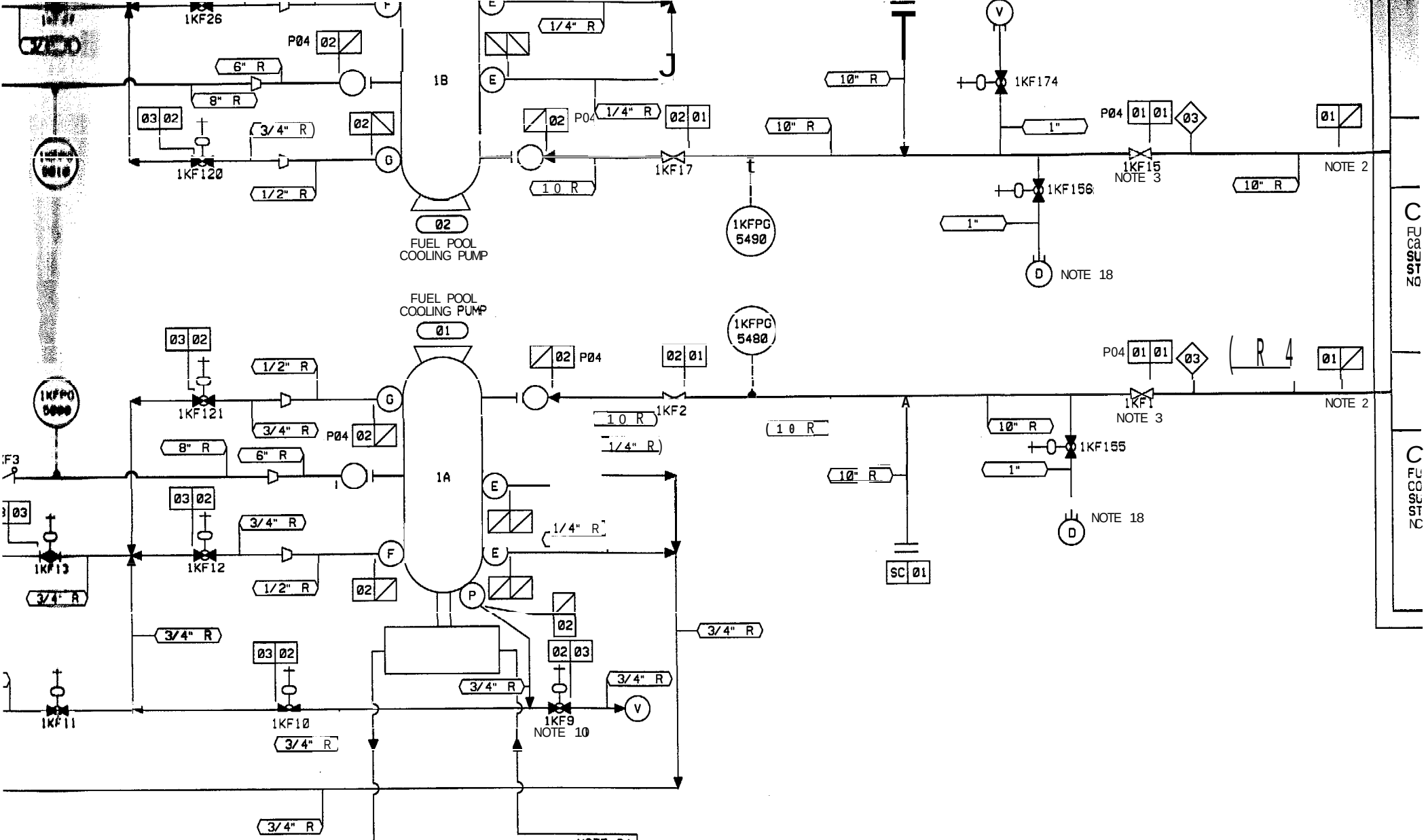
K. Affected Procedures - Selected by the Preparer after equipment is added to the Removal.

L. Energy Status - Documents any precautions or additional requirements that the work group must take for their safety.

M. Unit 1 Spec/Unit 2 Spec - Typically, these are manual entries based on information in the Technical Specification Action Item (TSAIL).


1KF112
1KF114
KC
CN-1573-1.2
1KF133
1KF115
SC 06
1A
C8
C7
N1
N2
P04
P05
FUEL POOL
COOLING HEAT
EXCHANGER
1KF134
1KF135
1KF138
1KF137
1B
P05 02 06
1KF22
1KF136
1KF109
1KF108
1KF111
KC E-9
CN-1573-1.2
FUEL POOL PUMP
MOTOR COOLER
NOTE 25
1KFPX
5040
1KFTX
5020
1KFTX
5030
8" R
10" R
1" R
3/4" R
2" R
1/2" R


FUEL POOL SKIMMER PUMP
09
1KFPS 5220
08
1KFFG 5320
WL K-8
CN-1565-2.3
WASTE EVA FEED TAN
1KF88
1KF89
1KF90
1KF87
1KF70
3/40, R
1KF71
1KF72
1KF147
1KF146
1KF145
NOTE 18
1KF91
NOTE 10
NOTE 12
FUEL POOL SKIMMER FILTER 1
1KF92
1KFSV 0920
1KF93
1KFSV 0930
1KF94
SW
1KF95
1KFSV 0950
1KFPG 5140
1KFFS 5150
1KF73
1KFFS 5340
1KFFE 5150
1KF86
NOTE 10
WL F-8
CN-1565-2.3
WASTE EVAPORATOR FEED TANK
1KF171
1KF172
FW E-12
CN-1571-1.0
FWST OVERFLOW LINE
NOTE 23
ASSURED FUEL POOL MAKEUP 1A
RN C-2
CN-1574-2.0
1KF97
1KF100
1KF98
1KF99
REACTOR MAKEUP WATER PUMPS
NB C-1
CN-1556-2.0
1KF154
1KF103A
1KF101B
SS-K
REFUELING WATER STOR. TK.
FW K-14
CN-1571-1.0
ASSURED FUEL POOL MAKEUP 1B
RN C-2
CN-1574-2.4
1KF104
1KF102
3" RUBBER
1KF84
FUEL POOL SKIMMER STRAINER 1
1KF83
1KF80
NOTE 10
1KF81
1KF173
YM
CN-1601-3.1
19



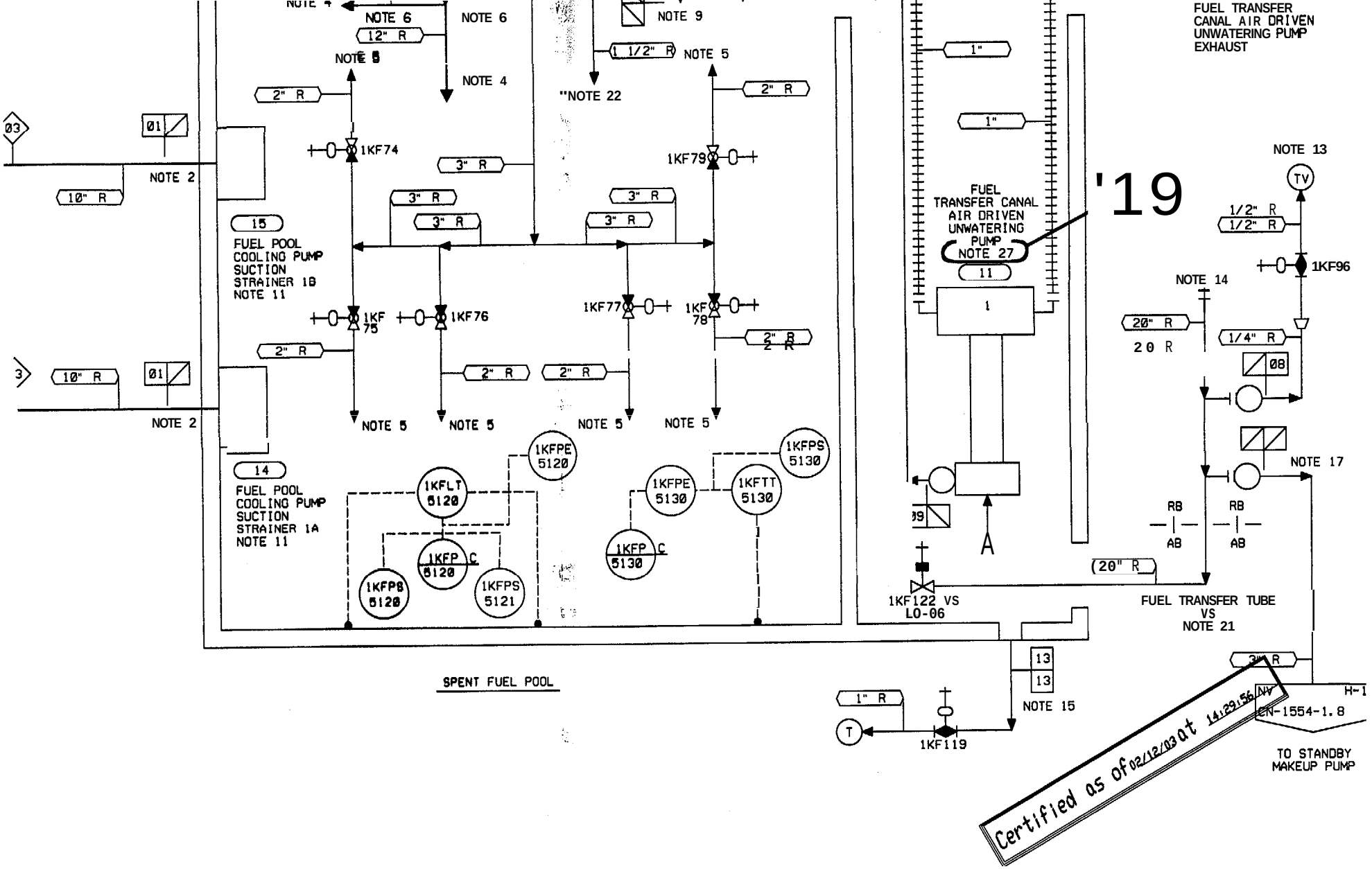
FER TUBE IN ANNULUS.
N.
FUEL POOL OECK
VES FAIL AS SS AND ARE
WITCHES. THEY ARE
S.
SEMBLY, EXCEPT VALVE 1KF122,
LASS MC PART.
NG.
OF THE MAKEUP LINE
DAPTER, PERMITTING
A 1 1/2" FIREHOSE TO DIVERT
TION OF STANDBY MAKEUP
WHEN THE FUEL POOL IS EMPTY.
BEFORE 1KF97 AND/OR

NO PROCESS FLUID IN THESE LINES.
IATION ONLY. REFERENCE KC
SPECIFIC INFORMATION.
HIGH LEVEL FOR SIPHON
RIFICATION OF FLOW.

LINE LISTING	PIPE SPEC	PRESSURE	TEMPERATURE	CLASS	MATERIAL
01	151.3	35 PSIA	200°F	C	SS
02	151.3	190 PSIA	200°F	C	SS
03	151.4	190 PSIA	200°F	E	SS
06	151.3	105 PSIA	200°F	C	SS
07	151.3	165 PSIA	200' F	C	SS

NO	FLOW
01	2310 GPM
02	2840 GPM
03	
04	100 GPM
05	300 GPM

REF CE-71974
REF CE-71700



QA CONDITION 2

QA CONDITION 1

19	REV PER CE-71974 IMP. DATE 12-16-02	VDC	12-17 02	CLI	12-18 02	PFB	12-23 02	RFK	CPS	WKL
18	REV PER CE-71700 IMP. DATE 6-24-02	VDC	6-27 02	CLI	7-1 02	PFB	7-8 02	RFK	CPS	JKR

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION UNIT 1

FLOW DIAGRAM OF
SPENT FUEL **COOLING** SYSTEM
(KF)

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM 5S/ADMIN

Upgrade to a Higher Emergency Classification

CANDIDATE _____

EXAMINER _____

CATAWBA
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Upgrade to a higher emergency classification

Alternate Path:

NO

Facility JPM #:

New

KIA Rating(s):

2.4.41 (2.3/4.1)

Task Standard:

Candidate classifies the event as an Alert within 15 minutes of starting the JPM, and correctly completes the follow-up notification form within 15 minutes of determining the classification.

Preferred Evaluation Location:

Simulator ___X___ In-Plant ___X___

Preferred Evaluation Method:

Perform ___X___ Simulate _____

References:

RP/0/A/5000/001 (Classification of Emergency) revision 15
RP/0/A/5000/003 (Alert) revision 39
RP/0/A/5000/006A (Notification of States and Counties from the Control Room) revision **14**

Validation Time: 11 min. **Time Critical:** Yes

==========

Candidate: _____ Time Start : _____
NAME Time Finish: _____

Performance Ratina: SAT _____ UNSAT _____ Question Grade _____ Performance Time _____

Examiner: _____ _____/_____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

Tools/Equipment/Procedures Needed:

Each candidate requires one copy of the following: Complete initial notification sheet, RP/01, RP/03, RP/06A and a blank ENS sheet

READ TO OPERATOR

DIRECTION TO TRAINEE:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

- Unit 1 was in Mode 5 with loops filled
- Reactor Coolant temperature was 143° F.
- " A train ND, KC and RN in service.
- 1B ND pump is red tagged for repairs and unavailable.
- An Unusual Event was declared at 0830 per 4.7.U.1 (Natura, and Destructive Phenomena Affecting the Protected Area) when Security forces reported a tornado touched down on the northeast side of the Protected Area.
- At 0850, the unit entered AP/1/A/5500/19 (Loss of Residual Heat Removal System) after an electrical transient caused 1A ND pump breaker to fail.
- Reactor coolant temperature has started to increase.

INITIATING CUE:

Reactor Coolant temperature is currently at 181° F and increasing.

Based on the current plant status, determine the emergency classification and prepare an Emergency Notification Form for transmittal.

This JPM is Time Critical.

START TIME: _____

STEP 1: RP/01 step 2.1: Determine the operating mode that existed at the time the event occurred prior to any protection system or operator action initiated in response to the event. STANDARD: Candidate determines that Unit 1 is in Mode 5. COMMENTS:	___ SAT ___ UNSAT
STEP 2: RP/01 Step 2.2: IF the plant is in Mode 1-4 and a valid condition affects fission product barriers, proceed to Enclosure 4.1. STANDARD: From JPM Step 1, and the initial conditions, the candidate determines that Enclosure 4.1 will not be used. COMMENTS:	___ SAT ___ UNSAT
STEP 3: RP/01 Step 2.3: IF a General Emergency is NOT declared in step 2.2 OR the condition does not affect fission product barriers, review the listing enclosures to determine **if** the event is applicable to one of the categories shown. . STANDARD: From the initial conditions, reviews enclosures 4.2 through 4.7. COMMENTS:	___ SAT ___ UNSAT

STEP 4: RP/01 Step 2.4: Compare actual plant conditions to the Emergency Action Levels listed, then declare the appropriate Emergency Class as indicated. STANDARD: From the initial conditions, candidate determines the unit is an Alert based on Enclosure 4.4 page 2 of 3: 4.4.A.2 Inability to Maintain Plant In Cold Shutdown Operating Mode 5: (4.4A.2-1 Total Loss of ND AND Uncontrolled reactor coolant temperature rise to greater than **180°F.)** **EXAMINER NOTE: This declaration must be made within 15 minutes from the start of the JPM.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 5: RP/01 step 2.5: Implement the applicable Emergency Response Procedure (RP) for that classification and continue with subsequent steps of this procedure. STANDARD: Candidate determines procedure RP/0/A/5000/003 (Alert) applies and locates procedure. **EXAMINER CUE: When the candidate locates procedure hand him/her a clean copy.** COMMENTS:	___ SAT ___ UNSAT
STEP 6: Candidate uses RP/03 to perform actions for the Alert. Step 2 Immediate Actions: Advise site Personnel and Activate Emergency Organization. STANDARD: Candidate performs Advising Plant personnel and Activation of Emergency Organization. **EXAMINER CUE: Unit Supervisor will conduct Plant Page and activate emergency organization.** COMMENTS:	___ SAT ___ UNSAT

STEP **7:** Notify off-site agencies within 15 minutes of Emergency declaration time using an Emergency Notification Form. STANDARD: Candidate refers to RP/0/A/5000/06A "Notification of States and Counties from the Control Room. COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP **8:** Candidate locates RP/0/A/5000/006A (Notification *of* States and Counties from the Control Room). STANDARD: Candidate locates procedure RP/0/A/5000/ 006A. **EXAMINER CUE: When the candidate locates procedure hand him/her a clean copy.** COMMENTS:	___ SAT ___ UNSAT
STEP 9: Per RP/006A step 2.1, obtains a preprinted ENS form for 4.4.A.2 (Inability to Maintain Plant in Cold Shutdown) STANDARD: Candidate completes form per the guidelines in enclosure 4.3. COMMENTS:	___ SAT ___ UNSAT

STEP 10: RP/0/A/5000/006A Step 2.2, Complete appropriate lines of the Emergency Notification Form for transmittal as the Initial Notification. Lines 11-14 may be left blank on Initial Notifications, Refer to Enclosure 4.3 for line by line instructions

*CRITICAL STEP

___ SAT

___ UNSAT

STANDARD: Candidate completes form per the guidelines in enclosure 4.3

Line 1: Emergency checked, Initial checked, Message #2

Lines 2, 3 and 4 are not filled in

Line 5: Alert checked

*Line 6: Mark box "A" and enters date and time event is declared.

Line 7: Uses preprinted form or enters a clear and concise description of the event.

Line 8: Stable or Degrading

Line 9: Enters time reactor shutdown

EXAMINER CUE: Reactor was shutdown 3 days ago.

Line 10: Based on initial conditions, checks NONE

Line 11-14: leaves these blank

EXAMINER CUE: If asked, state that "surveys are not yet available".

Line 15: From initial cue, verifies Box " A is entered.

*Line 16: signs as Operations Shift Manager with date and time.

*EXAMINER NOTE: The following items are CRITICAL:

- This form must be completed within 15 minutes of the time that the declaration was made in STEP 4 of this JPM.
- Line 6 - enters date and time which is < 15 minutes since start of JPM.
- Line 16 - signature with date and time which is < 15 minutes since the declaration of Alert was made (STEP 4).

COMMENTS:

This JPM is complete.

TIME STOP: _____

Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.

CANDIDATE CUE SHEET
(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- Unit 1 was in Mode 5 with loops filled
- Reactor Coolant temperature was 143° F.
- "A" train ND, KC and RN in service.
- 1B ND pump is red tagged for repairs and unavailable.
- An Unusual Event was declared at 0830 per 4.7.U.1 (Natural and Destructive Phenomena Affecting the Protected Area) when Security forces reported a tornado touched down on the northeast side of the Protected Area.
- At 0850, the unit entered AP/1/A/5500/19 (Loss of Residual Heat Removal System) after an electrical transient caused 1A ND pump breaker to fail.
- Reactor coolant temperature has started to increase.

INITIATING CUE:

Reactor Coolant temperature is currently at 181° F and increasing.

Based on the current plant status, determine the emergency classification and prepare an Emergency Notification Form for transmittal.

This JPM is Time Critical.

***Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.**

FOR **TRAINING** PURPOSES ONLY KEY

EMERGENCY NOTIFICATION FORM

1. [A] THIS IS A DRILL [X] ACTUAL EMERGENCY [X] INITIAL [ ] FOLLOW-UP MESSAGE NUMBER 2

2. SITE: Catawba Nuclear Station UNIT: _____ REPORTED BY: _____

3. ANSMITTAL TIMWDATE: _____ (Easlern) ____ / ____ / ____ mm dd yy CONFIRMATION PHONE NUMBER: (803) 831-3807 (Simulator)

4. AUTHENTICATION (If Required): _____ (Number) _____ (Codeword)

5. EMERGENCY CLASSIFICATION:

[A] NOTIFICATION OF UNUSUAL EVENT [■] ALERT [C] SITE AREA EMERGENCY [D] GENERAL EMERGENCY

6. [■] Emergency Declaration At: [B] Termination At: TIME/DATE: "DECLARED" TIME ____ (Eastern) DECLARED DATE ____ / ____ / ____ mm dd W (If B, go to item 16.)

"DECLARED TIME" MUST BE <15 MINUTES FROM START OF JPM

7. **EMERGENCY DESCRIPTION/REMARKS:** **EAL # 4.4.A.2 - Equipment needed to maintain the reactor water temperature below the boiling point (ie:cold shutdown) has been lost. This EAL poses no threat to the safety of the aeneral public.**

8. PLANT CONDITION: [A] IMPROVING [X] STABLE OR [X] DEGRADING

9. REACTOR STATUS: [X] SHUTDOWN TIMUDATE: 3days Ago based on (Eastern) / ____ / ____ mm dd CANDIDATES JPM TIME yy [B] _____ %POWER

10. EMERGENCY RELEASE(S):

[X] NONE (Go to item **14.**) [B] POTENTIAL (Go **to** item **14.**) [C] IS OCCURRING [D] HAS OCCURRED

**11. TYPE OF RELEASE: [ ] ELEVATED [ ] GROUND LEVEL

[A] AIRBORNE: Started: _____ Time(Eastern) ____ / ____ / ____ Dale stopped: _____ Time(Eastern) ____ / ____ / ____ Dale

[ ] LIQUID: Started: _____ Time(Eastern) ____ / ____ / ____ Dale stopped: _____ Time(Eastern) ____ / ____ / ____ Dale

**12. RELEASE MAGNITUDE: [ ] CURIES PER SEC. [ ] CURIES NORMAL OPERATING LIMITS: [ ] BELOW [ ] ABOVE

[A] NOBLE GASES _____ [B] IODINES _____

[C] PARTICULATES _____ [D] OTHER _____

**13. ESTIMATE OF PROJECTED OFFSITE DOSE: [ ] NEW [ ] UNCHANGED PROJECTION TIME: _____ (Eastern)

	TEDE mrem	Thyroid CDE mrem
SITE BOUNDARY		
2 MILES		
5 MILES		
10 MILES		

ESTIMATED DURATION: _____ HRS.

**14. METEOROLOGICAL DATA: [A] WIND DIRECTION (from) _____ ° [B] SPEED (mph) _____

[C] STABILITY CLASS _____ [D] PRECIPITATION (type) _____

15. RECOMMENDED PROTECTIVE ACTIONS:

[■] NO RECOMMENDED PROTECTIVE ACTIONS

[B] EVACUATE _____

[C] SHELTER IN-PLACE _____

[D] OTHER _____

16. APPROVED BY: DIDATE SIGNATURE (Name) Emergency Coordinator (Title) TIME/DATE: SIGNED TIME (Eastern) DATE ____ / ____ mm dd W

SIGNED TIME MUST BE <15 MINUTES FROM DECLARED TIME

* If items 8-14 have not changed, only items 1-7 and 15-16 are required to be completed.

** Information may not be available on initial notifications.

EMERGENCY NOTIFICATION FORM

1. [A] THIS IS A DRILL [B] ACTUAL EMERGENCY [ ] INITIAL [ ] FOLLOW-UP MESSAGE NUMBER _____

2. Catawba Nuclear Station UNIT: _____ REPORTED BY: _____

3. TRANSMITTAL TIME/DATE: _____ (Eastern) ____/____/____ mm dd yy CONFIRMATION PHONE NUMBER: (803) 831-3807 **(Simulator)**

4. AUTHENTICATION **(If Required):** _____ (Number) _____ (Codeword)

5. EMERGENCY CLASSIFICATION:

[A] NOTIFICATION OF UNUSUAL EVENT [■] ALERT [C] SITE AREA EMERGENCY [D] GENERAL EMERGENCY

6. =Emergency Declaration At: [B] Termination At: TIME/DATE: _____ (Eastern) ____/____/____ mm dd yy (If B, go to item **16.**)

7. EMERGENCY **DESCRIPTION/REMARKS:** **EAL # 4.4.A.2 - Equipment needed to maintain the reactor water temperature below the boiling point (ie:cold shutdown) has been lost. This EAL poses no threat to the safety of the general public.**

8. PLANT CONDITION: [A] IMPROVING [B] STABLE [C] DEGRADING

9. REACTOR STATUS: ~ S H U T D O W N TIME/DATE: _____ (Eastern) ____/____/____ mm dd yy [B] _____ %POWER

10. EMERGENCY RELEASE(S):

[A] NONE (Go **to item 14.**) [B] POTENTIAL (Go **to item 14.**) [C] IS OCCURRING [D] HAS OCCURRED

**11. TYPE OF RELEASE: [ ] ELEVATED [ ] GROUND LEVEL

~ ~ A I R B O R N E : **Started:** _____ Time(Eastern) ____/____/____ Date **stopped:** _____ Time(Eastern) ____/____/____ Date

[ ] LIQUID: **Started:** _____ Time(Eastern) ____/____/____ Date **stopped:** _____ Time(Eastern) ____/____/____ Date

**12. RELEASE MAGNITUDE: [ ] CURIES PER SEC. [ ] CURIES NORMAL OPERATING LIMITS: [ ] BELOW [ ] ABOVE

[A] NOBLE GASES _____ [B] IODINES _____

[C] PARTICULATES _____ [D] OTHER _____

**13. ESTIMATE OF PROJECTED OFFSITE DOSE: [ ] NEW [ ] UNCHANGED PROJECTION TIME: _____ (Eastern)

	TEDE **mrem**	Thyroid CDE **mrem**
SITE BOUNDARY		
2 MILES		
5 MILES		
10 MILES		

ESTIMATED DURATION: _____ HRS.

14. METEOROLOGICAL DATA: [A] WIND DIRECTION **(from) _____ ° [B] SPEED **(mph)** _____

15. RECOMMENDED PROTECTIVE ACTIONS:

[■] NO RECOMMENDED PROTECTIVE ACTIONS

[B] EVACUATE _____

16. APPROVED BY: _____ (Name) Coordinator (Title) TIME/DATE: _____ (Eastern) ____/____/____ mm dd yy

* **If items 8-14 have not changed, only items 1-7 and 15-16 are required to be completed.**

** **Information may not be available on initial notifications.**

Duke Power Company
Catawba Nuclear Station

Classification of Emergency

Multiple Use

Procedure No.
RP/0/A/5000/001

Revision No.
015

Electronic Reference No.
CN005GNK

PERFORMANCE

Classification of Emergency

1. Symptoms

1.1 Notification of Unusual Event

1.1.1 Events are in process or have occurred which indicate a potential degradation of the level of safety of the plant.

1.1.2 No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety occurs.

1.2 Alert

1.2.1 Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant.

1.2.2 Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

1.3 Site Area Emergency

1.3.1 Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public.

1.3.2 Any releases are not expected to exceed EPA Protective Action Guideline exposure levels except near the site boundary.

1.4 General Emergency

1.4.1 Events are in process or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity.

1.4.2 Releases can be reasonably expected to exceed EPA Protective Action Guidelines exposure levels offsite for more than the immediate site area.

2. Immediate Actions

_____ 2.1 Determine operating mode that existed at the time the event occurred prior to any protection system or operator action initiated in response of the event.

_____ 2.2 **IF** the plant was in Mode 1-4 and a valid condition affects fission product barriers, proceed to Enclosure 4.1.

_____ 2.3 IF a General Emergency is **NOT** declared in Step 2.2 **OR** the condition does not affect fission product barriers, review the listing of enclosures to determine if the event is applicable to one the categories shown.

_____ 2.4 Compare actual plant conditions to the Emergency Action Levels listed, then declare the appropriate Emergency Class as indicated.

_____ 2.5 Implement the applicable Emergency Response Procedure (RP) for that classification and continue with subsequent steps of this procedure.

Notification of Unusual Event	RP/0/A/5000/002
Alert	RP/0/A/50001003
Site Area Emergency	RP/0/A/5000/004
General Emergency	RP/0/A/5000/005

3. Subsequent Actions

_____ 3.1 To escalate, de-escalate, or terminate the Emergency, compare plant conditions to the Initiating Conditions of Enclosures 4.1 through 4.7.

_____ 3.2 Refer to enclosure 4.9, Emergency Declaration Guidelines, as needed.

4. Enclosures

4.1 Fission Product Barrier Matrix
4.2 System Malfunctions
4.3 Abnormal Rad Levels/Radiological Effluent
4.4 **Loss** of Shutdown Functions
4.5 Loss of Power
4.6 Fires/Explosions and Security Events
4.7 Natural Disasters, Hazards and Other conditions Affecting Plant Safety
4.8 Definitions/Acronyms
4.9 Emergency Declaration Guidelines
4.10 Radiation Monitor Reading for Enclosure **4.3** EALs

Enclosure 4.1
Fission Barrier Matrix

Use EALs to determine Fission Product Barrier status (Intact, Potential Loss, or Loss). Add points for all **3** barriers. Classify according to the table below.

Note 1: This table is only applicable in Modes 1-4.

Note 2: Also, an event (or multiple events) could occur which results in the conclusion that exceeding the Loss or Potential Loss thresholds is IMMINENT (i.e., within **1-3** hours). In this IMMINENT LOSS situation, use judgement and classify as if the thresholds are exceeded.

Note **3:** When determining Fission Product Barrier status, the Fuel Clad Barrier should be considered to be lost or potentially lost if the conditions for the Fuel Clad Barrier loss or potential loss EALs were met previously during the event, even if the conditions do not currently exist.

Note **4:** Critical Safety Function (CSF) indications are not meant to include transient alarm conditions which may appear during the start-up of engineered safeguards equipment. **A** CSF condition is satisfied when the alarmed state is valid and sustained. The STA should be consulted to affirm that a CSF has been validated and the appropriate functional restoration procedure has been implemented prior to the CSF being used as a basis to classify an emergency.

EAL #	Unusual Event	EAL #	Alert	EAL #	Site Area Emergency	EAL #	General Emergency
4.1.U.1	Potential Loss of Containment	**4.1.A.1**	Loss **OR** Potential **Loss** of Nuclear Coolant System	**4.1.S.1**	Loss **OR** Potential Loss of Both Nuclear Coolant System **AND** Fuel Clad	**4.1.G.1**	Loss of All Three Barriers
4.1.U.2	Loss of Containment	**4.1.A.2**	Loss **OR** Potential **Loss** of Fuel Clad	**4.1.S.2**	Loss **AND** Potential Loss Combinations of Both Nuclear Coolant System **AND** Fuel Clad	**4.1.G.2**	Loss of Any Two Barriers **AND** Potential Loss of the Third
		4.1.A.3	Potential Loss of Containment Loss **OR** Potential **Loss** of Any Other Barrier	**4.1.S.3**	Loss of Containment **AND** **Loss** **OR** Potential **Loss** of Any Other Barrier		

NOTE: If a barrier is affected, it has a single point value based on a "potential loss" or a **"loss".** "Not Applicable" is included in the table as a place holder only, and has no point value assigned.

Barrier	Points (1-5)	Potential Loss (X)	Loss (X)	Total Points	Classification
Containment		1	3	1 – 3	Unusual Event
NCS		4	5	4 - 6	Alert
Fuel Clad		4	5	7 – 10	Site Area Emergency
Total Points				11 - 13	General Emergency

1. Compare plant conditions against the Fission Barrier Matrix on pages 3 through 6 of 6.
2. Determine the "potential loss" or "loss" status for each barrier (Containment, NCS and Fuel Clad) based on the EAL symptom description.
3. For each barrier, write the highest single point value applicable for the barrier in the "Points" column and mark the appropriate "loss" column.
4. Add the points in the "Points" column and record the sum as "Total Points".
5. Determine the classification level based on the number of "Total Points".
6. In the table on page 1 of 6, under the "classification" column, select the event number (e.g. 4.1.A.1 for Loss of Nuclear Coolant System) that best fits the loss of barrier descriptions.
7. Using the number (e.g. 4.1.A.1) select the preprinted notification form and complete the required information for Emergency Coordinator approval and transmittal.

POTENTIAL LOSS - (1 Point)	LOSS – (3 Points)	POTENTIAL LOSS - (4 Points)	LOSS – (5 Points)	4.1.F FUEL CLAD BARRIER POTENTIAL LOSS - (4 Points)	LOSS – (5 Points)
1. Critical Safety Function Status • Containment-RED • Core cooling-RED Path is indicated for > 15 minutes	• Not applicable	**1. Critical Safety Function Status** • NCS Integrity-Red • Heat Sink-Red	• Not applicable	**1. Critical Safety Function Status** • Core Cooling-Orange • Heat Sink-Red	• Core Cooling-Red
2. Containment Conditions • Containment Pressure > 15 PSIG • H2 concentration > 9% • Containment pressure greater than 3 psig with less than one full train of NS and a VX-CARF operating.	• Rapid unexplained decrease in containment pressure following initial increase • Containment pressure or sump level response not consistent with LOCA conditions.	**2. NCS Leak Rate** • Unisolable leak exceeding the capacity of one charging pump in the normal charging mode with letdown isolated.	• GREATER THAN available makeup capacity as indicated by a loss of NCS subcooling.	**2. Primary Coolant Activity Level** • Not applicable	• Coolant Activity GREATER THAN 300 µCi/cc Dose Equivalent Iodine (DEI) I-131

CONTINUED
CONTINUED
CONTINUED

4.1.N NCS BARRIER

POTENTIAL LOSS - (1 Point)	LOSS – (3 Points)	POTENTIAL LOSS - (4 Points)	LOSS – (5 Points)	POTENTIAL LOSS - (4 Points)	LOSS – (5 Points)
3. Containment Isolation Valves Status After Containment Isolation Actuation		**3. SG Tube Ru ture**		**3. Containment Radiation Monitoring**	
• Not applicable	• Containment isolation is incomplete and a release path from containment exists	• Primary-to-Secondary leak rate exceeds the capacity of one charging pump in the normal charging mode with letdown isolated.	• Indication that a SG is Ruptured and has a Non-Isolable secondary line fault • Indication that a SG is ruptured and a prolonged release of contaminated secondary coolant is occurring from the affected SG to the environment	• Not applicable	• Containment radiation monitor 53 A or 53 B reading >117 R/hr
4. SG Secondaw Side Release With Primary-to-Secondary Leakage		**4. Containment Radiation Monitoring**		**4. Emergency Coordinator/EOF Director Judgement**	
• Not applicable	• Releaseof secondary side to the environment with primary to secondary leakage GREATER THAN Tech Spec allowable	• Not applicable	• Not applicable	• Any condition, including inability to monitor the barrier, that in the opinion of the Emergency Coordinator/EOF Director indicates **LOSS** or **POTENTIAL LOSS** of the fuel clad barrier.	

CONTINUED

CONTINUED

END

POTENTIAL LOSS - (1 Point)	LOSS – (3 Points)	POTENTIAL LOSS - (4 Points)	LOSS – (5 Points)	POTENTIAL LOSS - (4 Points)	LOSS – (5 Points)
5. Significant Radioactive Inventory In Containment • Containment Rad. Monitor EMF53A **or 53B** Reading @ **time since** shutdown: **> 470 R/hr @ 0 - 0.5 hr** **> 170 R/hr @ 0.5-2 hr** **> 125 R/hr @ 2 - 4 hr** **> 90 R/hr @ 4 - 8 hr** **> 53 R/hr @ > 8 hr**	• Not applicable	**5. Emergency Coordinator/EOF Director Judgement** • **Any** condition, including inability to monitor the barrier, that in the opinion **of** the Emergency Coordinator E O F Director indicates **LOSS or POTENTIAL LOSS** of the NCS barrier. **END**			
6. Emergency Coordinator/EOF Director Judgement • **Any** condition, including inability to monitor the barrier, that in the opinion of the Emergency Coordinator EOF Director indicates **LOSS or POTENTIAL LOSS** of the containment barrier. **END**					

Enclosure 4.2

System Malfunctions

UNUSUAL EVENT

4.2.U.1 Inability to Reach Required Shutdown Within Technical Specification Limits.

OPERATING MODE: 1, 2, 3, 4

4.2.U.1-1 Plant is not brought to required operating mode Within Technical Specifications LCO Action Statement Time.

4.2.U.2 Unplanned Loss of Most or ***All*** Safety System Annunciation or Indication in the Control Room for Greater Than 15 Minutes.

OPERATING MODE: 1, 2, 3, ***4***

4.2.U.2-1 The following conditions exist:

Unplanned loss of most (>50%) annunciators associated With safety systems for greater than **15** minutes.

AND

In the opinion of the Operations Shift Manager/Emergency Coordinator EOF Director, the loss of the annunciators or indicators requires additional personnel (beyond normal shift compliment) to safely operate the unit.

CONTINUED

ALERT

4.2.A.1 Unplanned Loss of Most or All Safety System Annunciation or Indication in Control Room With Either (1) a Significant Transient in Progress, or (2) Compensatory Non-Alarming Indicators Unavailable.

OPERATING MODE: 1, 2, 3, 4

4.2.A.1-1 The following conditions exist:

Unplanned loss of most (>50%) annunciators associated with safety systems for greater than 15 minutes.

AND

In the opinion of the Operations Shift Manager/Emergency Coordinator/EOF Director, the loss of the annunciators or indicators requires additional personnel (beyond normal shift compliment) to safely operate the unit.

AND

EITHER of the following:

- A significant plant transient is in progress
- Loss of the OAC.

END

SITE AREA EMERGENCY

4.2.S.1 Inability to Monitor a Significant Transient in Progress.

OPERATING MODE: 1, 2, 3, 4

4.2.S.1-1 The following conditions exist:

Loss of most (>50%) Annunciators associated with safety systems.

AND

A significant plant transient is in progress.

AND

Loss of the OAC.

AND

Inability to provide manual monitoring of any of the following Critical Safety Functions:

- subcriticality
- core cooling
- heat sink
- containment.

END

GENERAL EMERGENCY

END

UNUSUAL EVENT | **ALERT** | **SITE AREA EMERGENCY** | **GENERAL EMERGENCY**

4.2.U.3 Fuel Clad Degradation.

OPERATING MODE: 1, 2, 3*

4.2.U.3-1 Dose Equivalent 1-131 greater than the Technical Specifications allowable limit. (*Mode 3 with **TAV >500° F)**

4.2.U.4 Reactor Coolant System (NCS) Leakage.

OPERATING MODE: 1, 2, 3, 4

4.2.U.4-1 Unidentified leakage ≥ 10 gpm.

4.2.U.4-2 Pressure boundary leakage ≥ 10 gpm.

4.2.U.4-3 Identified leakage ≥ **25** gpm

4.2.U.5 Unplanned Loss of All Onsite or Offsite Communications.

OPERATING MODE: ALL

4.2.U.5-1 Loss of all onsite communications capability (internal phone system, PA system, onsite radio system) affecting the ability to perform routine operations.

4.2.U.5-2 Loss of all offsite communications capability (Selective Signaling, NRC **ETS** lines, offsite radio system, commercial phone system) affecting the ability to communicate with offsite authorities.

END

Enclosure 4.3

Abnormal Rad Levels/Radiological Effluent

UNUSUAL EVENT

4.3.U.1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the SLC Limits for **60** Minutes or Longer.

OPERATING MODE: ALL

4.3.U.1-1 A valid Trip 2 alarm on radiation monitor EMF-49L or EMF-57 for ≥ 60 minutes **or** will likely continue for ≥ 60 minutes which indicates that the release may have exceeded the initiating condition and indicates the need to assess the release with procedure HP/0/B/1009/014.

4.3.U.1-2 A valid indication on radiation. monitor EMF- 36L of ≥ 3.00E+04 cprn for ≥ 60 minutes or will likely continue for ≥ 60 minutes, which indicates that the release may have exceeded the initiating condition and indicates the need to assess the release with procedure SH/0/B/2005/001.

{Continued)

ALERT

4.3.A.1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the SLC limits for **15** Minutes or Longer.

OPERATING MODE: ALL

43.A.1-1 A valid indication on radiation monitor **EMF-** 49L or EMF-57 of ≥ 1.2E+05 cpm for ≥ **15** minutes **or** will likely continue **for** ≥ 15 minutes, which indicates that the release may have exceeded the initiating condition and indicates the need to assess the release with procedure HP/0/B/1009/014.

JContinued)

SITE AREA EMERGENCY

4.3.S.1 Boundary Dose Resulting from an Actual or Imminent Release of Radioactivity Exceeds 100 mRem TEDE or **500** mRem CDE Adult Thyroid for the Actual or Projected Duration of the Release.

OPERATING MODE: ALL

4.3.S.1-1 A valid indication on radiation monitor EMF-36L of ≥ 2.7E+06 cpm sustained for ≥ 15 minutes.

43.S.1-2 Dose assessment team calculations indicate dose consequences greater than 100 mRem TEDE **or** 500 mRem CDE Adult Thyroid at the site boundary.

{Continued)

GENERAL EMERGENCY

4.3.G.1 Boundary Dose Resulting from an Actual or Imminent Release of Radioactivity that Exceeds 1000 mRem TEDE or **5000** mRem CDE Adult Thyroid for the Actual or Projected Duration of the Release.

OPERATING MODE: ALL

4.3.G.1-1 A valid indication on radiation monitor EMF-36H of ≥ 8.3E+03 cpm sustained for ≥ 15 minutes.

4.3.G.1-2 Dose assessment team calculations indicate dose consequences greater than 1000 mRem TEDE or 5000 mRem CDE Adult Thyroid at the site boundary.

{Continued)

Abnormal Rad Levels/Radiological Effluent

UNUSUAL EVENT

4.3.U.l-3 Gaseous effluent being released exceeds *two* times **SLC** 16.11-6 for ≥ 60 minutes as determined by RP procedure.

43.U.1-4 Liquid effluent being released exceeds two times **SLC** 16.11-1 for ≥ 60 minutes as determined by RP procedure.

Note: If the monitor reading is sustained for the time period indicated in the EAL ***AND*** the required assessments (procedure calculations) cannot be Completed within this time period, declaration must be made based on the **valid** radiation monitor reading.

{Continued)

ALERT

4.3.A.1-2 A **valid** indication on radiation monitor EMF- 36L of ≥ 5.4E+05 cpm for ≥ 15 minutes or will likely continue for ≥ 15 minutes, which indicates that the release may have exceeded the initiating condition and indicates the need to assess the release with procedure SH/0/B/2005/001.

43.A.1-3 Gaseous effluent being released exceeds 200 times the level of **SLC** 16.11-6 for **≥ 15** minutes as determined by RP procedure.

4.3.A.1-4 Liquid effluent being released exceeds 200 times the level of **SLC** 16.11-1 for ≥ 15 minutes as determined by RP procedure.

Note: If the monitor reading is sustained for the time period indicated in the EAL AND the required assessments (procedure calculations) cannot be completed within this time period, declaration must be made based on the **valid** radiation monitor reading.

{Continued)

SITE AREA EMERGENCY

4.3.S.1-3 Analysis of field survey results or field survey samples indicates dose consequences greater than 100 mRem TEDE or 500 mRem CDE Adult Thyroid at the **site boundary.**

Note 1: These EMF readings are calculated based on average **annual** meteorology, site boundary dose rate, and design unit vent flow rate. Calculations by the dose assessment team use actual meteorology, release duration, and unit vent flow rate. Therefore, these EMF readings should not be used if dose assessment team calculations are available.

Note 2: If dose assessment team calculations cannot be completed in 15 minutes, then **valid** monitor reading should be used for emergency classification.

END

GENERAL EMERGENCY

4.3.G.1-3 Analysis of field survey results or field survey samples indicates dose consequences greater than 1000 mRem TEDE or 5000 mRem CDE Adult Thyroid at the **site boundary.**

Note 1: These EMF readings are calculated based on average annual meteorology, site boundary dose rate, and design unit vent flow rate. Calculations by the dose assessment team use actual meteorology, release duration, and unit vent flow rate. Therefore, these EMF readings should not be used if dose assessment team calculations are available.

Note 2: If dose assessment team calculations cannot be completed in 15 minutes, then **valid** monitor reading should be used for emergency classification.

END

Abnormal Rad Levels/Radiological Effluent

UNUSUAL EVENT

43.U.2 Unexpected Increase in Plant Radiation or Airborne Concentration.

OPERATING MODE: ALL

4.3.U.2-1 Indication of uncontrolled water level decrease of greater than 6 inches in the reactor refueling cavity with all irradiated fuel assemblies remaining covered by water.

4.3.U.2-2 Uncontrolled water level decrease of greater than 6 inches in the spent fuel pool and fuel transfer canal with all irradiated fuel assemblies remaining covered by water.

43.U.2-3 Unplanned valid area EMF reading increases by a factor of 1000 over normal levels as shown in Enclosure 4.10.

END

ALERT

43.A.2 Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel.

OPERATING MODE: ALL

4.3.A.2-1 *An* unplanned valid trip II alarm on any of the following radiation monitors:

Spent Fuel Building Refueling Bridge
1EMF-15
2EMF-4

Spent Fuel Pool Ventilation
1EMF-42
2EMF-42

Reactor Building Refueling Bridge (applies to Mode 6 and No Mode Only)
1EMF-17
2EMF-2

Containment Noble Gas Monitor (Applies to Mode 6 and No Mode Only)
1EMF-39
2EMF-39

{Continued)

SITE AREA EMERGENCY

GENERAL EMERGENCY

UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
	43.A.2-2 Plant personnel report that water level drop in reactor refueling cavity, spent fuel pool, or fuel transfer canal has or will exceed makeup capacity such that any irradiated fuel will become uncovered.		
	43.A.2-3 **NC** system wide range level <95% after initiation of NC system make-up. **AND** Any irradiated fuel assembly not capable of being lowered into spent fuel pool or reactor vessel.		
	43.A.2-4 Spent Fuel Pool or Fuel Transfer Canal level decrease of >2 feet after initiation of makeup. **AND** Any irradiated fuel assembly not capable of being fully lowered into the spent fuel pool racks or transfer canal fuel transfer system basket.		

(Continued)

Abnormal Rad Levels/Radiological Effluent

UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY

4.3.A.3 Release of Radioactive Material or Increases in Radiation Levels Within the Facility That Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown.

OPERATING MODE: ALL

4.3.A.3-1 **Valid** reading on EMF-12 greater than 15 mR/hr in the Control Room.

4.3.A.3-2 **Valid** indication of radiation levels greater than 15 mR/hr in the Central Alarm Station (CAS) or Secondary Alarm Station (SAS).

4.3.A.3-3 Valid radiation monitor reading exceeds the levels shown in Enclosure 4.10.

END

Loss of Shutdown Functions

UNUSUAL EVENT

END

ALERT

4.4.A.1 Failure **of** Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Trip Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Trip Was Successful.

OPERATING MODE: **1, 2, 3**

4.4.A.1-1 The following conditions exist:

Valid reactor trip signal received or required and automatic reactor trip was not successful.

AND

Manual reactor trip from the control room is successful and reactor power is less than **5%** and decreasing.

(Continued)

SITE AREA EMERGENCY

4.4.S.1 Failure **of** Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Trip Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Trip Was NOT Successful.

OPERATING MODE: **1**

4.4.S.1-1 The following conditions exist:

Valid reactor trip signal received or required and automatic reactor trip was **not** successful.

AND

Manual reactor trip from the control room was not successful in reducing reactor power to less than **5%** and decreasing.

(Continued)

GENERAL EMERGENCY

4.4.G.1 Failure of the Reactor Protection System to Complete an Automatic Trip and Manual Trip was NOT Successful and There is Indication of an Extreme Challenge to the Ability to Cool the Core.

OPERATING MODE: **1**

4.4.G.1-1 The following conditions exist:

Valid reactor trip signal received or required and automatic reactor trip was **not** successful.

AND

Manual reactor trip from the control room was not successful in reducing reactor power to less than **5%** and decreasing.

AND

EITHER of the following conditions exist:

- Core Cooling CSF-RED
- Heat **Sink** CSF-RED.

END

Enclosure 4.4

Loss of Shutdown Functions

UNUSUAL EVENT

ALERT

4.4.A.2 Inability to Maintain Plant in Cold Shutdown.

OPERATING MODE: 5,6

4.4.A.2-1 Total loss of ND and/or RN and/or KC.

One of the following:

- Inability to maintain reactor coolant temperature below 200°F
- Uncontrolled reactor coolant temperature rise to >180°F.

END

SITE AREA EMERGENCY

4.4.S.2 Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown.

OPERATING MODE: 1, 2, 3, 4

4.4.S.2-1 Subcriticality CSF-RED.

4.4.S.2-2 Heat Sink CSF-RED.

4.4.S.3 Loss of Water Level in the Reactor Vessel That Has or Will Uncover Fuel in the Reactor Vessel.

OPERATING MODE: 5,6

4.4.S.3-1 Failure of heat sink causes loss of cold shutdown conditions.

AND

Lower range Reactor Vessel Level Indication System (RVLIS) decreasing after initiation of NC system makeup.

4.4.S.3-2 Failure of heat sink causes loss of cold shutdown conditions.

AND

Reactor Coolant (NC) system mid or wide range level less than 11% and decreasing after initiation of NC system makeup.

(Continued)

GENERAL EMERGENCY

UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
		4.4.S.3-3 Failure of heat sink causes loss of cold shutdown conditions. **AND** Either train ultrasonic level indication less than 7.25% and decreasing after initiation of NC system makeup. **END**	

Enclosure 4.5

Loss of Power

UNUSUAL EVENT

4.5.U.1 Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes.

OPERATING MODE: 1, 2, 3, 4

4.5.U.1-1 The following conditions exist:

Loss of offsite power to essential buses ETA and ETB for greater than 15 minutes.

AND

Both emergency diesel generators are supplying power to their respective essential busses.

OPERATING MODE: 5, 6, No Mode

[Continued)

ALERT

4.5.A.1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses During Cold Shutdown Or Refueling Mode.

OPERATING MODE: 5, 6, No Mode

4.5.A.1-1 Loss of all offsite and onsite AC power as indicated by:

Loss of power on essential buses ETA and ETB.

AND

Failure to restore power to at least one essential bus within 15 minutes.

{Continued)

SITE AREA EMERGENCY

4.5.S.1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses.

OPERATING MODE: 1, 2, 3, 4

4.5.S.1-1 Loss of all offsite and onsite AC power as indicated by:

Loss of power on essential buses ETA and ETB.

AND

Failure to restore power to at least one essential bus within 15 minutes.

4.5.S.2 Loss of All Vital DC Power.

OPERATING MODE: 1, 2, 3, 4

(Continued)

GENERAL EMERGENCY

4.5.G.1 Prolonged Loss of All (Offsite and Onsite) AC Power.

OPERATING MODE: 1, 2, 3, 4

4.5.G.1-1 Prolonged loss of all offsite and onsite AC power as indicated by:

Loss of power on essential buses ETA and ETB for greater than 15 minutes.

AND

Standby Shutdown Facility (SSF) fails to supply NC pump seal injection OR CA supply to Steam Generators.

AND

At least one of the following conditions exist:

- Restoration of at least one essential bus within 4 hours is NOT likely

{Continued)

Enclosure 4.5

Loss of Power

UNUSUAL EVENT

4.5.U.1-2 The following conditions exist:
Loss of offsite power to essential buses ETA and ETB for greater than 15 minutes.

AND

One emergency diesel generator is supplying power to its respective essential bus.

4.5.U.2 Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for Greater than 15 Minutes.

OPERATING MODE: 5,6

4.5.U.2-1 The following conditions exist:

Unplanned loss of both unit related busses: EBA and EBD both <112 VDC, and EBB and EBC both <109 VDC.

AND

Failure to restore power to at least one required DC bus within 15 minutes from the time of loss.

END

ALERT

4.5.A.2 AC power to essential busses reduced to a single power source for greater than 15 minutes such that an additional single failure could result in station blackout.

OPERATING MODE: 1, 2, 3, 4

4.5.A.2-1 The following condition exists:

AC power capability has been degraded to one essential bus powered from a single power source for > 15 min. due to the loss of all but one Of

SATA SATB
ATC ATD
D/G A D/G B.

END

SITE AREA EMERGENCY

4.5.S.2-1 The following conditions exist:

Unplanned loss of both unit related busses: EBA and EBD both <112 VDC, and EBB and EBC both <109 VDC.

AND

Failure to restore power to at least one required DC bus within 15 minutes from the time of loss.

END

GENERAL EMERGENCY

- Indication of continuing degradation of core cooling based on Fission Product Barrier monitoring.

END

Enclosure 4.6

Fire/Explosion and Security Events

UNUSUAL EVENT

4.6.U.1 Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection **OR** Explosion Within the Protected Area Boundary.

OPERATING MODE: ALL

4.6.U.1-1 Fire in any of the following areas not extinguished within **15** minutes of control room notification or verification of a control room fire alarm.

- Reactor Building
- Auxiliary Building
- Diesel Generator Rooms
- Control Room
- RN Pumphouse
- SSF
- CAS
- SAS
- Doghouses
- **FWST**
- Turbine Building
- Service Building
- Interim Radwaste Building
- Equipment Staging Building.
- Monitor Tank Building

{Continued)

ALERT

4.6.A.1 Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown.

OPERATING MODE: 1, 2, 3, 4, 5, 6

4.6.A.1-1 The following conditions exist: (Non-security events)
Fire or explosion in any of the following areas:

- Reactor Building
- Auxiliary Building
- Diesel Generator Rooms
- Control Room
- RN Pumphouse
- SSF
- CAS
- SAS
- FWST
- Doghouses (Applies in Mode 1, 2, 3, 4 only).

AND

One of the following:

- Affected safety system parameter indications show degraded performance

{Continued)

SITE AREA EMERGE

4.6.S.1 Security Event in a Plant Vital Area.

OPERATING MODE: ALL

4.6.S.1-1 Intrusion into any of the following plant areas by a hostile force:

- Reactor Building
- Auxiliary Building
- Diesel Generator Rooms
- Control Room
- RN Pumphouse
- **SSF**
- Doghouses
- CAS
- SAS.

4.6.S.1-2 Security confirmed bomb discovered/exploded in a vital area.

4.6.S.1-3 Security confirmed sabotage in a plant vital area.

END

GENERAL EMERGENCY

4.6.G.1 Security Event Resulting in Loss Of Ability to Reach and Maintain Cold Shutdown.

OPERATING MODE: ALL

4.6.G.1-1 Loss of physical control of the control room due to security event.

4.6.6.1-2 Loss of physical control of the SSF and ASP due to security event.

END

Enclosure 4.6

Fire/Explosion and Security Events

UNUSUAL EVENT

4.6.U.1-2 Report by plant personnel of an unanticipated explosion within protected area boundary resulting in visible damage to permanent structure or equipment.

4.6.U.2 Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant.

OPERATING MODE: All

4.6.U.2-1 Security confirmed bomb device discovered within plant Protected Area and outside Vital Areas.

4.6.U.2-2 Hostage situation/extortion

4.6.U.2-3 A violent civil disturbance within the owner controlled area.

4.6.U.24 A credible terrorist threat as determined by security.

END

ALERT

- Plant personnel report visible damage to permanent structures or equipment within the specified area required to establish or maintain safe shutdown within the specifications.

Note: Only one train of a system needs to be affected or damaged in order to satisfy this condition.

4.6.A.2 Fire or Explosion Affecting the Operability of Plant Safely Systems Required to Establish or Maintain Safe Shutdown.

OPERATING MODE: No Mode

4.6.A.2-1 The following conditions exist: won-security events)
Fire or explosion in any of the following areas:
- Spent Fuel Pool
- Auxiliary Building.
- RNPumphouse

AND

One of the following:
- Spent Fuel Pool level and/or temperature show degraded performance

(Continued)

SITE AREA EMERGENCY

GENERAL EMERGENCY

UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY

- Plant personnel report **visible damage** to permanent structures or equipment supporting spent fuel pool cooling.

4.6.A.3 Security Event in a Plant Protected Area.

OPERATING MODE: ALL

4.6.A.3-1 Intrusion into **plant Protected Area by** a hostile force.

END

Enclosure 4.7

Natural Disasters, Hazards, And Other Conditions Affecting Plant Safety

UNUSUAL EVENT

4.7.U.1 Natural and Destructive Phenomena Affecting the Protected Area.

OPERATING MODE: ALL

4.7.U.1-1 Tremor felt and valid alarm on the "strong motion accelerograph".

4.7.U.1-2 Tremor felt and valid alarm on the "Peak shock annunciator".

4.7.U.1-3 Report by plant personnel of tornado striking within protected area boundary.

4.7.U.1-4 Vehicle crash into plant structures or systems within protected area boundary.

4.7.U.1-5 Report of turbine failure resulting in casing penetration or damage to turbine or generator seals.

{Continued)

ALERT

4.7.A.1 Natural and Destructive Phenomena Affecting the Plant Vital Area.

OPERATING MODE: ALL

4.7.A.1-1 Valid "OBE Exceeded" Alarm on 1AD-4,B/8

4.7.A.1-2 Tornado or high winds:

Tornado striking plant structures within the vital area:

- Reactor Building
- Auxiliary Building
- FWST
- Diesel Generator Rooms
- Control Room
- RN Pumphouse
- SSF
- Doghouses
- CAS
- SAS.

OR

sustained winds ≥ 74 mph for > 15 minutes.

{Continued)

SITE AREA EMERGENCY

4.7.S.1 Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established.

OPERATING MODE: ALL

4.7.S.1-1 The following conditions exist:

Control Room evacuation has been initiated per AP/1(2)/A/5500/017

AND

Control of the plant cannot be established from the ASP or the SSF within 15 minutes.

4.7.S.2 Other Conditions Existing Which in the Judgement of the Emergency Coordinator/EOF Director Warrant Declaration of Site Area Emergency.

OPERATING MODE: ALL

4.7.S.2-1 Other conditions exist which in the Judgement of the Emergency CoordinatorEOF Director indicate actual or likely major failures of plant functions needed for protection of the public.

END

GENERAL EMERGENCY

4.7.G.1 Other Conditions Existing Which in the Judgement of the Emergency Coordinator/EOF Director Warrant Declaration of General Emergency.

OPERATING MODE: ALL

4.7.6.1-1 Other conditions exist which in the Judgement of the Emergency CoordinatorEOF Director indicate:

(1) actual or imminent substantial core degradation with potential for loss of containment

OR

(2) potential for uncontrolled radionuclide releases. These releases can reasonably be expected to exceed Environmental Protection Agency Protective Action Guideline levels outside the site boundary.

END

Natural Disasters, Hazards, And Other Conditions Affecting Plant Safety

UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY

4.7.U.2 Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant.

OPERATING MODE: ALL

4.7.U.2-1 Report or detection of toxic or flammable gases that **could enter** within the site area boundary in **amounts** that can affect safe operation of the plant.

4.7.U.2-2 Report by Local, County or State Officials for potential evacuation of site personnel based on offsite event.

4.7.U.3 Other Conditions Existing Which in the Judgement of the Emergency Coordinator/EOF Director Warrant Declaration of an Unusual Event.

OPERATING MODE: ALL

4.7.U.3-1 Other conditions exist which in the judgement of the Emergency Coordinator/EOF Director indicate a potential degradation of the level of safety of the plant.

END

4.7.A.1-3 Turbine failure generated missiles, vehicle crashes or other catastrophic events causing visible structural damage on any of the following plant structures:

- Reactor Building
- Auxiliary Building
- **FWST**
- Diesel Generator Rooms
- ControlRoom
- RNPumphouse
- SSF
- Doghouses
- CAS
- SAS

[Continued)

4.7.A.2 Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown.

OPERATING MODE: ALL

4.7.A.2-1 Report **or** detection of **toxic gases** within a Facility Structure in concentrations that will be life threatening to plant personnel.

4.7.A.2-2 Report or detection of flammable **gases** within a Facility **Structure** in concentrations that will affect the safe operation of the plant.

Structures for the above EALs:

- Reactor Building
- Auxiliary Building
- Diesel Generator Rooms
- Control Room
- RN Pumphouse
- **SSF**
- **CAS**
- **SAS**

(Continued)

UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY

4.7.A.3 Control Room Evacuation Has Been Initiated.

OPERATING MODE: ALL

4.7.A.3-1 Control Room evacuation has been initiated per AP/1(2)/A/5500/017.

4.7.A.4 Other Conditions Existing Which in the Judgement of the Emergency Coordinator/EOF Director Warrant Declaration of an Alert.

OPERATING MODE: ALL

4.7.A.4-1 Other conditions exist which in the Judgement of the Emergency Coordinator/EOF Director indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted.

END

ALERT- Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the EPA protective action guideline exposure levels.

ALL (As relates to Operating Mode Applicability) – Modes 1,2,3,4,5,6 and No Mode (Defueled)

BOMB- A fused explosive device.

CARF – Containment Air Return Fan.

CIVIL DISTURBANCE - A group of ten (10) or more people violently protesting station operations or activities at the site. A civil disturbance is considered to be violent when force has been used in an attempt to injure site personnel or damage plant property.

CREDIBLE THREAT - A threat should be considered credible when:

- Physical evidence supporting the threat exists.
- Information independent (law enforcement) from the actual threat message exists that supports the threat.
- A specific group or organization claims responsibility for the threat.

EPA PAG – Environmental Protection Agency Protective Action Guidelines for exposure to a release of radioactive material.

EXPLOSION - A rapid, violent unconfined combustion, or a catastrophic failure of pressurized equipment (e.g., a steamline or feedwater line break) that imparts energy sufficient to potentially damage or creates shrapnel to actually damage permanent structures, systems or components. **An** electrical breaker flash that creates shrapnel and results in damage to other components beyond scorching should also be considered.

EXTORTION - *An* attempt to cause **an** action at the site by threat of force.

FIRE - Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fires. Observation of flames is preferred but is NOT required if large quantities **of** smoke and heat are observed. **An** electrical breaker flash that creates high temperatures for a short duration and merely localized scorching to that breaker and its compartment should be considered a fire.

FUNCTIONAL – A component is fully capable of meeting its design function. It would be declared INOPERABLE if unable to meet Technical Specifications.

GENERAL EMERGENCY- Events are in process or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA protective action guideline exposure levels outside the Site Boundary.

HOSTAGE - A person or object held as leverage against the site to ensure demands will be met by the site.

HOSTILE FORCE - One of more individuals present in a protected area without authorization that may have or have threatened to use force in an attempt to injure site personnel or damage plant property.

IMMINENT - Expected to occur within 1-3 hours.

INOPERABLE – A component does not meet Technical Specifications. The component may be functional, capable of meeting its design.

INABILITY TO DIRECTLY MONITOR - Operational Aid Computer data points are unavailable or gauges/panel indications are not readily available to the operator.

INTRUSION/INTRUDER - Suspected hostile individual present in a protected area without authorization.

LOSS - A component is INOPERABLE and not FUNCTIONAL.

PROLONGED - a duration beyond normal limits, defined as "greater than 15 minutes" or as determined by the judgement of the emergency Coordinator.

PROTECTED AREA - Encompasses all owner controlled areas within the security perimeter fence.

RUPTURED (As relates to Steam Generator) - Existence of primary to secondary leakage of a magnitude sufficient to require or cause a reactor trip and safety injection.

SABOTAGE - Deliberate damage, misalignment, or misoperation of plant equipment with the intent to render the equipment unavailable.

SIGNIFICANT TRANSIENT- An unplanned event involving one or more of the following: (1) Automatic turbine runback >25% thermal reactor power, (2) Electrical load rejection >25% full electrical load; (3) Reactor Trip, (4) Safety Injection, (5) Thermal power oscillations >10%.

SITE AREA EMERGENCY - Events are in process or have occurred which involve actual or likely major failures of plant functions needed for the protection of the public. Any releases are NOT expected to result in exposure levels which exceed EPA protective action guideline exposure levels outside the Site Boundary.

SITE BOUNDARY - That area, including the protected area, in which Duke Power Company has the authority to control all activities, including exclusion or removal of personnel and property.

SLC - Selected Licensee Commitments.

SECURITY EVENT - A security related emergency situation for which prompt response by the Security Force, immediate action by plant personnel, and/or assistance from offsite agencies may be required to apprehend intruders and mitigate the effects of or prevent radiological sabotage.

SUSTAINED - A duration of time long enough to confirm that the **CSF** is valid (not momentary).

TERMINATION - Exiting the emergency condition.

TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE) - The sum of external dose exposure to radioactive plume, to radionuclides deposited on the ground by the plume, and the internal exposure inhaled radionuclides deposited in the body.

TOXIC GAS - A gas that is dangerous to life or health by reason of inhalation or skin contact (e.g. chlorine).

UNCONTROLLED - Event is not the result of planned actions by the plant staff.

UNPLANNED - An event or action is UNPLANNED if it is not the expected result of normal operations, testing, or maintenance. Events that result in corrective or mitigative actions being taken in accordance with abnormal or emergency procedures are UNPLANNED.

UNUSUAL EVENT- Events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

VALID - An indication or report or condition is considered to be VALID when it is conclusively verified by: (1) an instrument channel check, or **(2)** indications on related or redundant instrumentation, or **(3)** by direct observation by plant personnel such that doubt related to the instrument's operability, the condition's existence or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

VIOLENT - Force has been used in an attempt to injure site personnel or damage plant property.

VISIBLE DAMAGE - Damage to equipment or structure that is readily observable without measurements, testing, or analyses. Damage is sufficient to cause concern regarding the continued operability or reliability of affected structure, system, or component. Example damage: deformation due to heat or impact, denting, penetration, rupture, cracking, paint blistering.

VITAL AREA - Areas within the PROTECTED AREA that house equipment important for nuclear safety. Access to a VITAL AREA is allowed only if an individual has been authorized to be in that area.

THE FOLLOWING GUIDANCE IS TO BE USED BY THE EMERGENCY COORDINATOR IN ASSESSING EMERGENCY CONDITIONS.

- The Emergency Coordinator shall review all applicable initiating events to ensure proper classification.

- The BASIS Document (located in Section D of the Catawba Nuclear Site Emergency Plan) is available for review if any questions arise over proper classification.

- Emergencies are declared for the site. If an event results in multiple emergency action levels on a unit or different emergency action levels on each unit, then the emergency declaration shall be based on the higher classification. Information relating to the unit with the lesser classification will be noted as additional information on the Emergency Notification Form (ENF).

- If an event occurs, and a lower or higher plant operating mode is reached before the classification can be made, the classification shall be based on the mode that existed at the time the event occurred.

- The fission product barrier matrix is applicable only to those events that occur at (Mode 1-4) hot shutdown or higher. ***An*** event that is recognized at cold shutdown or lower (Mode 5 or ***6)*** shall not be classified using the fission product barrier matrix. Reference would be made to the other enclosures that provide emergency action levels for specific events (e.g. severe weather, fire, security).

- If a transient event should occur, the following guidance is provided.

    1. Some emergency action levels specify that a condition exist for a specific duration prior to declaration.

        a. For these EALs, the classification is made when the Emergency Coordinator assessment concludes that the specified duration is exceeded or will be exceeded (i.e. condition cannot be reasonably corrected before the duration elapses), whichever is sooner.

        b. If a plant condition exceeding EAL criteria is corrected before the specified duration time is exceeded, the event is **NOT** classified by that EAL. Lower Severity EALs, if any, shall be reviewed for possible applicability in these cases.

    2. If a plant condition exceeding EAL criteria is not recognized at the time of occurrence, but is identified well after the condition has occurred (e.g. as a result of routine log or record review) and the condition no longer exists, **an** emergency shall **NOT** be declared. Reporting under 10CFR50.72 may be required. Such a condition could occur, for example, if a follow-up evaluation of an abnormal condition uncovers evidence that the condition was more severe than earlier believed.

3. If an emergency classification is warranted, but the plant condition is corrected prior to declaration and notification, the Emergency Coordinator must consider the potential that the initiating condition (e.g. Failure of Reactor Protection System or earthquake) may have caused plant damage that warrants augmenting the on-shift personnel via activation of the Emergency Response Organization. The following action shall be taken:

a. For UNUSUAL EVENTS, the condition shall be declared and notifications made. The event may be terminated in the same notification or in a follow-up notification.

b. For ALERT, SITE AREA EMERGENCY, and GENERAL EMERGENCY, the event shall be declared and the emergency response organization activated.

DETERMINATION OF "EVENT TIME" (TIME THE *15* MINUTE CLOCK STARTS)

1. If plant conditions require implementation of EP/1 or 2/A/5000/E-0 (Reactor Trip or Safety Injection), increased emphasis shall be given to evaluation of plant conditions for determination of EAL(s) when "kickout" of the diagnostic procedure occurs. "Event Time" is the time at which the EAL(s) is determined.

2. If plant conditions do not require implementation of EP/1 or 2/A/5000/E-0 (Reactor Trip or Safety Injection), and conditions of a specific EAL are met, the "Event Time" is the time at which the EAL(s) is determined.

3. The time the event is classified shall be entered on the emergency notification form.

MOMENTARY ENTRY INTO A HIGHER CLASSIFICATION

If, while in **an** emergency classification, the specified EALs of a higher classification are met momentarily, and in the judgment of the Emergency Coordinator are not likely to recur, the entry into the higher classification must be acknowledged. Acknowledgment is performed as follows:

If this condition occurs prior to the initial notification to the emergency response organization and off site agencies, the initial message should note that the site is currently in the lower classification, but had momentarily met the criteria for the higher classification. It should also be noted that plant conditions have improved and stabilized to the point that the criteria for the higher classification are not expected to be repeated.

Enclosure 4.10

Radiation Monitor Readings for Enclosure 4.3

Note: These values are not intended to apply to anticipated temporary increases due to planned events (e.g. incore detector movement, radwaste container movement, depleted resin transfers, etc.)

Detector	Elevation	Column	Identifier	Unusual Event mRad/hr	Alert mRad/hr
1EMF-1	522'	FF, 57	Auxiliary Building Corridor	500	5000
1EMF-3	543'	GG, 55	Unit 1 Charging Pump Area	100	5000
1EMF-4	543'	GG, 59	Unit 2 Charging Pump Area	100	5000
1EMF-7	560'	NN, 55	Unit 1 Auxiliary Building Corridor	1500	5000
1EMF-8	560'	NN, 59	Unit 2 Auxiliary Building Corridor	500	5000
1EMF-9	577'	LL, 55	Unit 1 Aux. Building Filter Hatch	100	5000
1EMF-10	577'	LL, 58	Unit 2 Aux. Building Filter Hatch	100	5000
1EMF-22	594'	KK, 53	Containment Purge Filter Area	100	5000
2EMF-9	594'	KK, 61	Containment Purge Filter Area	100	5000

Duke Power Company Catawba Nuclear Station **Alert** **Reference Use**	Procedure No. **RP/0/A/5000/003** Revision No. **039** Electronic Reference No. CN005GNM

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

Alert

1. Symptoms

1.1 Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant.

2. Immediate Actions

.NOTE: 1. Lines in left margin are for place keeping. Immediate actions may be performed simultaneously.

2. Security events may require the suspension of access to and movement about the site. Staffing and activation of the on-site emergency response facilities could complicate or interfere with security operations resulting in unwarranted casualties.

____ IF a security event exists, discuss the feasibility of conducting a site assembly and activating the TSC/OSC with the Security Shift Supervisor at 5765 or 5766.

____ **IF** site assembly and activation of the TSC/OSC are not feasible, refer to the following procedure enclosures for guidance and N/A the steps in this procedure under Immediate Actions concerning site assembly and ERO activation:

____ RP/0/B/5000/026, "Site Response to Security Events," Enclosure 4.3 - Step 5 that evaluates taking protective action

____ RP/0/B/5000/026, "Site Response to Security Events," Enclosure 4.4 - Activation of ERO during an Imminent Security Event

____ IF the security event involves an insider threat, implement 2-person rule for access to all vital areas.

____ Consider delaying other actions in this procedure that could endanger site personnel until the security threat is terminated.

____ IF TSC, *OSC* and EOF have **NOT** been previously activated, notify the ERO to staff emergency response facilities by performing the following steps (A and **B):**

____ **A.** Notify site personnel to activate the **TSC** and OSC by making the following announcement **twice** over public address system:

"This is the Operations Shift Manager. An Alert has been declared. Unit(s) ___ is (are) affected. Activate the TSC, OSC, and EOF."

____ B. Activate Emergency Response Organization by completing Enclosure 4.1 of this procedure.

____ Notify off-site agencies within 15 minutes of Emergency declaration time using an Emergency Notification Form. Refer to one of the following notification procedures for instructions:

- RP/0/A/5000/006A, "Notifications to States and Counties from the Control Room"
- RP/0/A/5000/006B, "Notifications to States and Counties from the Technical Support Center"
- SR/0/B/2000/004, "Notifications to States and Counties from the Emergency Operations Facility"

_____ IF there is an indication of a radioactive release **AND** the TSC is not activated, contact RP shift to perform off-site dose assessment per HP/0/B/1009/026.

_____ IF a radioactive release or hazardous material spill is occurring or has occurred **AND** the TSC is not activated, contact Environmental Management (EM), ext. 3333 for assistance in reporting to state, local or federal authorities. After hours, contact the Environmental Duty person by phone or pager. **IF** no answer, page 8-777-3333 which will page all Environmental Management personnel.

_____ Conduct a Site Assembly using RP/0/A/5000/010, "Conducting a Site Assembly or Preparing the Site for an Evacuation."

_____ Notify the NRC using RP/0/B/5000/013, '"RC Notification Requirements." This notification should be made as quickly as possible but shall be made within one hour of the emergency declaration time.

_____ Initiate Emergency Response Data System (ERDS) transmission by performing the following:

_____ Type **"ERDS"** or select **"Main,"** then **"General,"** then **"ERDS"** on a Control Room OAC workstation connected to the affected unit's OAC

_____ Initiate ERDS transmission by depressing **F1** or clicking **"Activate."**

_____ IF ERDS transmission will not connect to the NRC, inform the NRC using ENS. The TSC Data Coordinator will troubleshoot and initiate ERDS transmission upon arrival in the TSC.

3. Subsequent Actions

NOTE: Subsequent Actions are not required to be followed in any particular sequence.

_____ IF a security event has occurred, perform the following to account for site personnel:

_____ A. **WHEN** Security notifies the OSM that the security threat has been terminated, make the following announcement **twice** over the public address system:

"This is the Operations Shift Manager. The security event has been terminated. The security event has been terminated."

_____ B. Conduct a site assembly per RP/0/A/5000/10, "Conducting a Site Assembly or Preparing the Site for an Evacuation."

_____ Ensure RP has dispatched technicians for on-site monitoring/surveys per HP/0/B/1009/009, "Guidelines for Accident and Emergency Response."

_____ Make Follow-up Notifications using applicable "Notifications to States and Counties" procedure.

_____ RP/0/A/5000/018, "Emergency Worker Dose Extension," shall be used to authorize emergency worker doses expected to exceed normal occupational exposure limits during a declared emergency event or exceed blanket dose extension limits authorized by the Radiation Protection Manager.

_____ Augment shift resources to assess **and** respond to the emergency situation as needed.

_____ Announce over the plant public address system the current emergency classification level and *summary* of plant status.

_____ Assess emergency conditions and the corresponding emergency classification. See RP/0/A/5000/001, "Classification of Emergency," then:

Remain in an Alert

OR

Escalate to a more severe emergency classification

OR

Reduce to a less severe emergency classification

(Refer to Enclosure **4.3)**

OR

Terminate the emergency (Refer to RP/0/A/5000/020 or SR/0/B/2000/003 for Termination Criteria).

- Announce any emergency classification level changes over the plant public address system, including a *summary* of plant status.

NOTE: Turnover of command and control to the TSC or EOF relieves the OSM/Emergency Coordinator of classification, notification and Protective Action Recommendation (PAR) responsibilities allowing a focused effort on plant response.

_____ Turnover the responsibility of command and control for the emergency as follows:

_____ Provide turnover to the TSC Emergency Coordinator per Enclosure 4.2.

_____ IF the emergency situation prevents activation of the TSC within 75 minutes of declaration, contact the EOF Director and perform a turnover. Refer to EOF Director Turnover Form in RP/0/A/5000/020, "Technical Support Center (TSC) Activation," Enclosure 4.1.

_____ IF neither facility can take turnover, maintain command and control until one of the facilities is capable of accepting turnover.

_____ In the event that a worker's behavior or actions contributed to an actual or potential substantial degradation of the level of safety of the plant (incidents resulting in an Alert or higher emergency declaration), the supervisor must consider and establish whether or not a for cause drug/alcohol screen is required. The FFD Program Administrator or designee is available to discuss/assist with the incident.

_____ The EOF Director shall close out the emergency with a verbal *summary* to county and state authorities. Document this summary using Enclosure 4.4.

_____ The EOF Director shall assign an individual to provide a written report to county and state authorities within thirty days. This report could be an LER or a written report if an LER is not required.

Person assigned responsibility _____

4. Enclosures

4.1 Emergency Organization Activation

4.2 Emergency Coordinator Turnover Form

4.3 Criteria for Downgrading an Emergency Level

4.4 Alert Close Out Briefing with States and Counties

NOTES: 1. Quiktel key pads for pager activation are located in the Control Room (behind MC14) and in the TSC (in Offsite Agency Communicator's cubicle).

2. Pager activation can be delayed up to 5 minutes depending on pager system status.

1. **IF** the Quiktel key pads used in step 3 are not available or do not function properly, immediately go to step **4.**

2. Assure confirmation pagers are turned on.

3. Activate the ERO pagers at a Quiktel key pad as follows:

_____ 3.1 Press the <EXIT> key to assure key pad is cleared.

_____ 3.2 Type "**ERO**"

_____ 3.3 Press <ENTER>

_____ 3.4 Press "M" (for Message)

_____ **3.5** **IF** activation is for **an actual emergency**, perform the following:

_____ 3.5.1 Type the following message:

"Catawba Emergency. An Alert was declared at _____(time). Activate the TSC, OSC and EOF."

_____ 3.5.2 Press **"ENTER"**

_____ 3.5.3 Monitor the confirmation pagers located at the Quiktel key pad to verify proper ERO pager activation.

_____ 3.5.4 **IF** pager activation is successful, go to step 5.

_____ 3.6 IF activation is for an **ERO drill,** perform the following:

_____ 3.6.1 Type the following message:

"Catawba Drill. An Alert was declared at _____(time). Activate the TSC, OSC and EOF."

_____ 3.6.2 Press **"ENTER"**

_____ 3.6.3 Monitor the confirmation pager located at the Quiktel key pad to verify proper ERO pager activation.

_____ 3.6.4 IF pager activation is successful, go to step 5.

4. For drills or emergencies, activate the ERO pagers using a Touch Tone phone as follows:

_____ 4.1 Dial 8-777-8376.

_____ 4.2 When prompted, enter the numeric password **2580.**

_____ 4.3 When prompted, enter the activation code **6789.**

_____ 4.4 Monitor the pager located at the Quiktel key pad to verify proper ERO pager activation.

_____ 4.5 Go to Step 5.

5. Activate Automatic Dialing Call Back System (Community Alert Network)

NOTE: Back-up telephone number for Community Alert Network is 1-877-786-8478.

_____ 5.1 Dial 1-800-552-4226 (Hotline/Activation Line)

_____ **5.2** **IF** *CAN* is being activated for a **DRILL,** read one **of** the following messages depending on day and time.

IF Monday through Thursday between 0700 through 1730, read the following message:
"This is _____(name)_____ fkom Duke Power, Catawba. The Password is Catawba. Please run Catawba Day List message number **5.** Please call me back to verify system operation at _____ "
(Phone # in Simulator)

IF not Monday through Thursday between 0700 through 1730, read the following message:
"This is _____(name)_____ from Duke Power, Catawba. The Password is Catawba. Please run Catawba Night List message number 5. Please call me back to verify system operation at _____ "
(Phone # in Simulator)

_____ 5.3 **IF** CAN is being activated for an **EMERGENCY,** read one of the following messages depending on day and time.

IF Monday through Thursday between 0700 through 1730, read the following message:
"This is _____(name)_____ **from** Duke Power, Catawba. The Password is Catawba. Please run Catawba Day List message number 6. Please call me back to verify system operation at (803) 831-7332."

IF not Monday through Thursday between 0700 through 1730, read the following message:
"This is _____(name)_____ from Duke Power, Catawba. The Password is Catawba. Please run Catawba Night List message number 6. Please call me back to verify system operation at (803) 831-7332."

Enclosure 4.2

Emergency Coordinator Turnover Form

1. Plant Status:

   Unit 1: _____

   _____

   Unit 2: _____

   _____

2. Emergency Classification: _____

   Time Declared: _____

3. Off-Site Agency Notifications Turnover to TSC Complete? _____ (Y/N)

4. Time Next Notification due: _____

5. Significant Events:

   _____ Radioactive Release
   Y/N

   _____ Injured Personnel
   Y/N

   _____ Other (Specify _____)

6. Protective Actions in Progress:

   _____ Site Assembly (Time Initiated _____)
   Y/N

   _____ Off-Site Protective Actions Recommended
   Y/N (List _____)

   _____ Other (Specify _____)
   Y/N

7. Response Procedure In Progress:

   RP _____ RP _____ RP _____

8. Actions in Progress:

   _____

   _____

Enclosure 4.3
Criteria for Downgrading an Emergency Level

Date

Initial/Time

_____ 1. The probability that plant conditions will continue to improve is evident.

_____ 2. **All** emergency action level notifications have been completed.

_____ **3** Emergency response facility staffing may be reduced.

_____ **4.** The criteria established for the emergency classification has been evaluated. Conditions warrant a lower emergency action level.

_____ **5.** The event related release of radioactive material to the environment is terminated.

_____ 6. The control of any fire, flood, earthquake or similar emergency condition is acceptable.

_____ 7. Any corrective actions specified by the Emergency Coordinator to place the plant in a safe condition have been completed and the plant has been placed in the appropriate operating mode.

_____ 8. The Emergency Coordinator has evaluated the plant status with respect to the Emergency Action Levels **and** recommends downgrading the emergency classification.

_____ 9. Emergency classification level downgraded to _____
_____

Enclosure 4.4

Alert Close Out Briefing with States and Counties

Person Providing Verbal Summary: _____

Brief Event Description: _____

_____

_____

_____

Agency	Person Contacted	Date/Time
South Carolina		
North Carolina		
York County		
Gaston County		
Mecklenburg County		

Comments/Questions from States and Counties: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Duke Power Company
Catawba Nuclear Station

Procedure No.
RP/0/A/5000/006 A

Revision No.
014

Notifications to States and Counties from the Control Room

Multiple Use

CN005GNQ

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

1. Symptoms

1.1 An emergency classification has been declared and an off-site agency notification is required.

2. Immediate Actions

Initial Notifications

NOTE:
1. The first notification for each of the four emergency classifications is the Initial Notification. The transmittal time for an initial notification must be within 15 minutes of the time the emergency classification was declared. Subsequent messages within the same classification are designated as Follow-up Notifications (see Section 3).
2. If any calls are received requesting information about the emergency and information is NOT on the Emergency Notification Form, refer to step 3.4 of Subsequent Actions.
3. Changes in Protective Action Recommendations and Termination notifications must be transmitted verbally.
4. Changes in Protective Action Recommendations must be transmitted within 15 minutes.

Operations Shift Manager/Emergency Coordinator Duties:

2.1 Obtain pre-printed Emergency Notification Form (ENF) for the appropriate EAL. These forms are located in the Control Room Off-site Agency Communicator's desk drawer.

2.2 Complete appropriate lines of the Emergency Notification Form for transmittal as the Initial Notification. Lines 1-14 may be left blank on Initial Notifications. Refer to Enclosure 4.3 for line by line instructions.

2.3 Delegate transmittal of Initial Emergency Notification Form to Control Room Off-site Agency Communicator.

Control Room Off-site Agency Communicator Duties:

2.4 Obtain copy of Authentication Code List (see Enclosure 4.7 for location) and Off-site Agency Communicator Guide (Enclosure 4.2) from Control Copy of Off-site Agency Communicator's Notebook.

2.5 Verbally transmit the Initial Emergency Notification Form to the Off-site Agencies using Enclosure 4.2 as a guide.

NOTE: TSC Communicators will assist with Faxing the notification form if requested.

2.6 After verbal transmission of initial notification, fax a copy of the Emergency Notification Form (front side only) to Energy Quest, TSC, EOF, JIC and Off-site Agencies. Refer to Enclosure **4.9** (Fax Communicator Checklist).

3. Subsequent Actions

Follow Up Notifications

NOTE:

1. Notifications following Initial Notifications within the same emergency classification are designated Follow-up Notifications.

2. Follow-up Notifications are required as follows:

   Every **hour** until the emergency is terminated

   OR

   If there is any significant change to the situation (make notification as soon as possible)

   OR

   As agreed upon with an Emergency Management official from **each** individual agency. Documentation shall be maintained for any agreed upon schedule change and the interval shall not be greater than **4** hours to any agency.

3. OSM/Emergency Coordinator should never approve a Follow-up Notification for a lesser classification after an upgrade to a higher classification is declared. Emphasis should be placed on providing current information and NOT on providing a message to meet a superseded deadline. If a follow-up is due and an upgrade in classification is declared, Off-site Agency Communicators should contact the agencies that the pending follow-up is being superseded by an upgrade in classification and information will be provided within 15 minutes.

4. Termination of the emergency will be transmitted as a Follow-up Notification. Refer to Enclosure **4.4** (Termination) for instructions.

5. Use Enclosure **4.6** (Emergency Status Sheet) as necessary to track Follow-up Notification due times.

6. Changes in Protective Action Recommendations and Termination notifications **must** be transmitted verbally.

7. Changes in Protective Action Recommendations must be transmitted within 15 minutes.

3.1 Complete ENF for Follow-up Notifications. Refer to Enclosure **4.3** for line by line instructions.

3.2 Delegate transmittal of Follow-up Emergency Notification to Control Room Communicator.

3.3 Transmit Follow-up Emergency Notifications to Off-site Agencies by one of the following methods:

NOTE: **1.** Changes in Protective Action Recommendations and Termination notifications **must** be transmitted verbally.

2. Changes in Protective Action Recommendations must be transmitted within 15 minutes.

3.3.1 **Verbally** - Follow verbal transmission by faxing a courtesy copy to the EOF, TSC, EnergyQuest, JIC and Off-site Agencies.

OR

3.3.2 **Fax** the Off-site Agencies, Energy Quest, TSC, EOF, and JIC a copy of the Emergency Notification Form. Call each Off-site Agency to verify receipt and give opportunity for questions. Record Off-site Agency representative name on backside of Emergency Notification Form.

3.4 Other Information

3.4.1 **IF** any off-site call is received in the Control Room requesting information about the emergency which is not contained on the Emergency Notification Form, perform the following:

1. Authenticate (Enclosure **4.8)** the request to ensure the caller is a legitimate Off-site Agency Official.

2. Log the question, caller's name and agency in the Off-site Agency Communicator's Logbook. (Logbook is located at the Off-site Agency Communicator's desk in the Control Room).

3. OSM/Emergency Coordinator will provide information requested and sign the log entry to document approval for transmission. Transmittal time should also be documented in the logbook.

4. Enclosures

4.1 Emergency Notification Form (ENF)

4.2 Emergency Notification to Off-site Agencies, Off-site Communicator Guide

4.3 Initial/Follow-up Notification Message Completion

4.4 Termination Notification Completion/Transmission

4.5 Communications Systems

4.6 Emergency Status Sheet

4.7 Authentication Code List Locations

4.8 Authentication Instructions

4.9 Fax Communicator Checklist

4.10 Additional Reportable Events

Obtain Emergency Notification Form from EP Control Copy (Designer Document)

NOTE:
1. Use Selective Signal phone as primary communication device. Use Bell line as first back-up, radios as second back-up and the Satellite Phone as the third back-up.
2. Selective Signal may be used simultaneously with Bell line (or other back-up) if an agency fails to receive Selective Signal call.
3. Refer to Enclosures 4.5 for further information regarding back-up communication devices.

1. Establish communications with Off-site Agencies using the Selective Signaling phone:

Dial *5 to call all agencies simultaneously. **If** all agencies do not answer, dial the agencies that do not answer individually **as** indicated below.

- **As** each agency answers, say:

SELECTIVE SIGNAL,		BELL LINE
Comm Check	Selective Signal # Agency	Individual phone numbers OR One touch dial button
	513 York County (WPEOC)	8031329-1110
	116 Mecklenburg County (WPEOC)	7041943-6200
	112 Gaston County (WPEOC)	7041866-3300
	518 S.C. (WP/EOC)	8031737-8500
	314 N.C. (WP/EOC)	9191733-3300

For additional phone numbers, refer to the Emergency Response Telephone Directory.

2. Document the time the first agency answers the call as the Transmittal Time on line 3 of Emergency Notification Form.

3. **WHEN** all available agencies are "on the line," say the following:

*"This is the Catawba Nuclear Station Control **Room.** This is a drill/emergency. The following is Emergency Notification Information."*

4. Transmit Notification Message

- Slowly read Emergency Notification Message line by line to the agencies allowing time for them to copy the information.
- To authenticate on line **4: Ask** one **of** the agencies to give YOU a number, then YOU will give the corresuonding word (document on line **4).** Refer to Enclosure **4.8** if authentication instructions are needed.
- Continue reading the Emergency Notification message until completed.

5. Obtain names of each agency representative. Say:

"I need to verify the name of each agency representative. When I call out the agency, please give your name.

- Transfer Name, Date, and Time to backside of ENF.*

* Date and time do not need to be transferred if all parties were on line at the time of message transmission.

6. Say:

*"This concludes message #_____. **You** will be receiving a FAX copy of this message shortly. Are there any questions?"*

NOTE: If question is outside of ENF information, do not answer question.

1. Have the request evaluated by the OSM/Emergency Coordinator.
2. Keep a log of the question, answer, and the time the answer was transmitted.

Enclosure 4.3

Initial/Follow-up Notification Message Completion

Line	Fill out the Emergency Notification Form as **follows:**	Info Source
	Check appropriate blocks: **(Drill/Emergency).(Initial/Follow-up) Initial:** First message in each of the **4** classifications. **Follow-up:** Subsequent messages following the initial message within the same classification. Message #'s are seauentiallv numbered throughout drill/emergency starting with the Control Room.	OPS Shift **Mgr.** or Designee
	Write in site and unit or units affected and the "Reported by" name NOTE: "Reported by" is communicator's name.	OPS Shift Mgr. **or** Designee/
	Assure confirmation phone number. Document the "transmittal time" at the beginning of message transmission. (Note: Transmittal time is: **Initial -** when the first agency answers the call.	Communicator
	Authentication will be completed while transmitting the notification to states and counties (Encl **4.7/4.8).**	Communicator
	Check appropriate emergency classification.	OPS Shift Mgr/ Designee
	Mark box "**A**" and write time and date current classification is declared.	OPS Shift Mgr/ Designee
	NOTE: D not use acronyms or t k i l bt ri ti ! It i i t t bt i t understood terms such as gallons **per minute** ; A. i a concise escription for declaring the current emergency classification. B. Follow r description with any other i that requires off-site agency support Refer t l 4.10 ? additional reportable events. r **Follow up messages, inclu relevant information and changes** that occurred since the last message t j t **restate the EAL or last message).**	OPS Shift Mgr. **or** Designee
	Mark pl plant li i vi - Emergency conditions are **improving** in the direction of a lower classification or termination of the event. **Stable** - The r situation is **under** control. Emergency ore cooling syst equipment, plant, etc., are erating as g **Degrading** - Giv current and projected l t q t , recovery efforts **are not expected to prevent entry** into a **higher emergency** classification or **the need to** upgrade **off-** Protective Action i	OPS Shift Mgr. or Designee
	Write time and date Reactor Shutdown ☐ **A or** Reactor Power ☐ level **as** applicable.	**OPS** Shift **Mg.** or Designee
	Mark appropriate box for emergency release. If A **or B,** go to Item 14. If **C or** D, complete Lines **l 1-14. A** release is any unplanned and quantifiable discharge to the environment of radioactive effluent attributable to a declared emergency event. **Base** determinations on information such as EMF readings, containment pressure and other instrument indications, field monitoring results, and knowledge of the event and its impact on system operation and resultant release pathways. **A** release is considered to be in progress if the following occurs: • Rx. Bldg. EMF monitors **(38, 39 or 40** reading indicates an increase in activity **or** EMF monitors **53A** or **53B** read greater than 1.5 **R/hr)** AND pressure inside the containment building is greater than Tech. **Specs.** OR an actual containment breach is determined. • Increase in activity monitored by unit vent EMF monitors 35, 36, or **37.** • Steam generator tube leak monitored **by EMF 33.**	OPS Shift Mgr. or Designee
	• Items I **1-14** may be left blank on **initial** notifications. • Items **11-14 -** On-Shift Dose Assessment will provide information for follow-up messages.	
	• For Unusual Event, Alert, & Site Area Emergency, mark box "A." • For General Emergency, mark and complete information for boxes **B &** C using RP/0/A/5000/005 (General Emergency).	OPS Shift Mgr. **or** Designee
	Have Operations Shift Manager approve message.	OPS Shift Mgr.

Enclosure 4.4

Termination Notification Completion/Transmission

Fill out the Emergency Notification Form as follows:

NOTE: When sending a termination notification, **a** follow-up message should be **marked** on the Emergency Notification Form.

1. Completion

Item #	Action	Source of Information
1.	Check appropriate blocks NOTE: Message #'s are sequentially numbered throughout the drill/emergency starting with the Control Room. Termination Notification is to be designated as "Follow-up."	Operations Shift Manager or Designee
2.	Write in site and unit or units affected. Note: Reported by is communicator's name Note: Reported by is communicator's name	Operations Shift Manager or Designee
3.	A. Transmittal time is the time the first agency answers the call. Transmittal time is the time the first agency answers the call. B. Assure confirmation phone number that state and counties may call back on is listed. Assure confirmation phone number that state and counties may call back on is listed. Assure confirmation phone number that state and counties may call back on is listed.	
4.	Authentication will be completed while transmitting the notification to states and counties.	
5.	Check appropriate classification that is being terminated from.	Operations Shift Manager or Designee
6.	Mark box "B" and write time and date of termination.	Operations Shift Manager or Designee
7	Enter Event/Drill has been terminated as of _____.	
16.	Have Emergency Coordinator approve message.	Operations Shift Mgr./ Emergency Coordinator

2. Transmission

NOTE:	All termination notifications are verbal. Avoid using abbreviation or jargon likely to be unfamiliar to states and counties. If any information is not available or not applicable, write out "Not available" or "Not Applicable" in the margin or other space as appropriate. Do not abbreviate "N.A." because this is ambiguous.

1. Ensure all Counties and States are on the line. Document this time in item # 3.

2. Tell them you have a termination notification and to get out the notification form.

3. Read the message aloud to the State and Counties allowing time for them to copy the information.

4. When you reach item # **4,** ask the State or a County to provide a number from the authentication code word list. Then give them the code word corresponding with that number. Write the number and code word on the form.

5. After communicating the entire message, ask if there are any questions. Ask for individual's names and write the names on the back of the form.

6. After verbally transmitting the message, FAX (front page only) of the notification form to the appropriate agencies per Enclosure **4.9.**

The following **is** the suggested priority for the communications systems used to notify the state and counties.

1. **Selective Signaling System**

2. **Commercial Telephone** (Conference Call – bottom of this page)

   ***a. SC and NC Emergency Radio** (States) (Located in the TSC only – If this radio is needed, send a person to the TSC to make this communication)

   ***b. Duke Power Low Band Radio Network** (Gaston & Mecklenburg Counties only)

4. ***Satellite Telephone**

   * Refer to the Emergency Response Telephone Directory for operating instructions

SELECTIVE SIGNALING

NOTES: 1. Selective Signaling is an open line that is capable of connecting all agencies together at the same time. No special conferencing process is required to get all agencies on the line. The line is always active (i.e., no dial tone). *5 may be used initially to contact county and warning points/EOCs.

2. The handset has a "push to talk" button which must be pressed in order for the parties on the other end to hear you. To use the headset instead of the handset, set the switch on the headset controller to "headset" and remove the handset from the phone cradle. Then resume normal operation. There is no "push to talk" feature associated with the headset, **however, the handset must be removed from the cradle when the headset is in use.**

1. Pick up receiver (no dial tone will be heard). Dial * 5 and wait for agencies to answer. Verify that all agencies have answered. Note: If all agencies do not answer the group call, dial the agencies individually per step 2).

2. Alternately, the agencies may be contacted individually by dialing the three digit Selective Signal number for each agency. When they pick up, identify yourself and tell them to hold while you get the other agencies on the line. Dial the second agency's three-digit Selective Signal number. When they pick up, identify yourself **and** tell them to hold while you get the other agencies on the line.

   513 York County (WP/EOC)
   116 Mecklenburg County (WP/EOC)
   112 Gaston County (WPEOC)
   518 SC (WP/EOC)
   314 NC (WPEOC)

3. Continue this process until all applicable agencies are on the line.

COMMERCIAL TELEPHONE (Conference Call)

I. Pick up the receiver, PRESS preprogrammed button or dial agency number; when they pick up, tell them to hold, PRESS **FLASH**

2. PRESS preprogrammed number or dial 2nd agency number; when they pick up, tell them to hold, PRESS CONF. Tell both parties to hold, then PRESS **FLASH.**

3. Repeat Step 2 until you have conferenced all of the appropriate agencies.

Enclosure 4.6

Emergency Status Sheet

Initial Notification Within 15 minutes — Simulator #3 167 — EOF # (704)382-0724

TSC # 3438 or (803)831-7410

					WP-117
	513	112	116	518	EOC-314
Communication Check	York	Gaston	Meck	SC	NC

UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
Time Declared	Time Declared:	Time Declared:	Time Declared:
Message Due Out:	Message Due Out:	Message Due Out:	Message Due Out:
Messages	Messages	Messages	Messages
Time	Time	Time	Time
Msg #_Out_____	Msg #_Out_____	Msg #_Out_____	Msg #_Out_____
Next Msg Due _____	Next Msg Due _____	Next Msg Due _____	Next Msg Due _____
Msg #_Out_____	Msg #_Out_____	Msg #_Out_____	Msg #_Out_____
Next Msg Due _____	Next Msg Due _____	Next Msg Due _____	Next Msg Due _____
Msg #_Out_____	Msg #_Out_____	Msg #_Out_____	Msg #_Out_____
Next Msg Due _____	Next Msg Due _____	Next Msg Due _____	Next Msg Due _____
Follow-up Msg (1 hr)	Follow-up Msg (1 hr)	Follow-up Msg (1 hr)	Follow-up Msg (1 hr)

The Authentication Code List is a controlled listing of numbers and corresponding words provided by the state(s). This listing is used by the site and the off-site agencies to "authenticate" communications between the various parties. This listing is utilized primarily in notifications to the off-site agencies during events and drills. This listing provides assurance to the communication "***receiver***" that information from the "***transmitter***" is valid and authentic. Communication authentication may be performed anytime the ***receiver*** of information wishes to assure the information is authentic. This is accomplished by having the ***receiver*** provide a number from the code word list and then having the ***transmitter*** provide the corresponding word to that specified number from the list.

The Authentication Code List (EP Group Manual Guideline 5.1.7) is located in:

1. Off-site Communicator Notebook inside the front cover of the notebook
2. Off-site Communicator Notebook under the "Authentication Code List" tab
3. Communicator desk bottom right drawer in the "Authentication Code List" file folder

Authentication instructions are located in Enclosure **4.8** of this procedure.

PLACING A CALL

When providing Emergency Notification Form information to the Off-site Agencies, the Communicator should:

1. Ask a State or County Representative to provide a number from the Authentication Code list.
2. Then give them the code word corresponding with the number from the Authentication Code List.
3. Write the number and code word on the Emergency Notification Form (Line **4).**

RECEIVING A CALL

When receiving a call from off site and the identity of the party calling is not known, you should:

1. Provide a number from the Authentication Code List to the caller.
2. The caller will then provide the word corresponding with the number of the Authentication Code List.
3. Document in Communicator's Logbook.
4. Rule of Thumb: Caller - gives word

   Callee - gives number

1. Faxing Process

1.1 This enclosure provides instruction for faxing the ENF to the primary WP/EOCs. Refer to the following sections of this enclosure for the desired method:

Section 2 - AT&T Enhanced Fax - Preprogrammed Button Method
Section 3 - AT&T Enhanced Fax - Dialing Method
Section 4 - Individually (Via Fax Machine)

2. AT&T Enhanced Fax - Preprogrammed Button Method

NOTE: 1. This process will **fax** to the following locations simultaneously:

York County	North Carolina	Technical Support Center (TSC)
Gaston County	South Carolina	Emergency Operations Facility (EOF)
Mecklenburg County	EnergyQuest	Joint Information Center (JIC)
		Control Room

2. If a problem is experienced using the AT&T Enhanced Fax Service, send the fax to the agencies individually utilizing one of the other faxing methods.

3. Process may be completed without waiting for the prompts.

____ 2.1 Place the Notification Form face down in the Fax machine.

____ 2.2 Using the AT&T Enhanced Fax Phone located by the Fax machine, take the phone off the hook by using the speakerphone option (SP-Phone button) or handset.

2.3 Perform the following:

____ 2.3.1 Press the preprogrammed button labeled ***AT&T Enhanced Fax***.

____ 2.3.2 Wait to hear: *"Welcome **to AT&T Enhanced** Fax*," then,

____ 2.3.3 Press the preprogrammed button labeled ***Subscriber ID,*** then

____ 2.3.4 Press the preprogrammed button labeled ***Password*** (You will hear *"Logging in, please wait")*

____ 2.3.5 Wait to hear: *"Login **Successful,"*** then

____ 2.3.6 Press **1,** then

____ 2.3.7 Press *** 5** (Recipient List), then

____ 2.3.8 Press # (Own Private List), then

____ 2.3.9 Press **1** # (List Name), then

____ 2.3.10 Press * # (No other lists to add)

_____ 2.3.11 Press **START** on the Fax machine.

2.3.12 Wait (form will be processed **through** Fax machine).

_____ 2.3.13 When indicated by Fax machine LED and alarm, hang up the phone. (The Fax Service will then fax the Notification Form to the designated facilities, which includes the Control Room).

_____ 2.4 Ensure the primary off-site agencies have received the Fax.

3. AT&T Enhanced Fax - Dialing Method

NOTE: 1. This process will fax to the following locations simultaneously:

York County	North Carolina	Technical **Support** Center (TSC)
Gaston County	South Carolina	Emergency Operations Facility (EOF)
Mecklenburg County	EnergyQuest	Joint Information Center (JIC)
		Control Room

2. If a problem is experienced using the AT&T Enhanced Fax Service, send the fax to the agencies individually utilizing one **of** the other faxing methods.

3. Process may be completed without waiting for the prompts.

_____ 3.1 Place the Notification Form face down in the Fax machine.

_____ 3.2 Using the AT&T Enhanced Fax Phone located by the Fax machine, take the phone off the hook by using the speakerphone option (SP-Phone button) or handset.

3.3 Perform the following:

_____ 3.3.1 Dial **1-800-232-9674,** then

_____ 3.3.2 Wait to hear: ***"Welcome to AT&T Enhanced Fax,"*** then

_____ 3.3.3 Dial **5 3 0 9 1 2 8** # (Subscriber ID), then

_____ 3.3.4 Dial **4** 8 6 6 6 3 5 2 # (Password) (You will hear ***"Logging in, please wait"***)

_____ 3.3.5 Wait to hear: ***"Login Successful,"*** then

_____ 3.3.6 Press **1,** then

_____ 3.3.7 Press * **5** (Recipient List), then

_____ 3.3.8 Press # (Own Private List), then

_____ 3.3.9 Press **1** # (List Name), then

_____ 3.3.10 Press * # (No other lists to add)

_____ 3.3.11 Press **START** on the Fax machine.

_____ 3.3.12 Wait (form will be processed through the Fax machine).

_____ 3.3.13 When indicated by Fax machine LED and alarm, hang up the phone (the Fax Service will then fax the Notification Form to the designated facilities, which includes the Control Room).

_____ 3.4 Ensure the primary off-site agencies have received the fax.

4. Individually (Via Fax Machine)

4.1 To send a fax to multiple locations using the one touch dialing or direct dialing:

_____ 4.1.1 Place the Fax you are transmitting face down into the Fax machine.

4.1.2 Press the preprogrammed one-touch speed dial numbers for the following:

	Press	Energy Quest
	Press	Joint Information Ctr (JIC)
	Press	York Co. WP/EOC
	Press	Gaston Co. WPEOC
	Press	Meck **Warning** Pt.
	Press	S.C. WPEOC
	Press	N.C. WP/EOC
	Press	TSC
	Press	EOF

_____ 4.1.3 Press **Start.**

4.2 To send a Fax to a **single** location using one-touch dialing or direct dialing:

_____ 4.2.1 Insert the document face down

	Press	Energy Quest	or dial	**8-831-3415**
	Press	Joint Information Ctr (JIC)	or dial	**8-382-0069**
	Press	York Co. WPEOC	or dial	**1-803-324-7420**
	Press	**Gaston** Co. **WP/EOC**	or dial	**1-704-866-7623**
	Press	Meck **Warning** Pt.	or dial	**1-704-943-6189**
	Press	S.C. WPEOC	or dial	**1-803-737-8575**

	Press	N.C. WP/EOC	or dial	1-919-733-7554
	Press	EOF	ordial	1-704-382-0722

_____ 4.2.3 Ensure Fax was sent to the designated agency or agencies via the Fax report(s) or phone. Resend as appropriate.

5. AT&T Enhanced Fax Message Retrieval

5.1 IF a Fax is not delivered via the AT&T Enhanced Fax process or if there are problems experienced utilizing the AT&T Enhanced Fax process, the system will generate an ERROR MESSAGE. To retrieve messages from the AT&T Enhanced Fax Service, perform the following:

_____ **5.1.1** Place the Notification form in the Off-site Communicator Fax machine

_____ 5.1.2 **Using** the Fax telephone located next to the Off-site Communicator Fax machine perform the following:

_____ A. Press the preprogrammed button labeled **AT&T Enhanced Fax** (or dial **1-800-232-9674)**

_____ B. Press the preprogrammed button labeled **Subscriber ID** (or dial **5 3** 0 **9** 1 2 **8** #)

_____ C. Press the preprogrammed button labeled **Password** (or dial **4** 8 **6 6 6 3 5** *2 #) (Logging in,* ***Please*** *Wait...***)**

_____ D. When Login is verified Successful, **Press 2** (to receive a message)

_____ 5.1.3 Press Start on the Fax machine.

_____ **5.1.4** When prompted, hang up phone.

During a declared emergency, the following are events that should be reported to Off-site Agencies in addition to the Emergency to the Emergency Action Level **(EAL)** requirements. These events may be the basis for the current emergency classification or an additional event to be reported under Step 7 of the Emergency Notification Form. These events may need off-site agency action or resolution.

- Fires
- Flooding
- Explosions
- Major/Key Equipment Out of Service
- Loss of Off-site Power

  Core Uncoverings
- Core Damage
- Injuries
- Deaths
- Contaminated Individuals
- Individuals Transported Off Site
- Site Evacuations
- Saboteurs
- Intruders
- Chemical or Hazardous Material Spills or Releases
- Extraordinary Noise Audible Off Site
- Any event causing/requiring Off-site Agency response
- Any event causing increased media attention
- Other unrelated classifiable events **of** lesser severity
- Emergency response actions underway