Final Submittal

CATAWBA OCTOBER 2004

EXAM 50-413, 414/2004-301
OCTOBER 4 - 8, 2004 &
OCTOBER 13, 2004 (WRITTEN)

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

Changes to RO-1: Perform a shutdown margin calculation.

Revised the key to reflect the revisions of Catawba Nuclear Station ROD Book Tables used by candidates: Sections 5.3 and 5.11.

Revised the JPM as follows:
Page 2: updated the Task Standard to the new calculated time of 8/7/2004 1826.
Page 4 JPM step 2: corrected which time the candidate would insert for latest valid Iodine and Xenon Concentrations to 8/6/2004 1824.
Page 5 JPM step 3: inserted the correct boron from Section 5.11 of 1293 ppm.
Page 5 JPM step 7: inserted the calculated boron concentration 1293 ppm.
Page 6 JPM step 8: recalculated to 283 ppm.
Page 6 JPM step 10: inserted the correct differential boron worth from Section 5.3 of 7.62 pcm/ppm.
Page 7 JPM step 11: recalculated to 2156.46 pcm.
Page 7 JPM step 12: recalculated to 2540.03 pcm.
Page 8 JPM step 14: recalculated the new time based on previous information changes to 8/7/2004 1826.

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

NRC –RO-1/Admin

Perform a shutdown margin calculation.

CANDIDATE ________________________________

EXAMINER ________________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Perform a shutdown margin calculation.

Alternate Path: N/A

Facility JPM #: 2003 NRC SRO ADMIN JPM 2S (Modified)

K/A Rating(s): Generic KA 2.1.25 (2.8/3.1)

Task Standard:

Candidate determines the unit has sufficient SDM until 8/7/2004 at 1826 ± 3 minutes.

Preferred Evaluation Location: Simulator _X_ In-Plant _____

Preferred Evaluation Method: Perform _X_ Simulate _____

References:
OP/0/A/6100/006 (Reactivity Balance Calculation) Revision 66
Unit One Reactor Operating Data Book.

Validation Time: 15 min. **Time Critical:** No

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Candidate: ____________________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ____________________________ ____________________________ / ________
NAME SIGNATURE DATE

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COMMENTS

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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 has shutdown from 100 % power to mode 3 in 4 hours. The unit will next cooldown to 500°F and remain there long enough to complete needed repairs.

Present conditions: Date: 8/6/2004 Time: 2230
Tave = 557 °F
EFPD: 250
Boron Concentration: 1010 PPM
Samarium Difference from Equilibrium = -2.57
Iodine Concentration = 7830 atm/cc
Xenon Concentration = 3290 atm/cc

INITIATING CUE:

You are instructed to perform a manual shutdown margin calculation using OP/0/A/6100/06 (Reactivity Balance Calculation) Enclosure 4.4 (Shutdown Margin (With or Without Xenon Credit)) to determine how long the unit can cooldown and then remain at the 500°F temperature using the present boron concentration.

'EP 1 Review Limits and Precautions and per step 2.1, N/A's step 2.2 STANDARD: Step 2.2 is N/A'd COMMENTS:	___SAT ___UNSAT
STEP 2: 2.3 Determine the following information: STANDARD: Operator determines the following using the initial conditions. Unit: 1 Date/Time: 8/6/2004 / 2230 Present NC System Boron Concentration: **1010** ppm Present NC System T-AVG: **557** °F Desired NC System T-AVG: **500** °F Present Cycle Burnup: **250** EFPD Present Difference from Equilibrium Samarium Worth: **(-) 2.57** pcm Date and time of last valid Iodine and Xenon Concentrations: **Candidate uses date on Xenon predict program printout: 8/6/2004 / 1824** Iodine Concentration: **7830** atm/cc Xenon Concentration: **3290** atm/cc COMMENTS:	___SAT ___UNSAT
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.	

⁻EP 3: 2.4 Select the HIGHEST boron concentration for the T-AVG's between the range of present and desired T-AVG's at current cycle burnup per Section 5.11 of the R.O.D. manual. STANDARD: Determine the HIGHEST boron concentration for the T-AVG's to be **1293 ppm** per section 5.11 of the R.O.D. Manual. COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
STEP 4: 2.5.1 Determine there are no untrippable RCCA's per the initial conditions. STANDARD: Determines the untrippable rod penalty to be **0 pcm.** COMMENTS:	___SAT ___UNSAT
STEP 5: 2.5.2 Enter 0 ppm for Zero power physics testing penalty. STANDARD: Enter **0 ppm** for Zero power physics testing penalty in step 2.5.2. **EXAMNINER CUE: Zero Power Physics Testing has been completed** 'MMENTS:	___SAT ___UNSAT
STEP 6: 2.5.3 Calculate the total additional boron concentration penalty. STANDARD: Determines penalty to be **0 ppm** since there are no inoperable rods and ZPPT is complete. COMMENTS:	___SAT ___UNSAT
STEP 7: 2.6 Calculate total required boron concentration for SDM. STANDARD: Calculates a required boron concentration of **1293 ppm**. COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT

ᵀEP 8: 2.7 Determine the Boron Difference between Required Boron Concentration from SDM and current NC Boron Concentration. STANDARD: Calculation: **1293 PPM - 1010 PPM = 283 PPM** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
NOTE: A negative boron difference in Step 2.7 implies that SDM is maintained for Xenon free conditions. A positive boron difference means that SDM is maintained using a Xenon credit and/or boration.	
STEP 9: 2.7.1 IF Boron Difference (Step 2.7) is negative, N/A Step2.8 2.8 Determine Xenon credit as follows: STANDARD: Determines from Step 2.7 that boron difference is NOT negative and goes to step 2.8. COMMENTS:	___SAT ___UNSAT
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.	
STEP 10: 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. STANDARD: Determines a ARI, Differential Boron Worth at 500 °F of **7.62 PCM/PPM** COMMENTS:	___SAT ___UNSAT

ᵀEP 11: 2.8.2 Calculate the reactivity worth of the boron difference. STANDARD: Calculation is **7.62 PCM/PPM X 283 PPM = 2156.46 PCM.** COMMENTS:	___SAT ___UNSAT
STEP 12: 2.8.3 Calculate the xenon worth that is required to ensure SDM at the present NC System Boron. STANDARD: Determines for step 2.8.3. A. Calculation **(2156.46 PCM – (-)2.57)/ 0.85 = 2159.03 PCM / 0.85 =** **2540.03 PCM** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
STEP 13: 2.8.4 Predict Xenon for approximately two days into the future. STANDARD: Uses printed copy of OAC Xenon predict program. Comments	
CAUTION: SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM.	

STEP 14: 2.8.5 Interpolate the Date/Time from the Xenon predict of step 2.8.4 that equal the xenon worth of step 2.8.3 STANDARD: From the table, interpolation is: **7-AUG-2004 1820 2552.258 PCM** **7-AUG-2004 1830 2531.655 PCM** Based on a required reactivity worth of **2540.03 PCM** Difference between reactivity at 1820 and 1830 = 20.603 Difference between reactivity at 1830 and 2540.03 = 8.375 8.375 / 20.603 = 0.406 or 40.6% to 1830 = 4.06 minutes. 1830 - 4 = 1826 **Date/Time when SDM is lost is 8/7/2004 at 1826** Acceptable variance on the time is **1823 to 1829**	**CRITICAL STEP** ___SAT ___UNSAT
This JPM is complete	

TIME STOP: ________

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

INITIAL CONDITIONS:

Unit 1 has shutdown from 100 % power to mode 3 in 4 hours. The unit will next cooldown to 500°F and remain there long enough to complete needed repairs.

Present conditions: Date: 8/6/2004 Time: 2230
Tave = 557 °F
EFPD: 250
Boron Concentration: 1010 PPM
Samarium Difference from Equilibrium = -2.57
Iodine Concentration = 7830 atm/cc
Xenon Concentration = 3290 atm/cc

INITIATING CUE:

You are instructed to perform a manual shutdown margin calculation using OP/0/A/6100/06 (Reactivity Balance Calculation) Enclosure 4.4 (Shutdown Margin (With or Without Xenon Credit)) to determine how long the unit can cooldown and then remain at the 500°F temperature using the present boron concentration.

Duke Power Company Catawba Nuclear Station **Reactivity Balance Calculation** **Continuous Use**	Procedure No. **OP/ 0/A/6100/006** Revision No. **066** 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 and/or misaligned RCCA's. (TS 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. (TS 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. (TS 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 ≥1000 pcm in Mode 5. (Tech Spec 3.1.1 and Enclosure 4.4)

2.4 SDM shall be ≥1300 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 T-AVG changes in Modes 3, 4 and 5 shall only be performed to a temperature where measured NC System boron concentration is ≥ boron concentration required for SDM.

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 or misaligned 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 - Untrippable / Misaligned RCCA(s) - Modes 1 and 2.

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

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.

CAUTION:	SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM. {PIP C-03-04173}

G. Interpolate the Date/Time from the xenon predict of step 2.2.7.F that equals the xenon worth of step 2.2.7.A

Loss of SDM Date/Time _______/_______

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: ________________________________ Date/Time: _______/_______

Verified By: ________________________________ Date/Time: _______/_______

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.

2.3 Determine the following information:

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 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} __________ ppm

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

2.6 Calculate total required boron concentration for SDM:

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**

NOTE: A negative boron difference in Step 2.7 implies that SDM is maintained for Xenon free conditions. A positive boron difference means that SDM is maintained using a Xenon credit and/or boration. {0-C99-0318}

2.7.1 <u>IF</u> 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	( ) 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.

CAUTION: SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM. {PIP C-03-04173}

2.8.5 Interpolate the Date/Time from the xenon predict of step 2.8.4 that equals the xenon worth of step 2.8.3.

Loss of SDM Date/Time _______/_______

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: _________________________________ Date/Time: _______/_______

RO-1 ADMIN
KEY

Duke Power Company Catawba Nuclear Station	Procedure No. OP/ 0/A/6100/006
Reactivity Balance Calculation	Revision No. **066**
Continuous Use	Electronic Reference No. **CN0092MR**

PERFORMANCE

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(ISSUED) - PDF Format

KEY

RO-1 ADMIN
KEY

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 and/or misaligned RCCA's. (TS 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. (TS 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. (TS 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 ≥1000 pcm in Mode 5. (Tech Spec 3.1.1 and Enclosure 4.4)

2.4 SDM shall be ≥1300 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 T-AVG changes in Modes 3, 4 and 5 shall only be performed to a temperature where measured NC System boron concentration is ≥ boron concentration required for SDM.

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 or misaligned 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 - Untrippable / Misaligned RCCA(s) - Modes 1 and 2.

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

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.

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.

N/A

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.

CAUTION: SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM. {PIP C-03-04173}

G. Interpolate the Date/Time from the xenon predict of step 2.2.7.F that equals the xenon worth of step 2.2.7.A

Loss of SDM Date/Time _______/_______

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: ________________________________ Date/Time: _______/_______

Verified By: ________________________________ Date/Time: _______/_______

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.

2.3 Determine the following information:

Step	Description	Reference	Value
2.3.1	Unit	N/A	1
2.3.2	Date/Time	N/A	8/6/04 2230
2.3.3	Present NC System Boron Conc	N/A	1010 ppm
2.3.4	Present NC System T-AVG	N/A	557 °F
2.3.5	Desired NC System T-AVG	N/A	500 °F
2.3.6	Present cycle burnup	P1457 or Duty Reactor Engineer	250 EFPD
2.3.7	Present Difference from Equilibrium Samarium Worth	P1475 or Duty Reactor Engineer	(-) 2.57 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	8/6/04 / ~~1825~~ 1824 RK
2.3.9	Iodine concentration at time listed in step 2.3.8; 0 if xenon free.	P0124 or Duty Reactor Engineer	7830 atm/cc
2.3.10	Xenon concentration at time listed in step 2.3.8; 0 if xenon free.	P0125 or Duty Reactor Engineer	3290 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 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} 1293 ppm

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	0
B. Boron Penalty per Untrippable rod	N/A	160 ppm
Untrippable RCCA Penalty	**(A) X (B)**	0 ppm

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

2.5.3 Calculate total additional boron concentration penalty:

Description	Reference	Value
A. Untrippable RCCA Penalty	Step 2.5.1	0 ppm
B. Additional Boron Conc Penalty for ZPPT	Step 2.5.2	0 ppm
Total Boron Penalty	**(A) + (B)**	0 ppm

2.6 Calculate total required boron concentration for SDM:

Description	Reference	Value
A. Required SDM Boron	Step 2.4	1293 ppm
B. Total Boron Penalty	Step 2.5.3	0 ppm
Total Required Boron Concentration for SDM (Xenon Free)	**(A) + (B)**	1293 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	1293 ppm
B. Present NC System Boron Concentration	Step 2.3.3	1010 ppm
Boron Difference	**(A) - (B)**	283 **ppm**

NOTE: A negative boron difference in Step 2.7 implies that SDM is maintained for Xenon free conditions. A positive boron difference means that SDM is maintained using a Xenon credit and/or boration. {0-C99-0318}

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. 7.62 pcm/ppm

2.8.2 Calculate the reactivity worth of the boron difference:

Description	Reference	Value
A. Boron Difference	Step 2.7	283 ppm
B. ARI Differential Boron Worth	Step 2.8.1	7.62 pcm/ppm
Reactivity Worth of Boron Difference	**(A) X (B)**	2156.46 **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	2156.46 pcm
B. Difference from Eq Sm Worth	Step 2.3.7	(-) 2.57 pcm
Xenon Worth	**{(A) - (B)} / 0.85**	2540.03 **pcm**

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

N/A

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.

CAUTION: SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM. {PIP C-03-04173}

2.8.5 Interpolate the Date/Time from the xenon predict of step 2.8.4 that equals the xenon worth of step 2.8.3.

Loss of SDM Date/Time 8/7/04 / 1826 ± 3 MIN

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: ______________________ Date/Time: ______/______

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Initial Values used for calculations:

250.0062	: BURNUP (EFPD)
3289.904	: XE-135 Concentration (Atoms/CC)
37001.88	: SM-149 Concentration (Atoms/CC)
16931.09	: PM-149 Concentration (Atoms/CC)
7830.452	: I-135 Concentration (Atoms/CC)

NO : Were Equilibrium Concentrations Selected?

------ Power Profile -------

DD-MMM-YYYY HH:MM	% POWER
06-AUG-2004 18:25	99.6
06-AUG-2004 19:25	75.0
06-AUG-2004 20:25	50.0
06-AUG-2004 21:25	25.0
06-AUG-2004 22:25	0.0
07-AUG-2004 02:25	0.0
07-AUG-2004 06:25	0.0
07-AUG-2004 10:25	0.0
08-AUG-2004 10:25	0.0
09-AUG-2004 10:25	0.0

DATE-TIME	%POWER	XE-135 CONC	I-135 CONC	XE WORTH PCM	XE-WORTH RATE PCM/MIN	SM-149 CONC	PM-149 CONC	SM WORTH PCM
06-AUG-2004 18:25	99.6	3289.9	7830.5	2648.486	0.000	37001.9	16931.1	904.333
6-AUG-2004 19:00	85.2	3311.6	7797.7	2665.983	0.904	37010.8	16922.2	904.551
6-AUG-2004 20:00	60.4	3434.0	7594.0	2764.475	2.214	37068.2	16864.6	905.953
6-AUG-2004 21:00	35.4	3643.0	7217.2	2932.734	3.281	37178.8	16753.7	908.657
6-AUG-2004 22:00	10.4	3928.3	6684.2	3162.441	4.296	37342.2	16590.0	912.650
6-AUG-2004 22:40	0.0	4156.3	6256.1	3345.992	4.527	37478.6	16453.6	915.984
6-AUG-2004 22:50	0.0	4210.7	6149.3	3389.731	4.323	37513.7	16418.5	916.842
6-AUG-2004 23:00	0.0	4262.5	6044.3	3431.465	4.124	37548.7	16383.4	917.698
6-AUG-2004 23:10	0.0	4311.9	5941.1	3471.246	3.930	37583.7	16348.5	918.552
6-AUG-2004 23:20	0.0	4359.0	5839.7	3509.121	3.741	37618.6	16313.6	919.404
6-AUG-2004 23:30	0.0	4403.7	5740.0	3545.140	3.556	37653.4	16278.8	920.255
6-AUG-2004 23:40	0.0	4446.2	5642.1	3579.347	3.376	37688.1	16244.1	921.104
6-AUG-2004 23:50	0.0	4486.5	5545.7	3611.791	3.201	37722.8	16209.4	921.951
7-AUG-2004 00:00	0.0	4524.7	5451.1	3642.514	3.030	37757.3	16174.8	922.796
7-AUG-2004 00:10	0.0	4560.8	5358.0	3671.562	2.863	37791.8	16140.3	923.640
7-AUG-2004 00:20	0.0	4594.8	5266.6	3698.977	2.701	37826.3	16105.9	924.481
7-AUG-2004 00:30	0.0	4626.9	5176.7	3724.801	2.543	37860.6	16071.5	925.321
7-AUG-2004 00:40	0.0	4657.0	5088.3	3749.074	2.389	37894.9	16037.2	926.159
7-AUG-2004 00:50	0.0	4685.3	5001.4	3771.839	2.239	37929.1	16003.0	926.995
7-AUG-2004 01:00	0.0	4711.8	4916.1	3793.134	2.093	37963.3	15968.9	927.830
7-AUG-2004 01:10	0.0	4736.4	4832.1	3812.996	1.951	37997.4	15934.8	928.662
7-AUG-2004 01:20	0.0	4759.4	4749.7	3831.465	1.813	38031.4	15900.8	929.493
7-AUG-2004 01:30	0.0	4780.6	4668.6	3848.578	1.678	38065.3	15866.9	930.322
7-AUG-2004 01:40	0.0	4800.3	4588.9	3864.370	1.547	38099.1	15833.0	931.150
7-AUG-2004 01:50	0.0	4818.3	4510.6	3878.876	1.419	38132.9	15799.2	931.975

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7-AUG-2004 02:00	0.0	4834.7	4433.6	3892.133	1.295	38166.6	15765.5	932.799
7-AUG-2004 02:10	0.0	4849.7	4357.9	3904.172	1.174	38200.3	15731.9	933.621
7-AUG-2004 02:20	0.0	4863.2	4283.5	3915.027	1.056	38233.8	15698.3	934.442
7-AUG-2004 02:30	0.0	4875.2	4210.4	3924.731	0.942	38267.3	15664.8	935.260
7-AUG-2004 02:40	0.0	4885.9	4138.5	3933.316	0.831	38300.7	15631.4	936.077
7-AUG-2004 02:50	0.0	4895.2	4067.9	3940.812	0.723	38334.1	15598.1	936.892
7-AUG-2004 03:00	0.0	4903.2	3998.4	3947.250	0.618	38367.4	15564.8	937.705
7-AUG-2004 03:10	0.0	4909.9	3930.2	3952.659	0.516	38400.6	15531.6	938.517
7-AUG-2004 03:20	0.0	4915.4	3863.1	3957.069	0.416	38433.7	15498.4	939.327
7-AUG-2004 03:30	0.0	4919.7	3797.2	3960.507	0.320	38466.8	15465.4	940.135
7-AUG-2004 03:40	0.0	4922.8	3732.4	3963.002	0.226	38499.8	15432.4	940.941
7-AUG-2004 03:50	0.0	4924.7	3668.6	3964.580	0.135	38532.7	15399.5	941.746
7-AUG-2004 04:00	0.0	4925.6	3606.0	3965.270	0.047	38565.6	15366.6	942.549
7-AUG-2004 04:10	0.0	4925.4	3544.5	3965.094	-0.039	38598.3	15333.8	943.350
7-AUG-2004 04:20	0.0	4924.1	3484.0	3964.081	-0.122	38631.1	15301.1	944.150
7-AUG-2004 04:30	0.0	4921.8	3424.5	3962.254	-0.203	38663.7	15268.5	944.948
7-AUG-2004 04:40	0.0	4918.6	3366.1	3959.637	-0.281	38696.3	15235.9	945.744
7-AUG-2004 04:50	0.0	4914.4	3308.6	3956.255	-0.357	38728.8	15203.4	946.538
7-AUG-2004 05:00	0.0	4909.3	3252.1	3952.130	-0.431	38761.2	15170.9	947.331
7-AUG-2004 05:10	0.0	4903.3	3196.6	3947.285	-0.502	38793.6	15138.6	948.122
7-AUG-2004 05:20	0.0	4896.4	3142.1	3941.742	-0.571	38825.9	15106.3	948.911
7-AUG-2004 05:30	0.0	4888.6	3088.4	3935.524	-0.639	38858.1	15074.0	949.699
7-AUG-2004 05:40	0.0	4880.1	3035.7	3928.650	-0.703	38890.3	15041.9	950.485
7-AUG-2004 05:50	0.0	4870.8	2983.9	3921.143	-0.766	38922.4	15009.8	951.269
7-AUG-2004 06:00	0.0	4860.7	2933.0	3913.021	-0.827	38954.4	14977.8	952.052
7-AUG-2004 06:10	0.0	4849.9	2882.9	3904.304	-0.886	38986.3	14945.8	952.833
7-AUG-2004 06:20	0.0	4838.3	2833.7	3895.013	-0.943	39018.2	14913.9	953.612
7-AUG-2004 06:30	0.0	4826.1	2785.3	3885.166	-0.998	39050.0	14882.1	954.390
7-AUG-2004 06:40	0.0	4813.2	2737.8	3874.780	-1.052	39081.8	14850.4	955.166
7-AUG-2004 06:50	0.0	4799.6	2691.1	3863.875	-1.103	39113.5	14818.7	955.940
7-AUG-2004 07:00	0.0	4785.5	2645.1	3852.468	-1.153	39145.1	14787.1	956.713
7-AUG-2004 07:10	0.0	4770.7	2600.0	3840.575	-1.201	39176.6	14755.5	957.484
7-AUG-2004 07:20	0.0	4755.3	2555.6	3828.214	-1.248	39208.1	14724.0	958.254
7-AUG-2004 07:30	0.0	4739.4	2512.0	3815.402	-1.292	39239.5	14692.6	959.021
7-AUG-2004 07:40	0.0	4723.0	2469.1	3802.152	-1.336	39270.9	14661.3	959.787
7-AUG-2004 07:50	0.0	4706.0	2427.0	3788.483	-1.377	39302.2	14630.0	960.552
7-AUG-2004 08:00	0.0	4688.5	2385.6	3774.409	-1.417	39333.4	14598.8	961.315
7-AUG-2004 08:10	0.0	4670.5	2344.9	3759.944	-1.456	39364.5	14567.6	962.076
7-AUG-2004 08:20	0.0	4652.1	2304.8	3745.104	-1.493	39395.6	14536.6	962.836
7-AUG-2004 08:30	0.0	4633.2	2265.5	3729.901	-1.529	39426.6	14505.5	963.594
7-AUG-2004 08:40	0.0	4613.9	2226.8	3714.351	-1.564	39457.6	14474.6	964.350
7-AUG-2004 08:50	0.0	4594.2	2188.8	3698.467	-1.597	39488.4	14443.7	965.105
7-AUG-2004 09:00	0.0	4574.0	2151.5	3682.261	-1.628	39519.3	14412.9	965.858
7-AUG-2004 09:10	0.0	4553.5	2114.8	3665.748	-1.659	39550.0	14382.1	966.609
7-AUG-2004 09:20	0.0	4532.6	2078.7	3648.938	-1.688	39580.7	14351.5	967.359
7-AUG-2004 09:30	0.0	4511.4	2043.2	3631.846	-1.716	39611.3	14320.8	968.108
7-AUG-2004 09:40	0.0	4489.8	2008.3	3614.482	-1.743	39641.9	14290.3	968.854
7-AUG-2004 09:50	0.0	4468.0	1974.0	3596.858	-1.769	39672.4	14259.8	969.599
7-AUG-2004 10:00	0.0	4445.8	1940.4	3578.986	-1.793	39702.8	14229.4	970.343
7-AUG-2004 10:10	0.0	4423.3	1907.2	3560.876	-1.817	39733.1	14199.0	971.085
7-AUG-2004 10:20	0.0	4400.5	1874.7	3542.541	-1.839	39763.4	14168.7	971.826
7-AUG-2004 10:30	0.0	4377.4	1842.7	3523.988	-1.860	39793.7	14138.5	972.564
7-AUG-2004 10:40	0.0	4354.1	1811.3	3505.230	-1.881	39823.8	14108.3	973.301
7-AUG-2004 10:50	0.0	4330.6	1780.3	3486.277	-1.900	39853.9	14078.2	974.037
7-AUG-2004 11:00	0.0	4306.8	1750.0	3467.138	-1.918	39884.0	14048.2	974.771
7-AUG-2004 11:10	0.0	4282.8	1720.1	3447.822	-1.936	39913.9	14018.2	975.504
7-AUG-2004 11:20	0.0	4258.6	1690.7	3428.339	-1.952	39943.8	13988.3	976.235
7-AUG-2004 11:30	0.0	4234.2	1661.9	3408.698	-1.968	39973.7	13958.5	976.964
7-AUG-2004 11:40	0.0	4209.6	1633.5	3388.908	-1.983	40003.5	13928.7	977.692
7-AUG-2004 11:50	0.0	4184.9	1605.7	3368.977	-1.997	40033.2	13899.0	978.418

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7-AUG-2004 12:00	0.0	4160.0	1578.3	3348.913	-2.010	40062.8	13869.3	979.143
7-AUG-2004 12:10	0.0	4134.9	1551.3	3328.726	-2.022	40092.4	13839.7	979.866
7-AUG-2004 12:20	0.0	4109.7	1524.9	3308.423	-2.033	40122.0	13810.2	980.588
7-AUG-2004 12:30	0.0	4084.3	1498.8	3288.011	-2.044	40151.4	13780.7	981.308
7-AUG-2004 12:40	0.0	4058.8	1473.3	3267.498	-2.054	40180.8	13751.3	982.027
7-AUG-2004 12:50	0.0	4033.2	1448.1	3246.892	-2.063	40210.2	13722.0	982.744
7-AUG-2004 13:00	0.0	4007.5	1423.4	3226.199	-2.071	40239.4	13692.7	983.459
7-AUG-2004 13:10	0.0	3981.7	1399.1	3205.427	-2.079	40268.7	13663.5	984.173
7-AUG-2004 13:20	0.0	3955.8	1375.3	3184.581	-2.086	40297.8	13634.4	984.885
7-AUG-2004 13:30	0.0	3929.9	1351.8	3163.670	-2.093	40326.9	13605.3	985.596
7-AUG-2004 13:40	0.0	3903.8	1328.7	3142.699	-2.099	40355.9	13576.3	986.306
7-AUG-2004 13:50	0.0	3877.7	1306.1	3121.674	-2.104	40384.9	13547.3	987.014
7-AUG-2004 14:00	0.0	3851.5	1283.8	3100.601	-2.108	40413.8	13518.4	987.720
7-AUG-2004 14:10	0.0	3825.3	1261.9	3079.487	-2.112	40442.6	13489.5	988.425
7-AUG-2004 14:20	0.0	3799.0	1240.3	3058.337	-2.116	40471.4	13460.8	989.128
7-AUG-2004 14:30	0.0	3772.7	1219.2	3037.156	-2.119	40500.1	13432.0	989.830
7-AUG-2004 14:40	0.0	3746.4	1198.4	3015.951	-2.121	40528.8	13403.4	990.531
7-AUG-2004 14:50	0.0	3720.0	1177.9	2994.725	-2.123	40557.4	13374.8	991.230
7-AUG-2004 15:00	0.0	3693.6	1157.8	2973.485	-2.124	40585.9	13346.3	991.927
7-AUG-2004 15:10	0.0	3667.2	1138.1	2952.235	-2.125	40614.4	13317.8	992.623
7-AUG-2004 15:20	0.0	3640.8	1118.7	2930.980	-2.126	40642.8	13289.4	993.317
7-AUG-2004 15:30	0.0	3614.4	1099.6	2909.725	-2.125	40671.2	13261.0	994.010
7-AUG-2004 15:40	0.0	3588.0	1080.8	2888.475	-2.125	40699.4	13232.7	994.702
7-AUG-2004 15:50	0.0	3561.6	1062.4	2867.233	-2.124	40727.7	13204.5	995.392
7-AUG-2004 16:00	0.0	3535.3	1044.2	2846.004	-2.123	40755.8	13176.3	996.080
7-AUG-2004 16:10	0.0	3508.9	1026.4	2824.792	-2.121	40784.0	13148.2	996.767
7-AUG-2004 16:20	0.0	3482.6	1008.9	2803.601	-2.119	40812.0	13120.2	997.453
7-AUG-2004 16:30	0.0	3456.3	991.7	2782.435	-2.116	40840.0	13092.2	998.137
7-AUG-2004 16:40	0.0	3430.0	974.8	2761.298	-2.113	40867.9	13064.2	998.820
7-AUG-2004 16:50	0.0	3403.8	958.2	2740.193	-2.110	40895.8	13036.4	999.501
7-AUG-2004 17:00	0.0	3377.7	941.8	2719.125	-2.106	40923.6	13008.6	1000.180
7-AUG-2004 17:10	0.0	3351.5	925.8	2698.095	-2.102	40951.4	12980.8	1000.859
7-AUG-2004 17:20	0.0	3325.5	910.0	2677.109	-2.098	40979.1	12953.1	1001.536
7-AUG-2004 17:30	0.0	3299.4	894.4	2656.167	-2.093	41006.7	12925.5	1002.211
7-AUG-2004 17:40	0.0	3273.5	879.2	2635.276	-2.088	41034.3	12897.9	1002.885
7-AUG-2004 17:50	0.0	3247.6	864.2	2614.436	-2.083	41061.8	12870.4	1003.558
7-AUG-2004 18:00	0.0	3221.8	849.4	2593.651	-2.077	41089.2	12842.9	1004.229
7-AUG-2004 18:10	0.0	3196.0	835.0	2572.925	-2.071	41116.6	12815.5	1004.898
7-AUG-2004 18:20	0.0	3170.4	820.7	2552.258	-2.065	41144.0	12788.2	1005.566
7-AUG-2004 18:30	0.0	3144.8	806.7	2531.655	-2.059	41171.3	12760.9	1006.233
7-AUG-2004 18:40	0.0	3119.3	793.0	2511.117	-2.052	41198.5	12733.7	1006.899
7-AUG-2004 18:50	0.0	3093.8	779.4	2490.647	-2.045	41225.7	12706.5	1007.563
7-AUG-2004 19:00	0.0	3068.5	766.1	2470.248	-2.038	41252.8	12679.4	1008.225
7-AUG-2004 19:10	0.0	3043.3	753.1	2449.921	-2.031	41279.8	12652.4	1008.886
7-AUG-2004 19:20	0.0	3018.1	740.2	2429.669	-2.023	41306.8	12625.4	1009.546
7-AUG-2004 19:30	0.0	2993.0	727.6	2409.495	-2.016	41333.7	12598.4	1010.204
7-AUG-2004 19:40	0.0	2968.1	715.2	2389.399	-2.008	41360.6	12571.5	1010.861
7-AUG-2004 19:50	0.0	2943.2	703.0	2369.385	-1.999	41387.4	12544.7	1011.517
7-AUG-2004 20:00	0.0	2918.5	691.0	2349.453	-1.991	41414.2	12518.0	1012.171
7-AUG-2004 20:10	0.0	2893.8	679.2	2329.606	-1.983	41440.9	12491.3	1012.823
7-AUG-2004 20:20	0.0	2869.3	667.6	2309.845	-1.974	41467.6	12464.6	1013.475
7-AUG-2004 20:30	0.0	2844.8	656.3	2290.173	-1.965	41494.2	12438.0	1014.125
7-AUG-2004 20:40	0.0	2820.5	645.1	2270.590	-1.956	41520.7	12411.5	1014.773
7-AUG-2004 20:50	0.0	2796.3	634.1	2251.099	-1.947	41547.2	12385.0	1015.420
7-AUG-2004 21:00	0.0	2772.2	623.3	2231.700	-1.938	41573.6	12358.6	1016.066
7-AUG-2004 21:10	0.0	2748.2	612.6	2212.395	-1.928	41600.0	12332.2	1016.711
7-AUG-2004 21:20	0.0	2724.3	602.2	2193.186	-1.919	41626.3	12305.9	1017.354
7-AUG-2004 21:30	0.0	2700.6	591.9	2174.074	-1.909	41652.5	12279.7	1017.995
7-AUG-2004 21:40	0.0	2677.0	581.8	2155.060	-1.899	41678.7	12253.5	1018.635
7-AUG-2004 21:50	0.0	2653.5	571.9	2136.145	-1.889	41704.9	12227.3	1019.274

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7-AUG-2004 22:00	0.0	2630.1	562.2	2117.330	-1.879	41730.9	12201.2	1019.912
7-AUG-2004 22:10	0.0	2606.9	552.6	2098.616	-1.869	41757.0	12175.2	1020.548
7-AUG-2004 22:20	0.0	2583.7	543.2	2080.005	-1.859	41783.0	12149.2	1021.183
7-AUG-2004 22:30	0.0	2560.8	533.9	2061.497	-1.848	41808.9	12123.3	1021.817
7-AUG-2004 22:40	0.0	2537.9	524.8	2043.094	-1.838	41834.7	12097.4	1022.449
7-AUG-2004 22:50	0.0	2515.2	515.8	2024.795	-1.827	41860.6	12071.6	1023.079
7-AUG-2004 23:00	0.0	2492.6	507.1	2006.603	-1.817	41886.3	12045.9	1023.709
7-AUG-2004 23:10	0.0	2470.1	498.4	1988.517	-1.806	41912.0	12020.2	1024.337
7-AUG-2004 23:20	0.0	2447.8	489.9	1970.539	-1.795	41937.6	11994.5	1024.964
7-AUG-2004 23:30	0.0	2425.6	481.6	1952.668	-1.784	41963.2	11968.9	1025.589
7-AUG-2004 23:40	0.0	2403.5	473.4	1934.906	-1.773	41988.8	11943.4	1026.213
7-AUG-2004 23:50	0.0	2381.6	465.3	1917.253	-1.763	42014.3	11917.9	1026.836
8-AUG-2004 00:00	0.0	2359.8	457.4	1899.711	-1.751	42039.7	11892.5	1027.457
8-AUG-2004 00:10	0.0	2338.1	449.6	1882.279	-1.740	42065.1	11867.1	1028.077
8-AUG-2004 00:20	0.0	2316.6	441.9	1864.957	-1.729	42090.4	11841.8	1028.696
8-AUG-2004 00:30	0.0	2295.2	434.4	1847.747	-1.718	42115.6	11816.5	1029.314
8-AUG-2004 00:40	0.0	2274.0	427.0	1830.649	-1.707	42140.8	11791.3	1029.930
8-AUG-2004 00:50	0.0	2252.9	419.7	1813.662	-1.696	42166.0	11766.2	1030.545
8-AUG-2004 01:00	0.0	2231.9	412.5	1796.788	-1.685	42191.1	11741.1	1031.158
8-AUG-2004 01:10	0.0	2211.1	405.5	1780.026	-1.673	42216.2	11716.0	1031.771
8-AUG-2004 01:20	0.0	2190.4	398.6	1763.378	-1.662	42241.1	11691.0	1032.381
8-AUG-2004 01:30	0.0	2169.9	391.8	1746.842	-1.651	42266.1	11666.1	1032.991
8-AUG-2004 01:40	0.0	2149.5	385.1	1730.420	-1.639	42291.0	11641.2	1033.599
8-AUG-2004 01:50	0.0	2129.2	378.6	1714.112	-1.628	42315.8	11616.4	1034.206
8-AUG-2004 02:00	0.0	2109.1	372.1	1697.917	-1.617	42340.6	11591.6	1034.812
8-AUG-2004 02:10	0.0	2089.1	365.8	1681.836	-1.605	42365.3	11566.9	1035.416
8-AUG-2004 02:20	0.0	2069.3	359.5	1665.869	-1.594	42390.0	11542.2	1036.019
8-AUG-2004 02:30	0.0	2049.6	353.4	1650.016	-1.582	42414.6	11517.6	1036.621
8-AUG-2004 02:40	0.0	2030.1	347.4	1634.277	-1.571	42439.2	11493.0	1037.222
8-AUG-2004 02:50	0.0	2010.7	341.5	1618.651	-1.560	42463.7	11468.5	1037.821
8-AUG-2004 03:00	0.0	1991.4	335.7	1603.140	-1.548	42488.2	11444.0	1038.419
8-AUG-2004 03:10	0.0	1972.3	330.0	1587.742	-1.537	42512.6	11419.6	1039.016
8-AUG-2004 03:20	0.0	1953.3	324.3	1572.459	-1.526	42537.0	11395.2	1039.611
8-AUG-2004 03:30	0.0	1934.4	318.8	1557.289	-1.514	42561.3	11370.9	1040.205
8-AUG-2004 03:40	0.0	1915.7	313.4	1542.232	-1.503	42585.5	11346.7	1040.798
8-AUG-2004 03:50	0.0	1897.2	308.0	1527.289	-1.491	42609.8	11322.4	1041.390
8-AUG-2004 04:00	0.0	1878.8	302.8	1512.460	-1.480	42633.9	11298.3	1041.981
8-AUG-2004 04:10	0.0	1860.5	297.6	1497.744	-1.469	42658.0	11274.2	1042.570
8-AUG-2004 04:20	0.0	1842.3	292.6	1483.141	-1.457	42682.1	11250.1	1043.158
8-AUG-2004 04:30	0.0	1824.3	287.6	1468.650	-1.446	42706.1	11226.1	1043.744
8-AUG-2004 04:40	0.0	1806.5	282.7	1454.273	-1.435	42730.0	11202.2	1044.330
8-AUG-2004 04:50	0.0	1788.8	277.9	1440.007	-1.424	42753.9	11178.3	1044.914
8-AUG-2004 05:00	0.0	1771.2	273.2	1425.854	-1.413	42777.8	11154.4	1045.497
8-AUG-2004 05:10	0.0	1753.7	268.5	1411.812	-1.401	42801.6	11130.6	1046.078
8-AUG-2004 05:20	0.0	1736.4	263.9	1397.882	-1.390	42825.3	11106.9	1046.659
8-AUG-2004 05:30	0.0	1719.3	259.4	1384.063	-1.379	42849.0	11083.2	1047.238
8-AUG-2004 05:40	0.0	1702.2	255.0	1370.355	-1.368	42872.7	11059.6	1047.816
8-AUG-2004 05:50	0.0	1685.3	250.7	1356.758	-1.357	42896.3	11036.0	1048.392
8-AUG-2004 06:00	0.0	1668.6	246.4	1343.271	-1.346	42919.8	11012.4	1048.968
8-AUG-2004 06:10	0.0	1652.0	242.2	1329.893	-1.335	42943.3	10988.9	1049.542
8-AUG-2004 06:20	0.0	1635.5	238.1	1316.625	-1.324	42966.8	10965.5	1050.115
8-AUG-2004 06:30	0.0	1619.1	234.0	1303.467	-1.313	42990.1	10942.1	1050.687
8-AUG-2004 06:40	0.0	1602.9	230.1	1290.417	-1.302	43013.5	10918.7	1051.257
8-AUG-2004 06:50	0.0	1586.9	226.2	1277.475	-1.291	43036.8	10895.4	1051.827
8-AUG-2004 07:00	0.0	1570.9	222.3	1264.641	-1.281	43060.0	10872.2	1052.395
8-AUG-2004 07:10	0.0	1555.1	218.5	1251.914	-1.270	43083.2	10849.0	1052.962
8-AUG-2004 07:20	0.0	1539.4	214.8	1239.295	-1.259	43106.4	10825.9	1053.527
8-AUG-2004 07:30	0.0	1523.9	211.2	1226.782	-1.249	43129.5	10802.8	1054.092
8-AUG-2004 07:40	0.0	1508.5	207.6	1214.375	-1.238	43152.5	10779.7	1054.655
8-AUG-2004 07:50	0.0	1493.2	204.0	1202.074	-1.228	43175.5	10756.7	1055.217

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8-AUG-2004 08:00	0.0	1478.0	200.6	1189.877	-1.217	43198.5	10733.8	1055.778
8-AUG-2004 08:10	0.0	1463.0	197.1	1177.786	-1.207	43221.4	10710.9	1056.338
8-AUG-2004 08:20	0.0	1448.1	193.8	1165.798	-1.196	43244.2	10688.0	1056.896
8-AUG-2004 08:30	0.0	1433.4	190.5	1153.915	-1.186	43267.0	10665.2	1057.453
8-AUG-2004 08:40	0.0	1418.7	187.3	1142.134	-1.175	43289.8	10642.5	1058.010
8-AUG-2004 08:50	0.0	1404.2	184.1	1130.456	-1.165	43312.5	10619.8	1058.564
8-AUG-2004 09:00	0.0	1389.9	180.9	1118.880	-1.155	43335.1	10597.1	1059.118
8-AUG-2004 09:10	0.0	1375.6	177.9	1107.405	-1.145	43357.7	10574.5	1059.671
8-AUG-2004 09:20	0.0	1361.5	174.9	1096.032	-1.135	43380.3	10551.9	1060.222
8-AUG-2004 09:30	0.0	1347.5	171.9	1084.759	-1.125	43402.8	10529.4	1060.772
8-AUG-2004 09:40	0.0	1333.6	169.0	1073.586	-1.115	43425.3	10507.0	1061.321
8-AUG-2004 09:50	0.0	1319.8	166.1	1062.512	-1.105	43447.7	10484.6	1061.869
8-AUG-2004 10:00	0.0	1306.2	163.3	1051.537	-1.095	43470.1	10462.2	1062.416
8-AUG-2004 10:10	0.0	1292.7	160.5	1040.661	-1.085	43492.4	10439.9	1062.961
8-AUG-2004 10:20	0.0	1279.3	157.8	1029.882	-1.075	43514.6	10417.6	1063.506
8-AUG-2004 10:30	0.0	1266.0	155.1	1019.200	-1.066	43536.9	10395.4	1064.049
8-AUG-2004 10:40	0.0	1252.9	152.4	1008.615	-1.056	43559.0	10373.2	1064.591
8-AUG-2004 10:50	0.0	1239.9	149.9	998.126	-1.047	43581.2	10351.1	1065.132
8-AUG-2004 11:00	0.0	1226.9	147.3	987.732	-1.037	43603.3	10329.0	1065.671
8-AUG-2004 11:10	0.0	1214.2	144.8	977.433	-1.028	43625.3	10306.9	1066.210
8-AUG-2004 11:20	0.0	1201.5	142.4	967.228	-1.018	43647.3	10285.0	1066.747
8-AUG-2004 11:30	0.0	1188.9	139.9	957.117	-1.009	43669.2	10263.0	1067.284
8-AUG-2004 11:40	0.0	1176.5	137.6	947.099	-1.000	43691.1	10241.1	1067.819
8-AUG-2004 11:50	0.0	1164.1	135.2	937.173	-0.990	43713.0	10219.3	1068.353
8-AUG-2004 12:00	0.0	1151.9	132.9	927.339	-0.981	43734.8	10197.5	1068.886
8-AUG-2004 12:10	0.0	1139.8	130.7	917.596	-0.972	43756.5	10175.7	1069.417
8-AUG-2004 12:20	0.0	1127.8	128.5	907.944	-0.963	43778.2	10154.0	1069.948
8-AUG-2004 12:30	0.0	1116.0	126.3	898.382	-0.954	43799.9	10132.3	1070.477
8-AUG-2004 12:40	0.0	1104.2	124.1	888.909	-0.945	43821.5	10110.7	1071.006
8-AUG-2004 12:50	0.0	1092.5	122.0	879.525	-0.936	43843.1	10089.2	1071.533
8-AUG-2004 13:00	0.0	1081.0	120.0	870.230	-0.927	43864.6	10067.6	1072.059
8-AUG-2004 13:10	0.0	1069.5	117.9	861.022	-0.919	43886.1	10046.2	1072.584
8-AUG-2004 13:20	0.0	1058.2	115.9	851.901	-0.910	43907.5	10024.7	1073.108
8-AUG-2004 13:30	0.0	1047.0	114.0	842.866	-0.901	43928.9	10003.3	1073.630
8-AUG-2004 13:40	0.0	1035.9	112.0	833.917	-0.893	43950.2	9982.0	1074.152
8-AUG-2004 13:50	0.0	1024.9	110.1	825.054	-0.884	43971.5	9960.7	1074.672
8-AUG-2004 14:00	0.0	1014.0	108.3	816.275	-0.876	43992.8	9939.5	1075.192
8-AUG-2004 14:10	0.0	1003.2	106.4	807.579	-0.867	44014.0	9918.2	1075.710
8-AUG-2004 14:20	0.0	992.5	104.6	798.968	-0.859	44035.2	9897.1	1076.227
8-AUG-2004 14:30	0.0	981.9	102.9	790.438	-0.851	44056.3	9876.0	1076.743
8-AUG-2004 14:40	0.0	971.4	101.1	781.991	-0.843	44077.3	9854.9	1077.258
8-AUG-2004 14:50	0.0	961.0	99.4	773.626	-0.835	44098.4	9833.9	1077.772
8-AUG-2004 15:00	0.0	950.7	97.7	765.341	-0.826	44119.3	9812.9	1078.285
8-AUG-2004 15:10	0.0	940.5	96.1	757.136	-0.818	44140.3	9792.0	1078.796
8-AUG-2004 15:20	0.0	930.4	94.4	749.012	-0.810	44161.2	9771.1	1079.307
8-AUG-2004 15:30	0.0	920.4	92.8	740.966	-0.803	44182.0	9750.2	1079.816
8-AUG-2004 15:40	0.0	910.5	91.3	732.999	-0.795	44202.8	9729.4	1080.325
8-AUG-2004 15:50	0.0	900.7	89.7	725.109	-0.787	44223.6	9708.7	1080.832
8-AUG-2004 16:00	0.0	891.0	88.2	717.297	-0.779	44244.3	9688.0	1081.338
8-AUG-2004 16:10	0.0	881.4	86.7	709.561	-0.772	44264.9	9667.3	1081.843
8-AUG-2004 16:20	0.0	871.9	85.2	701.902	-0.764	44285.6	9646.7	1082.347
8-AUG-2004 16:30	0.0	862.5	83.8	694.318	-0.757	44306.2	9626.1	1082.850
8-AUG-2004 16:40	0.0	853.1	82.4	686.809	-0.749	44326.7	9605.6	1083.352
8-AUG-2004 16:50	0.0	843.9	81.0	679.374	-0.742	44347.2	9585.1	1083.853
8-AUG-2004 17:00	0.0	834.8	79.6	672.013	-0.734	44367.6	9564.6	1084.353
8-AUG-2004 17:10	0.0	825.7	78.3	664.724	-0.727	44388.0	9544.2	1084.851
8-AUG-2004 17:20	0.0	816.7	76.9	657.508	-0.720	44408.4	9523.9	1085.349
8-AUG-2004 17:30	0.0	807.9	75.6	650.365	-0.713	44428.7	9503.5	1085.846
8-AUG-2004 17:40	0.0	799.1	74.4	643.292	-0.705	44449.0	9483.3	1086.341
8-AUG-2004 17:50	0.0	790.4	73.1	636.290	-0.698	44469.2	9463.0	1086.836

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8-AUG-2004 18:00	0.0	781.8	71.9	629.358	-0.691	44489.4	9442.8	1087.329
8-AUG-2004 18:10	0.0	773.3	70.7	622.496	-0.684	44509.6	9422.7	1087.821
8-AUG-2004 18:20	0.0	764.8	69.5	615.703	-0.678	44529.6	9402.6	1088.313
8-AUG-2004 18:30	0.0	756.5	68.3	608.978	-0.671	44549.7	9382.5	1088.803
8-AUG-2004 18:40	0.0	748.2	67.1	602.321	-0.664	44569.7	9362.5	1089.292
8-AUG-2004 18:50	0.0	740.0	66.0	595.731	-0.657	44589.7	9342.5	1089.780
8-AUG-2004 19:00	0.0	731.9	64.9	589.208	-0.651	44609.6	9322.6	1090.267
8-AUG-2004 19:10	0.0	723.9	63.8	582.751	-0.644	44629.5	9302.7	1090.753
8-AUG-2004 19:20	0.0	715.9	62.7	576.359	-0.638	44649.4	9282.9	1091.239
8-AUG-2004 19:30	0.0	708.1	61.7	570.032	-0.631	44669.2	9263.1	1091.723
8-AUG-2004 19:40	0.0	700.3	60.6	563.770	-0.625	44688.9	9243.3	1092.205
8-AUG-2004 19:50	0.0	692.6	59.6	557.572	-0.618	44708.6	9223.6	1092.687
8-AUG-2004 20:00	0.0	685.0	58.6	551.437	-0.612	44728.3	9203.9	1093.168
8-AUG-2004 20:10	0.0	677.4	57.6	545.365	-0.606	44748.0	9184.3	1093.648
8-AUG-2004 20:20	0.0	670.0	56.6	539.355	-0.599	44767.6	9164.7	1094.127
8-AUG-2004 20:30	0.0	662.6	55.7	533.406	-0.593	44787.1	9145.1	1094.605
8-AUG-2004 20:40	0.0	655.3	54.8	527.519	-0.587	44806.6	9125.6	1095.082
8-AUG-2004 20:50	0.0	648.0	53.8	521.692	-0.581	44826.1	9106.2	1095.558
8-AUG-2004 21:00	0.0	640.9	52.9	515.926	-0.575	44845.5	9086.7	1096.032
8-AUG-2004 21:10	0.0	633.8	52.0	510.219	-0.569	44864.9	9067.4	1096.506
8-AUG-2004 21:20	0.0	626.8	51.2	504.570	-0.563	44884.2	9048.0	1096.979
8-AUG-2004 21:30	0.0	619.8	50.3	498.981	-0.558	44903.5	9028.7	1097.451
8-AUG-2004 21:40	0.0	613.0	49.5	493.449	-0.552	44922.8	9009.4	1097.922
8-AUG-2004 21:50	0.0	606.2	48.6	487.975	-0.546	44942.0	8990.2	1098.391
8-AUG-2004 22:00	0.0	599.4	47.8	482.557	-0.540	44961.2	8971.0	1098.860
8-AUG-2004 22:10	0.0	592.8	47.0	477.196	-0.535	44980.3	8951.9	1099.328
8-AUG-2004 22:20	0.0	586.2	46.2	471.891	-0.529	44999.4	8932.8	1099.794
8-AUG-2004 22:30	0.0	579.7	45.4	466.641	-0.524	45018.5	8913.8	1100.260
8-AUG-2004 22:40	0.0	573.2	44.7	461.446	-0.518	45037.5	8894.7	1100.725
8-AUG-2004 22:50	0.0	566.8	43.9	456.305	-0.513	45056.5	8875.8	1101.189
8-AUG-2004 23:00	0.0	560.5	43.2	451.219	-0.507	45075.4	8856.8	1101.652
8-AUG-2004 23:10	0.0	554.2	42.5	446.185	-0.502	45094.3	8837.9	1102.113
8-AUG-2004 23:20	0.0	548.1	41.8	441.205	-0.497	45113.2	8819.1	1102.574
8-AUG-2004 23:30	0.0	541.9	41.1	436.276	-0.492	45132.0	8800.3	1103.034
8-AUG-2004 23:40	0.0	535.9	40.4	431.400	-0.486	45150.8	8781.5	1103.493
8-AUG-2004 23:50	0.0	529.9	39.7	426.575	-0.481	45169.5	8762.7	1103.951
9-AUG-2004 00:00	0.0	524.0	39.0	421.801	-0.476	45188.2	8744.1	1104.407
9-AUG-2004 00:10	0.0	518.1	38.4	417.077	-0.471	45206.8	8725.4	1104.863
9-AUG-2004 00:20	0.0	512.3	37.7	412.404	-0.466	45225.5	8706.8	1105.318
9-AUG-2004 00:30	0.0	506.5	37.1	407.779	-0.461	45244.0	8688.2	1105.772
9-AUG-2004 00:40	0.0	500.9	36.5	403.204	-0.456	45262.6	8669.7	1106.225
9-AUG-2004 00:50	0.0	495.2	35.9	398.678	-0.451	45281.1	8651.2	1106.677
9-AUG-2004 01:00	0.0	489.7	35.3	394.199	-0.447	45299.5	8632.7	1107.128
9-AUG-2004 01:10	0.0	484.2	34.7	389.768	-0.442	45317.9	8614.3	1107.578
9-AUG-2004 01:20	0.0	478.7	34.1	385.385	-0.437	45336.3	8595.9	1108.028
9-AUG-2004 01:30	0.0	473.3	33.5	381.048	-0.433	45354.7	8577.6	1108.476
9-AUG-2004 01:40	0.0	468.0	33.0	376.757	-0.428	45372.9	8559.3	1108.923
9-AUG-2004 01:50	0.0	462.7	32.4	372.512	-0.423	45391.2	8541.0	1109.369
9-AUG-2004 02:00	0.0	457.5	31.9	368.313	-0.419	45409.4	8522.8	1109.815
9-AUG-2004 02:10	0.0	452.4	31.4	364.159	-0.414	45427.6	8504.6	1110.259
9-AUG-2004 02:20	0.0	447.2	30.8	360.049	-0.410	45445.8	8486.5	1110.703
9-AUG-2004 02:30	0.0	442.2	30.3	355.983	-0.405	45463.9	8468.4	1111.145
9-AUG-2004 02:40	0.0	437.2	29.8	351.961	-0.401	45481.9	8450.3	1111.587
9-AUG-2004 02:50	0.0	432.3	29.3	347.982	-0.397	45500.0	8432.3	1112.027
9-AUG-2004 03:00	0.0	427.4	28.8	344.046	-0.393	45517.9	8414.3	1112.467
9-AUG-2004 03:10	0.0	422.5	28.4	340.152	-0.388	45535.9	8396.3	1112.906
9-AUG-2004 03:20	0.0	417.7	27.9	336.300	-0.384	45553.8	8378.4	1113.343
9-AUG-2004 03:30	0.0	413.0	27.4	332.490	-0.380	45571.7	8360.5	1113.780
9-AUG-2004 03:40	0.0	408.3	27.0	328.721	-0.376	45589.5	8342.7	1114.216
9-AUG-2004 03:50	0.0	403.7	26.5	324.993	-0.372	45607.3	8324.9	1114.651

XENON AND SAMARIUM REACTIVITY WORTH PREDICTION

9-AUG-2004 04:00	0.0	399.1	26.1	321.306	-0.368	45625.1	8307.2	1115.085
9-AUG-2004 04:10	0.0	394.6	25.7	317.658	-0.364	45642.8	8289.4	1115.518
9-AUG-2004 04:20	0.0	390.1	25.2	314.050	-0.360	45660.5	8271.7	1115.950
9-AUG-2004 04:30	0.0	385.7	24.8	310.481	-0.356	45678.1	8254.1	1116.382
9-AUG-2004 04:40	0.0	381.3	24.4	306.950	-0.352	45695.7	8236.5	1116.812
9-AUG-2004 04:50	0.0	377.0	24.0	303.458	-0.348	45713.3	8218.9	1117.241
9-AUG-2004 05:00	0.0	372.7	23.6	300.005	-0.344	45730.8	8201.4	1117.670
9-AUG-2004 05:10	0.0	368.4	23.2	296.588	-0.341	45748.3	8183.9	1118.098
9-AUG-2004 05:20	0.0	364.2	22.8	293.210	-0.337	45765.8	8166.4	1118.524
9-AUG-2004 05:30	0.0	360.1	22.5	289.867	-0.333	45783.2	8149.0	1118.950
9-AUG-2004 05:40	0.0	356.0	22.1	286.562	-0.330	45800.6	8131.6	1119.375
9-AUG-2004 05:50	0.0	351.9	21.7	283.293	-0.326	45817.9	8114.3	1119.799
9-AUG-2004 06:00	0.0	347.9	21.4	280.059	-0.322	45835.3	8097.0	1120.222
9-AUG-2004 06:10	0.0	343.9	21.0	276.861	-0.319	45852.5	8079.7	1120.644
9-AUG-2004 06:20	0.0	340.0	20.7	273.698	-0.315	45869.8	8062.5	1121.066
9-AUG-2004 06:30	0.0	336.1	20.3	270.569	-0.312	45887.0	8045.3	1121.486
9-AUG-2004 06:40	0.0	332.3	20.0	267.475	-0.309	45904.1	8028.1	1121.905
9-AUG-2004 06:50	0.0	328.5	19.7	264.415	-0.305	45921.3	8011.0	1122.324
9-AUG-2004 07:00	0.0	324.7	19.3	261.389	-0.302	45938.4	7993.9	1122.742
9-AUG-2004 07:10	0.0	321.0	19.0	258.396	-0.298	45955.4	7976.8	1123.158
9-AUG-2004 07:20	0.0	317.3	18.7	255.436	-0.295	45972.4	7959.8	1123.574
9-AUG-2004 07:30	0.0	313.7	18.4	252.508	-0.292	45989.4	7942.8	1123.989
9-AUG-2004 07:40	0.0	310.1	18.1	249.613	-0.289	46006.3	7925.9	1124.403
9-AUG-2004 07:50	0.0	306.5	17.8	246.750	-0.286	46023.3	7909.0	1124.817
9-AUG-2004 08:00	0.0	303.0	17.5	243.919	-0.282	46040.1	7892.1	1125.229
9-AUG-2004 08:10	0.0	299.5	17.2	241.119	-0.279	46057.0	7875.3	1125.640
9-AUG-2004 08:20	0.0	296.1	17.0	238.349	-0.276	46073.8	7858.5	1126.051
9-AUG-2004 08:30	0.0	292.7	16.7	235.611	-0.273	46090.5	7841.7	1126.461
9-AUG-2004 08:40	0.0	289.3	16.4	232.903	-0.270	46107.3	7825.0	1126.870
9-AUG-2004 08:50	0.0	286.0	16.1	230.225	-0.267	46123.9	7808.3	1127.278
9-AUG-2004 09:00	0.0	282.7	15.9	227.577	-0.264	46140.6	7791.6	1127.685
9-AUG-2004 09:10	0.0	279.4	15.6	224.958	-0.261	46157.2	7775.0	1128.091
9-AUG-2004 09:20	0.0	276.2	15.4	222.368	-0.258	46173.8	7758.4	1128.496
9-AUG-2004 09:30	0.0	273.0	15.1	219.807	-0.255	46190.4	7741.8	1128.901
9-AUG-2004 09:40	0.0	269.9	14.9	217.275	-0.253	46206.9	7725.3	1129.305
9-AUG-2004 09:50	0.0	266.8	14.6	214.770	-0.250	46223.4	7708.9	1129.708
9-AUG-2004 10:00	0.0	263.7	14.4	212.294	-0.247	46239.8	7692.4	1130.109
9-AUG-2004 10:10	0.0	260.7	14.2	209.846	-0.244	46256.2	7676.0	1130.510
9-AUG-2004 10:20	0.0	257.7	13.9	207.424	-0.241	46272.6	7659.6	1130.910

XENON AND SAMARIUM REACTIVITY WORTH PREDICTION

FXS	=	0.836631E+01 (CM(-1) x 10(-2))	- Macro Fission X-Sect
YX	=	0.518772E-02	- XE-135 Yeilds/Fission
YI	=	0.643346E-01	- I-135 Yields/Fission
YP	=	0.172559E-01	- PM-149 Yields/Fission
AXSX	=	0.128266E+02 CM(-1) x 10(-19)	- XE-135 Micro Absorption X-Sect
AXSS	=	0.390157E+00 CM(-1) x 10(-10)	- SM-149 Micro Absorption X-Sect
XWH	=	0.821145E-12 (PCM/XE cm(3)) x 10(-12)	- XE-135 Reactivity Worth
SWH	=	0.244402E-13 (PCM/SM cm(3)) x 10(-12)	- SM-149 Reactivity Worth
ATE	=	0.304604E+05 x 10(-2)	- Fissions/MW Sec
XSIGMA	=	0.987909E+00	- XE-135 Micro X-Sect Correction
XRHO	=	0.980380E+00	- XE-135 Worth/Atom Correction

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.11
MINIMUM SHUTDOWN MARGIN BORON

Required Boron Concentration for <u>1.3%</u> Shutdown Margin as a Function of Temperature and Burnup

BURNUP (EFPD)	CORE AVERAGE TEMPERATURE (°F) 200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	557
0	1594	1591	1587	1583	1577	1570	1561	1549	1536	1522	1505	1483	1454	1418	1372	1358
20	1608	1606	1604	1601	1596	1590	1582	1572	1560	1547	1530	1509	1482	1448	1406	1392
40	1617	1616	1615	1613	1609	1603	1596	1587	1576	1564	1548	1528	1502	1469	1429	1416
60	1621	1621	1621	1619	1616	1611	1604	1596	1585	1573	1559	1539	1514	1482	1443	1430
80	1620	1621	1621	1620	1617	1612	1606	1598	1587	1576	1562	1543	1518	1487	1448	1435
100	1615	1616	1616	1615	1612	1608	1601	1593	1582	1572	1558	1540	1515	1484	1444	1431
120	1604	1606	1606	1605	1602	1597	1591	1582	1572	1562	1548	1529	1504	1472	1432	1418
140	1589	1590	1590	1589	1586	1581	1574	1566	1555	1545	1531	1512	1487	1453	1411	1397
160	1567	1569	1569	1567	1564	1559	1552	1543	1532	1521	1507	1487	1461	1426	1382	1368
180	1541	1542	1542	1540	1537	1532	1524	1515	1503	1491	1476	1455	1427	1391	1345	1330
200	1509	1510	1510	1508	1504	1499	1491	1481	1469	1456	1440	1417	1388	1350	1301	1286
220	1474	1474	1474	1471	1468	1462	1454	1443	1430	1416	1398	1374	1343	1302	1252	1236
240	1435	1435	1434	1431	1427	1421	1412	1401	1386	1371	1352	1326	1293	1250	1197	1180
260	1393	1392	1390	1387	1383	1376	1366	1354	1339	1323	1302	1274	1239	1194	1139	1121
280	1348	1347	1345	1341	1335	1327	1317	1304	1287	1270	1248	1219	1182	1136	1078	1060
300	1301	1299	1296	1292	1285	1276	1265	1250	1233	1214	1191	1161	1122	1074	1014	995
320	1251	1249	1245	1240	1232	1222	1210	1194	1175	1156	1131	1099	1059	1009	947	927
340	1199	1196	1192	1186	1177	1166	1153	1136	1116	1095	1069	1036	994	942	878	858
360	1145	1141	1136	1130	1120	1108	1094	1076	1054	1033	1006	971	928	872	804	782
380	1088	1085	1079	1072	1062	1049	1034	1015	992	970	942	906	860	801	727	703
400	1031	1027	1021	1012	1002	989	972	953	929	906	877	839	791	729	651	626
420	973	968	961	952	941	927	910	889	865	841	811	771	721	657	578	553
440	914	908	901	892	880	865	847	826	800	775	742	702	651	588	511	486
460	855	848	840	830	818	803	784	762	736	707	673	631	581	521	450	428
480	796	789	780	769	756	740	721	698	671	638	601	559	511	458	399	382
509	711	703	694	682	668	651	630	606	578	538	496	453	412	375	344	337
524	667	659	649	638	623	605	584	559	530	486	440	398	362	337	326	326
539	623	616	606	594	579	561	539	513	483	433	384	342	313	302	316	325

NOTES: **1) Tech Spec Refueling boron concentration is 2700 ppmB (per C1C15 COLR)**

2) Fill and Vent Boron concentration is 1584 ppmB.

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.3
ARI DIFFERENTIAL BORON WORTH

Source: CNEI-0400-26
Prepared By: M.W. Hawes
Revision Number: 418
Date: 12/11/03

(PCM/PPM)

TEMPERATURE

BURNUP (EFPD)	68	100	150	200	250	300	350	400	450	500	510	520	530	540	550	557
0	-9.30	-9.25	-9.12	-8.95	-8.73	-8.50	-8.23	-7.95	-7.59	-7.22	-7.13	-7.04	-6.96	-6.87	-6.78	-6.72
20	-9.28	-9.23	-9.09	-8.92	-8.70	-8.47	-8.19	-7.92	-7.56	-7.20	-7.11	-7.02	-6.93	-6.83	-6.74	-6.68
40	-9.25	-9.20	-9.06	-8.90	-8.67	-8.44	-8.16	-7.89	-7.54	-7.19	-7.09	-6.99	-6.90	-6.80	-6.70	-6.63
60	-9.23	-9.18	-9.04	-8.87	-8.64	-8.40	-8.13	-7.86	-7.52	-7.17	-7.07	-6.97	-6.87	-6.76	-6.66	-6.59
80	-9.22	-9.17	-9.03	-8.86	-8.63	-8.39	-8.12	-7.85	-7.51	-7.16	-7.06	-6.95	-6.85	-6.75	-6.64	-6.57
100	-9.28	-9.23	-9.08	-8.91	-8.68	-8.44	-8.17	-7.90	-7.53	-7.17	-7.07	-6.97	-6.88	-6.78	-6.68	-6.61
120	-9.33	-9.28	-9.14	-8.96	-8.73	-8.49	-8.22	-7.94	-7.56	-7.18	-7.09	-6.99	-6.90	-6.81	-6.71	-6.65
140	-9.38	-9.33	-9.19	-9.01	-8.78	-8.54	-8.26	-7.99	-7.59	-7.19	-7.10	-7.01	-6.92	-6.84	-6.75	-6.69
160	-9.46	-9.40	-9.26	-9.08	-8.83	-8.59	-8.31	-8.04	-7.63	-7.23	-7.14	-7.06	-6.97	-6.89	-6.81	-6.75
180	-9.55	-9.49	-9.35	-9.17	-8.90	-8.64	-8.36	-8.09	-7.70	-7.30	-7.22	-7.13	-7.05	-6.97	-6.88	-6.82
200	-9.64	-9.58	-9.43	-9.25	-8.97	-8.69	-8.42	-8.14	-7.76	-7.38	-7.29	-7.21	-7.12	-7.04	-6.95	-6.90
220	-9.72	-9.67	-9.52	-9.33	-9.04	-8.75	-8.47	-8.19	-7.82	-7.46	-7.37	-7.29	-7.20	-7.11	-7.03	-6.97
240	-9.81	-9.76	-9.61	-9.42	-9.11	-8.80	-8.52	-8.24	-7.89	-7.53	-7.45	-7.36	-7.27	-7.19	-7.10	-7.04
260	-9.91	-9.85	-9.70	-9.51	-9.20	-8.89	-8.60	-8.32	-7.97	-7.62	-7.53	-7.45	-7.36	-7.28	-7.19	-7.13
280	-10.00	-9.94	-9.79	-9.60	-9.30	-9.00	-8.71	-8.43	-8.08	-7.72	-7.64	-7.55	-7.46	-7.37	-7.29	-7.23
300	-10.10	-10.03	-9.88	-9.69	-9.40	-9.11	-8.82	-8.53	-8.18	-7.83	-7.74	-7.65	-7.56	-7.47	-7.39	-7.32
320	-10.20	-10.13	-9.97	-9.78	-9.50	-9.22	-8.93	-8.64	-8.28	-7.93	-7.84	-7.75	-7.66	-7.57	-7.48	-7.42
340	-10.29	-10.22	-10.07	-9.87	-9.60	-9.33	-9.04	-8.75	-8.39	-8.03	-7.94	-7.85	-7.76	-7.67	-7.58	-7.52
360	-10.42	-10.35	-10.19	-10.00	-9.73	-9.46	-9.17	-8.87	-8.51	-8.15	-8.06	-7.97	-7.88	-7.79	-7.70	-7.63
380	-10.57	-10.50	-10.34	-10.14	-9.88	-9.61	-9.31	-9.01	-8.64	-8.28	-8.19	-8.10	-8.00	-7.91	-7.82	-7.76
400	-10.73	-10.66	-10.50	-10.30	-10.02	-9.75	-9.45	-9.15	-8.78	-8.41	-8.32	-8.23	-8.13	-8.04	-7.95	-7.89
420	-10.88	-10.82	-10.65	-10.45	-10.17	-9.89	-9.59	-9.29	-8.92	-8.54	-8.45	-8.36	-8.26	-8.17	-8.08	-8.01
440	-11.03	-10.97	-10.81	-10.59	-10.32	-10.04	-9.73	-9.43	-9.05	-8.67	-8.58	-8.49	-8.39	-8.30	-8.20	-8.14
460	-11.20	-11.14	-10.97	-10.76	-10.48	-10.20	-9.89	-9.58	-9.20	-8.81	-8.71	-8.61	-8.51	-8.41	-8.31	-8.24
480	-11.39	-11.32	-11.15	-10.94	-10.65	-10.37	-10.06	-9.75	-9.35	-8.95	-8.84	-8.73	-8.63	-8.52	-8.41	-8.33
509	-11.65	-11.58	-11.41	-11.20	-10.90	-10.61	-10.30	-9.99	-9.57	-9.15	-9.03	-8.91	-8.79	-8.67	-8.55	-8.46
524	-11.79	-11.72	-11.54	-11.33	-11.04	-10.74	-10.43	-10.11	-9.68	-9.26	-9.13	-9.00	-8.88	-8.75	-8.62	-8.53
539	-11.94	-11.87	-11.69	-11.47	-11.18	-10.88	-10.56	-10.24	-9.79	-9.33	-9.20	-9.07	-8.95	-8.82	-8.69	-8.60

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

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

NRC –RO-2/Admin
Calculate Reactor Coolant System Subcooling during Loss of OAC

CANDIDATE ____________________

EXAMINER ____________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Calculate Reactor Coolant System subcooling during a Loss of OAC

Alternate Path: N/A

Facility JPM #: Modified 2003 NRC JPM 2R/ADMIN

K/A Rating(s): Generic KA: 2.1.23 (3.9/4.0)

Task Standard:

Using the parameter information provided and interpreting data book curves, determines that the required subcooling margins are not met and notifies SRO.

Preferred Evaluation Location: Simulator __X__ In-Plant __X__

Preferred Evaluation Method: Perform __X__ Simulate _____

References:
PT/1/A/4600/009 (Loss of Operator Aid Computer) Revision 70

Validation Time: 7 minutes **Time Critical:** No

===

Candidate: ______________________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ______________________________ ______________________________/__________
NAME SIGNATURE DATE

===

COMMENTS

____

____

____

Tools/Equipment/Procedures Needed:

PT/1A/4600/009 (Loss of Operator Aid Computer)
Data sheets
Unit 1 Data Book Curves

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 in Mode 4 with 1B ND pump and 1B reactor coolant pump in service. You are the Balance of Plant operator responding to a Loss of Operator Aid Computer. Plant parameters are:

Pressurizer Pressure	Ch I: 1700	Ch II: 1700	Ch III: 1700	Ch IV: oos
NC Loop B Pressure	146 psig			
NC Loop C Pressure	157 psig			
ND Pump Discharge Pressure	308 psig			
ND Inlet Temperature	319 °F			
N/R Loop A T-hot	530 °F			
N/R Loop B T-hot	530 °F			
N/R Loop C T-hot	530 °F			
N/R Loop D T-hot	530 °F			
W/R Loop A T-hot	321 °F			
W/R Loop B T-hot	323 °F			
W/R Loop C T-hot	319 °F			
W/R Loop D T-hot	318 °F			
Train A 5 highest average T/Cs	329 °F			
Train B 5 highest average T/Cs	325 °F			

INITIATING CUE:

It has been one hour since the loss of OAC has occurred. The Control Room SRO directs you to perform Enclosure 13.10 (Subcooling Data), evaluate the data obtained from the enclosure, determine if it is acceptable, and then notify the Control Room SRO of the results.

Start Time:________

STEP 1: Enclosure 13.10 INFORMATION: for NC pressure – Record the lowest indicated system pressure. STANDARD: Based on information provided, Loop B NC Pressure (146 psig) is the lowest. COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
STEP 2: Enclosure 13.10 INFORMATION: T-SAT – Using NC pressure, determine the saturation temperature from the Unit One Revised Data Book Figure 57 or Figure 58. STANDARD: Based on NC pressure Loop B of 146 psig, Figure 58 is used and T-SAT equals 345 °F **(acceptable range is 340 – 350 °F)**. COMMENTS:	___SAT ___UNSAT
STEP 3: Enclosure 13.10 INFORMATION: Highest NC Temp – In Modes 3-6: Compare the average of the 5 highest reading operable core exit T/Cs to Loop Thot. OR Use the operating train(s) of ND inlet temperature, Loop Thot and/or the operable core exit T/Cs. STANDARD: For the Train "A" 5 highest average T/Cs compared to Loop Thots and ND Inlet Temperature, the T/Cs value of 329 °F is to be used. COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT

STEP 4: Enclosure 13.10 INFORMATION: °F Subcooled – Calculated by subtracting "HIGHEST NC TEMP" from "T-SAT" STANDARD: °F Subcooled = (T-SAT) 345 °F - (HIGHEST NC TEMP) 329 °F = 16°F Acceptable Calculated Range: °F Subcooled = 350 °F - 329 °F = **21°F (Upper Limit)** °F Subcooled = 340 °F - 329 °F = **11°F (Lower Limit)** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
STEP 5: Per initiating cue, determine whether the calculated value of Subcooling is acceptable, and report results to SRO. STANDARD: Candidate reports that for Mode 4, Subcooling less than 30 °F is unacceptable. **EXAMINER CUE: I understand that Subcooling does not meet the acceptable criteria.** 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 4 with 1B ND pump and 1B reactor coolant pump in service. You are the Balance of Plant operator responding to a Loss of Operator Aid Computer. Plant parameters are:

Pressurizer Pressure	Ch I: 1700	Ch II: 1700	Ch III: 1700	Ch IV: oos
NC Loop B Pressure	146 psig			
NC Loop C Pressure	157 psig			
ND Pump Discharge Pressure	308 psig			
ND Inlet Temperature	319 °F			
N/R Loop A T-hot	530 °F			
N/R Loop B T-hot	530 °F			
N/R Loop C T-hot	530 °F			
N/R Loop D T-hot	530 °F			
W/R Loop A T-hot	321 °F			
W/R Loop B T-hot	323 °F			
W/R Loop C T-hot	319 °F			
W/R Loop D T-hot	318 °F			
Train A 5 highest average T/Cs	329 °F			
Train B 5 highest average T/Cs	325 °F			

INITIATING CUE:

It has been one hour since the loss of OAC has occurred. The Control Room SRO directs you to perform Enclosure 13.10 (Subcooling Data), evaluate the data obtained from the enclosure, determine if it is acceptable, and then notify the Control Room SRO of the results.

RO-2 ADMIN
KEY

Duke Power Company Catawba Nuclear Station	Procedure No. PT/ 1/A/4600/009
Loss of Operator Aid Computer	Revision No. 070
Continuous Use	Electronic Reference No. CN005GA4

PERFORMANCE

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

(ISSUED) - PDF Format

KEY

RO-2 ADMIN
KEY

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 SR 3.1.6.2

2.2.12 SR 3.2.3.1

2.2.13 SR 3.2.4.1

2.2.14 SR3.4.2.1

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

5.1 Pyrometer

5.2 Calibrated Keithley 872 Digital Thermometer, Model "J", or equivalent

6. Limits and Precautions

6.1 If 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

NOTE:	Enclosures 13.4, 13.16, and 13.17 should be performed by an NLO.

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 ______________________

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

NOTE:
1. If pressures (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 (%Δ 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 (%Δ 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, Model 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 ΔT 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 **IF** in Modes 1-4, EVERY 4 HOURS perform a check of the Strong Motion Accelerograph and complete Enclosure 13.22 (Strong Motion Accelerograph).

12.27 **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.

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

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

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

___ 12.28.1 Verify the acceptance criteria specified in Section 11 is met.

OR

___ 12.28.2 **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.

___ 12.29 **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.

___ 12.30 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 (%Δ 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 ΔT Data Sheet

13.20 Overtemperature Delta T Setpoint Channel Check

13.21 Chemistry Data Sheet

13.22 Strong Motion Accelerograph

Enclosure 13.10

Subcooling Data Sheet

CALCULATION SHEET FOR NC SYSTEM DEGREES SUBCOOLED

Date/Time	NC Press	T-SAT	Highest NC Temp	°F Subcooled	Initials
TODAY/NOW	146 PSIG	345°F	329°F	16°	INITIALS
		(340-350)		(11-21)	

ACCEPTANCE CRITERIA:

Subcool limit is 10°F while at power.
30°F while shutdown.

INFORMATION:

NC Pressure - Record lowest indicated system pressure.

T-SAT - Using NC pressure, determine saturation temperature from the Unit One Revised Data Book Figure 57 or Figure 58.

Highest NC Temp - Determine the highest NC Temp:

- In Modes 1 and 2, use Loop T_{HOT}.
- In Modes 3-6:
  - Compare the average of the 5 highest reading operable core exit T/Cs to Loop T_{HOT}.
    OR
  - Use the operating train(s) of ND inlet temperature, Loop T_{HOT} and/or the operable core exit T/Cs.

°F Subcooled - Calculate by subtracting "HIGHEST NC TEMP" from "T-SAT".

CANDIDATE STATES THERE IS INSUFFICIENT SUBCOOLING.

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

NRC-RO-3/ADMIN

Perform emergency plan requirements for a site fire emergency

CANDIDATE ______________________________

EXAMINER ______________________________

**CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE**

Task: Perform emergency plan requirements for a site fire emergency

Alternate Path: NO

Facility JPM #: New

K/A Rating(s): Generic KA: 2.4.43 (2.8/3.5)

Task Standard:

Candidate completes the immediate action steps of RP/0/B/5000/029 enclosure 3.1 to activate the fire brigade response.

Preferred Evaluation Location: Simulator __X__ In-Plant __X___

Preferred Evaluation Method: Perform _____ Simulate __X___

References:

RP/0/B/5000/029 (Fire Brigade Response) Revision 7

Validation Time: 10 min . **Time Critical:** NO

===

Candidate: ____________________________________
NAME

Time Start : ________
Time Finish: ________

Performance Rating: SAT _____ UNSAT ____ Performance Time ______

Examiner: __________________________ __________________________/________
NAME SIGNATURE DATE

===

COMMENTS

____

____

____

Instructions to work the QUIKPAGE without a telephone connection.

1. Unplug the Gray telephone line from the QUIKPAGE.

2. Now the student can use as directed in the procedure.

3. When the message is typed in and the ENTER key is depressed, a few seconds pass then a warning and BEEP occurs. The message says:

   "No Dial Tone: Check Connection!"
   Press any Key to Confirm

4. When warning message is displayed, depress any key. You then receive another message depress "C".

5. The machine will reset itself and the next student can perform the JPM.

6. When the last student is completed. Ensure step 4 has been performed, reinstall the gray phone connection.

Tools/Equipment/Procedures Needed:

Each candidate requires one copy of the following: RP/0/B/5000/029 and appropriate information sheets.

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.

INITIATING CUE:

You are the Unit 2 BOP and have answered a 4911 phone call from a site employee who has reported a fire into the control room (Phone call information is below). The CRSRO has directed you to perform the immediate actions of RP/0/B/5000/029 Fire Brigade Response.

Information Sheet

Phone call information given to the control room on October 6, 2004 at 1127.

This is Dean Smith from Site Facilities reporting a fire located in warehouse number 2 at the south end of the building near the loading dock. The smoke is thick and there are visible flames coming out of the loading doors. This location contains discarded package material being processed for recycling.
Myself and 4 others were in the building when the fire broke out. I observed 3 other members of my work crew leaving by the rear exit, the rest of us are on the south side of the building near the other warehouses. I don't think there are any others inside the building. You can reach me here in Warehouse number 1 extension 5992.

Do Not erase, Use – Hidden text for later use

EXAMINER NOTE: Ensure candidate knows this is a simulation. Both the Control Room and Simulator locations can perform the notification of the Fire Brigade members.
Hand copy of RP/029 and phone call information to candidate with today's date on the information sheet.

STEP 1: From initial conditions, candidate determines that TSC/OSC is not activated and proceeds to Enclosure 3.1.

STANDARD: Candidate selects Enclosure 3.1 from initial conditions:

COMMENTS:

___ SAT

___ UNSAT

CRITICAL STEP

STEP 2: Candiate performs immediate action 1.1 from information on phone message sheet:

- Name/group of person reporting fire: **Dean Smith**
- Location of fire: **Warehouse #2**
- Elevation: **N/A** Column Line: **N/A**
- Are smoke and flames visible? **Yes**
- Equipment/components affected **Contents in warehouse**
- Are there any injured/missing people? **NO** How Many? **N/A?**
- Are there people in the immediate area who need to be relocated to a safer area? **NO**
- Call back number: **5992**
- Time of call: **Today and Now**

STANDARD: The candidate fills in the enclosure 3.1 step 1.1 blanks with the above information.

COMMENTS:

___ SAT

___ UNSAT

CRITICAL STEP

STEP 3: In step 1.2, candidate determines the correct course of action based on data entered in step 1.1.

STANDARD: Based on the 3rd bulleted information concerning level of fire, candidate selects 1.2 first option to dispatch fire brigade per Enclosure 3.5.

COMMENTS:

___ SAT

___ UNSAT

Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.

	CRITICAL STEP
STEP 4: Candidate proceeds to Enclosure 3.5 to perform step 1. ANDARD: Candidate performs the actions at the Quiktel Key Pad as follows: • Type in **"FIRE"** and press **"ENTER"** **EXAMINER CUE: "FIRE" has been typed and "ENTER" depressed** • Type the **"M"** **EXAMINER CUE: "M" has been typed** • Type the following message: **"Fire Brigade Emergency at Warehouse #2. Fire Brigade please respond."** **EXAMINER CUE: "Fire Brigade Emergency at Warehouse #2. Fire Brigade please respond" has been typed** • Press **"Enter".** **EXAMINER CUE: "Enter" has been depressed** • Reads the note about the time delay and monitors the confirmation pager located at the Quiktel Key Pad **AMINER NOTE: When the message is sent, the candidate will read the note after step 1.4 When read, then provide the cue.** **EXAMINER CUE: Confirmation Pager reads the sent fire brigade message.** COMMENTS:	___ SAT ___ UNSAT
STEP 5: Enclosure 3.5 step 1.2 and step 1.3 STANDARD: Step 1.2 is N/A. Step 1.3 is read to determine a need for additional fire brigade response. **EXAMINER CUE: Additional off-shift/off-duty Fire Brigade member response is not needed.** COMMENTS:	___ SAT ___ UNSAT
AMINER NOTE: Candidate returns to Enclosure 3.1 step 1.4	

***Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.**

STEP 6: Step 1.4, announce the following over the PA system: ANDARD: Candidate locates the gray phone located on MC-01 or uses the page through a site telephone and delivers the announcement: "Attention Fire Brigade members. Attention Fire Brigade members. This is the Control Room. A fire has been reported at (Warehouse #2). All Fire Brigade members please respond. All other plant personnel please stay clear of the area until further notice." **EXAMINER CUE: Plant page announced with Warehouse #2 location has been made.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 7: Step 1.5, announce the following over the Fire Brigade radio, channel 1: STANDARD: Candidate locates radio on channel 1 to make the announcement: "Catawba Control Room to all units – clear channel 1 for emergency use." **EXAMINER CUE: Announcement on radio channel 1 for emergency use has been made.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 8: Step 1.6, Notifies Central Alarm Station (CAS at 5364) or Secondary Alarm Station (SAS at 5766) of Fire Brigade Response. STANDARD: Candidate uses a plant phone and contact either CAS or SAS using the assigned phone numbers to give the following information: • Location of response is "warehouse #2" • Initiate a MERT response to the location **EXAMINER CUE: I understand that a fire brigade response has been sent to warehouse #2 and we should initiate a MERT team response to the warehouse #2 location..** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 9: Step 1.7, If offsite fire department is needed, refer to enclosure 3.6 ANDARD: Candidate uses information to make step 1.7 determination. **EXAMINER CUE: The Fire Brigade Captain has responded and states that off-site department assistance is not needed.** COMMENTS:	___ SAT ___ UNSAT
STEP 10: Step 1.8, **WHEN** requested provide information to the responding Fire Brigade personnel. Refer to the Site Fire Plan. STANDARD: Candidate reads step. **EXAMINER CUE: No fire brigade team member has requested any information.** COMMENTS:	___ SAT ___ UNSAT
⁻TEP 11: Step 1.9, Notify RP Shift Technician (5572/pager #778-2777) of Fire Brigade response: • Record RP Shift Technician's name • Report location of response STANDARD: Candidate calls RP Shift Tech at 5572 to notify them of the fire response. Records technicians name and location of response as warehouse #2. **EXAMINER CUE: This is RP Technician "Dana" and I understand the fire response is at "warehouse #2".** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 12: Step 1.0, Notify the CNS Environmental, Health and Safety duty person (3333/pager 777-3333) of the Fire Brigade response. STANDARD: Candidate notifies CNS Environmental, Health and Safety duty person at 3333 of fire response. **EXAMINER CUE: This is Robert and I understand the fire response is at "warehouse #2".** COMMENTS:	___ SAT ___ UNSAT
STEP 13: Step 1.11 Determine required classification and notifications. STANDARD: Candidate reads step .11 **EXAMINER CUE: The Operations Shift Manager and Unit supervisor will perform Step 1.11.** COMMENTS:	___ SAT ___ UNSAT
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)

INITIATING CUE:

You are the Unit 2 BOP and have answered a 4911 phone call from a site employee who has reported a fire into the control room (Phone call information is below). The CRSRO has directed you to perform the immediate actions of RP/0/B/5000/029 Fire Brigade Response.

Information Sheet

Phone call information given to the control room on October 6, 2004 at 1127.

This is Dean Smith from Site Facilities reporting a fire located in warehouse number 2 at the south end of the building near the loading dock. The smoke is thick and there are visible flames coming out of the loading doors. This location contains discarded package material being processed for recycling.
Myself and 4 others were in the building when the fire broke out. I observed 3 other members of my work crew leaving by the rear exit, the rest of us are on the south side of the building near the other warehouses. I don't think there are any others inside the building. You can reach me here in Warehouse number 1 extension 5992.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

RO-3 ADMIN
KEY

Duke Power Company Catawba Nuclear Station **Fire Brigade Response** **Reference Use**	Procedure No. **RP/ 0/B/5000/029**
	Revision No. **007**
	Electronic Reference No. **CP00953N**

PERFORMANCE

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(ISSUED) - PDF Format

RO-3 ADMIN
KEY

Fire Brigade Response

1. Symptoms

1.1 Fire, alarms, explosions, or conditions associated with a fire that have been reported to the Control Room or OSC (when activated).

1.2 This procedure shall provide guidance to shift personnel and Emergency Coordinator for response, actions, and coordination associated with an incident involving real or suspected fires and fire drills.

2. Initial Actions

2.1 Select the appropriate enclosure to document reported information and to respond to the situation in progress:

- Actual Event without TSC/OSC Activation - Enclosure 3.1
- Actual Event after TSC/OSC Activation - Enclosure 3.2
- Shift Fire Drill without TSC/OSC Activation - Enclosure 3.3
- Shift Fire Drill after TSC/OSC Activation - Enclosure 3.4

3. Enclosures

3.1 Fire Brigade Response to an Actual Event without TSC/OSC Activation

3.2 Fire Brigade Response to an Actual Event after TSC/OSC Activation

3.3 Fire Brigade Response to a Shift Fire Drill without TSC/OSC Activation

3.4 Fire Brigade Response to a Shift Fire Drill after TSC/OSC Activation

3.5 Fire Brigade Response Activation

3.6 Off-site Fire Department Notification and Response

3.7 Courtesy Notification to States and Counties for a Non-emergency Plant Event

3.8 Corrective Actions or Commitments

1. Immediate Actions

INITIAL ____ 1.1 Record the following information taken from the caller:

- Name/group of person reporting fire: DEAN SMITH
- Location of fire: WAREHOUSE #2
  Elevation: - Column Line: -
- Are smoke and flames visible? YES
- Equipment/components affected CONTENTS (NO SPECIFIC INFORMATION IS SUPPLIED)
- Are there any injured/missing people? NO How Many? -
- Are there people in the immediate area who need to be relocated to a safer area?
  NO
- Call back number: 5992
- Time of call: (10-6-04) TODAY / 1127

NOTE:	The level of Fire Brigade response should be determined based on the information received. Example: An alarm may only need an operator to respond, investigate and report back to the Control Room.

1.2 Determine initial response based on the information received and one of the following conditions:

STEP APPLIES ____
- **IF** flames or smoke and sensed heat are reported, dispatch the Fire Brigade. Refer to Enclosure 3.5.

SEE PAGE ____
- **IF** a plant alarm or the report indicates overheating, dispatch an operator to determine the need for additional Fire Brigade response.

ENCL 3.5 page 1 of 2 ____ 1.3 **IF** a Fire Brigade response is **NOT** needed and no flames or smoke have been reported, complete procedure steps 2.7 and 2.9 and exit procedure.

____ 1.4 Announce the following over the PA system:

"Attention Fire Brigade members. Attention Fire Brigade members. This is the Control Room. A fire has been reported at (give location/elev., etc.) *. All Fire Brigade members please respond. All other plant personnel please stay clear of the area until further notice."*

WAREHOUSE #2

____ 1.5 Announce the following on the Fire Brigade radio, channel 1:

"Catawba Control Room to all units – clear channel 1 for emergency use."

____ 1.6 Notify the Central Alarm Station (CAS - 5364) or Secondary Alarm Station (SAS - 5766) of Fire Brigade response:

- Report location of response WAREHOUSE #2
- Request for assistance with CAD door access if needed.
- Request Security to initiate a MERT response to the location.
- **IF** fire is located inside containment Unit 1 or Unit 2, instruct the CAS/SAS operator to change radio selector switch from position "D" to the appropriate position for the affected unit (unit 1, position "A"; unit 2, position "B").

____ 1.7 **IF** off-site fire department assistance is needed, refer to Enclosure 3.6.

____ 1.8 **WHEN** requested provide information to the responding Fire Brigade personnel. Refer to the Site Fire Plan.

____ 1.9 Notify RP Shift Technician (5572/pager #778-2777) of Fire Brigade response:

- Record RP Shift Technician's name DANA
- Report location of response WAREHOUSE #2

____ 1.10 Notify the CNS Environmental, Health and Safety duty person (3333/pager 777-3333) of the Fire Brigade response.

1.11 Determine required classifications and notifications. Refer to the following procedures:

____ • RP/0/A/5000/001 (Classification of Emergency)

____ • RP/0/B/5000/013 (NRC Notification Requirements)

STOPS HERE. REMAINING ACTIONS ARE FOR AFTER THE FIRE IS EXTINGUISHED.

2. Subsequent Actions

NOTE:	1. Subsequent Actions are performed after the fire is extinguished. 2. Lines in left margin are for place keeping. Subsequent Actions may be performed simultaneously.

____ 2.1 Announce the following over the plant PA System:

"Attention plant personnel. Attention plant personnel. This is the Control Room. The fire incident at *<u>(give location)</u>* *has been terminated. Normal duties may now resume."*

____ 2.2 Announce the following on the Fire Brigade radio, channel 1:

"Catawba Control Room to all units - fire incident secured. Resume normal communications. KNHP-589 clear."

____ 2.3 **<u>IF</u>** any "fixed" fire protection suppression system has been activated/discharged, notify the site Fire Protection Engineer.

____ 2.4 **<u>IF</u>** smoke is generated inside the main plant complex, notify the following Engineering personnel to evaluate HVAC filters:

- Mech Syst
- BOP
- HVAC Grp Supvr

____ 2.5 **<u>IF</u>** both of the following conditions are met, perform steps 2.5.1 through 2.5.3 below:

- An emergency has **<u>NOT</u>** been declared for this event per RP/0/A/5000/001
- The NRC **<u>WILL NOT</u>** be notified of this event per RP/0/B/5000/013

____ 2.5.1 Notify the duty Emergency Planner.

____ 2.5.2 Notify the EnergyQuest/Public Affairs duty person.

____ 2.5.3 Make a courtesy notification to the states and counties using Enclosure 3.7. {1}

NOTE:	The following actions are performed by the Fire Brigade Leader on duty.

_____ 2.6 Process a Fire Emergency Report as follows:

_____ A. Complete a "Fire Emergency Report" (Appendix A, NSD 112).

_____ B. Route a copy of the report to the site Fire Protection Engineer (CN03SE).

_____ C. Route the original report to the Emergency Planning Group (CN01EP).

_____ 2.7 Initiate a PIP for event information retention.

PIP # ______________________________

_____ 2.8 **IF** Fire Brigade equipment **OR** supplies have been used, perform the following:

_____ 2.8.1 Ensure all equipment is returned to is proper storage/readiness location.

_____ 2.8.2 **IF** plant fire extinguishers have been used, notify the Site Services duty person of location and type.

_____ 2.8.3 Complete a Fire Brigade Equipment Checklist located in the Fire Brigade Building.

_____ 2.8.4 **IF** consumable supplies have been used, notify the Emergency Planning duty person.

_____ 2.9 Notify the Central Alarm Station (CAS-5364) or Secondary Alarm Station (SAS-5766) that the fire event has been terminated and the radio selector switch in the CAS/SAS can be returned to position "D" for normal operations.

_____ 2.10 Forward this procedure to the Emergency Planning Group (CN01EP).

1. Fire Brigade Response for an Actual Emergency:

1.1 Activate the emergency pager system from the Quiktel Key Pad located in the Control Room.

_____ 1.1.1 Type in "Fire" and press "Enter".

_____ 1.1.2 Type the letter "M".

_____ 1.1.3 Type the following message:

"Fire Brigade Emergency at WAREHOUSE #2 **(location). Fire Brigade please respond."**

_____ 1.1.4 Press "Enter".

NOTE:	Pager activation can be delayed up to 5 minutes depending on pager system status.

_____ 1.1.5 Monitor the confirmation pagers located at the Quiktel Key Pad to verify proper pager activation.

1.2 IF Quiktel Key Pad is unavailable, the site Public Address System shall be used to initiate a Fire Brigade Response.

1.3 IF additional off-shift/off-duty Fire Brigade member response is needed, perform the following:

_____ 1.3.1 Activate the emergency pager system from the Quiktel Key Pad located in the Control Room.

_____ A. Type in "Fire" and press "Enter".

_____ B. Type the letter "M".

_____ C. Type in the following message:

"Fire Brigade Emergency. Off-shift/off-duty Fire Brigade Members, please respond and report to the OSC if available and fit for duty."

_____ D. Press "Enter".

NOTE:	Pager activation can be delayed up to 5 minutes depending on pager system status.

_____ E. Monitor the confirmation pagers located at the Quiktel Key Pad to verify proper pager activation.

Changes to SRO-1: Verify unit shutdown margin status and evaluate the results.

Revised the key to reflect the revisions of Catawba Nuclear Station ROD Book Tables used by candidates: Sections 5.3 and 5.11.
Revised the JPM as follows:
Based on the number of errors the candidate must correct. The original JPM had many additional steps added to reflect corrects. All steps added came from the RO-1 Admin JPM.
Pages 4 to 8 insert new steps
JPM step 1
JPM step 2 inserted to reflect SRO review and needed correction of valid Iodine and xenon time of 8/6/2004 1824.
JPM step 3 inserted to reflect the SRO review and needed correction of boron of 1293 from Rod Book Section 5.11.
JPM step 4, 5, 6 inserted, no mistakes are noted.
JPM step 7 inserted to reflect SRO need to determine required boron of 1293 ppm.
JPM step 8 inserted to reflect the SRO recalculation to 283 ppm.
JPM step 9
JPM step 10 inserted to reflect the SRO need to select a new differential boron worth from Rod Book Section 5.3 of 7.62 pcm/ppm.
JPM step 11 inserted to reflect the SRO recalculation of 2157.46 pcm.
JPM step 12 inserted to reflect the SRO recalculation of 2540.03 pcm.
JPM step 13
JPM step 14 inserted the recalculation of new time limit based on corrections: 8/7/2004 1826.
JPM step 15 is the original JPM step 2 without any changes.

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

NRC –SRO-1/Admin

Verify unit shutdown margin status and evaluate the results.

CANDIDATE ____

EXAMINER ____

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Verify unit shutdown margin status and evaluate the results.

Alternate Path: N/A

Facility JPM #: 2003 NRC SRO ADMIN JPM 2S (Modified)

K/A Rating(s): Generic KA 2.1.25 (2.8/3.1)

Task Standard:

Candidate determines the unit does not have adequate shutdown margin and applies Technical Specification 3.1.1.

Preferred Evaluation Location:

Simulator __X__ In-Plant _____

Preferred Evaluation Method:

Perform __X__ Simulate _____

References:
OP/0/A/6100/006 (Reactivity Balance Calculation)
Unit One Reactor Operating Data Book.

Validation Time: 15 min. **Time Critical:** No

==

Candidate: ____________________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ____________________________ ____________________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

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 shutdown from 100 % power at 25%/hour and entered Mode 3 on 8/6/2004 at 2225. The unit was then cooled down to 500°F and remains there now while needed repairs are completed. Shutdown margin is being maintained with Xenon credit.

Present date and time is 8/8/2004 Time: 0230

INITIATING CUE:

You are reviewing a manual shutdown margin calculation OP/0/A/6100/06 (Reactivity Balance Calculation) Enclosure 4.4 (Shutdown Margin (With or Without Xenon Credit)) done earlier. Determine if the calculated time to loss of Shutdown was correct and if necessary; determine actions for the unit if shutdown margin is not met.

'EP 1 Review Limits and Precautions and per step 2.1, N/A's step 2.2 STANDARD: Step 2.2 is N/A'd COMMENTS:	___SAT ___UNSAT
STEP 2: 2.3 Determine the following information: STANDARD: SRO determines the following using the initial conditions. Unit: 1 Date/Time: 8/6/2004 / 2230 Present NC System Boron Concentration: **1010** ppm Present NC System T-AVG: **557** °F Desired NC System T-AVG: **500** °F Present Cycle Burnup: **250** EFPD Present Difference from Equilibrium Samarium Worth: **(-) 2.57** pcm Date and time of last valid Iodine and Xenon Concentrations: **SRO determines that 8/6/04 1824 from Xenon predict printout should be used.** Iodine Concentration: **7830** atm/cc Xenon Concentration: **3290** atm/cc COMMENTS:	___SAT ___UNSAT
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.	

'EP 3: 2.4 Select the HIGHEST boron concentration for the T-AVG's between the range of present and desired T-AVG's at current cycle burnup per Section 5.11 of the R.O.D. manual. STANDARD: SRO determines the HIGHEST boron concentration for the T-AVG's to should be **1293 ppm** per section 5.11 of the R.O.D. Manual. COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
STEP 4: 2.5.1 Determine there are no untrippable RCCA's per the initial conditions. STANDARD: No mistake COMMENTS:	___SAT ___UNSAT
STEP 5: 2.5.2 Enter 0 ppm for Zero power physics testing penalty. STANDARD: No mistake COMMENTS:	___SAT ___UNSAT
STEP 6: 2.5.3 Calculate the total additional boron concentration penalty. STANDARD: No mistake COMMENTS:	___SAT ___UNSAT
STEP 7: 2.6 Calculate total required boron concentration for SDM. STANDARD: SRO determines a required boron concentration of **1293 ppm**. COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT

⁻EP 8: 2.7 Determine the Boron Difference between Required Boron Concentration from SDM and current NC Boron Concentration. STANDARD: SRO calculates a corrected difference: **1293 PPM - 1010 PPM = 283 PPM** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
NOTE: A negative boron difference in Step 2.7 implies that SDM is maintained for Xenon free conditions. A positive boron difference means that SDM is maintained using a Xenon credit and/or boration.	
STEP 9: 2.7.1 IF Boron Difference (Step 2.7) is negative, N/A Step2.8 2.8 Determine Xenon credit as follows: STANDARD: SRO continues based on Step 2.7 that boron difference is NOT negative and goes to step 2.8. COMMENTS:	___SAT ___UNSAT
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.	
STEP 10: 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. STANDARD: SRO determines a ARI, Differential Boron Worth at 500 °F of: **7.62 PCM/PPM** COMMENTS:	**CRITCAL STEP** ___SAT ___UNSAT

"EP 11: 2.8.2 Calculate the reactivity worth of the boron difference. STANDARD: SRO recalculates: **7.62 PCM/PPM X 283 PPM = 2156.46 PCM.** COMMENTS:	___SAT ___UNSAT
STEP 12: 2.8.3 Calculate the xenon worth that is required to ensure SDM at the present NC System Boron. STANDARD: SRO recalculates for step 2.8.3. A. Calculation **(2156.46 PCM – (-)2.57)/ 0.85 = 2159.03 PCM / 0.85 =** **2540.03 PCM** COMMENTS:	**CRITICAL STEP** ___SAT ___UNSAT
STEP 13: 2.8.4 Predict Xenon for approximately two days into the future. STANDARD: Uses printed copy of OAC Xenon predict program. Comments	
CAUTION: SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM.	

<table>
<tr><td>Step 14 SRO candidate corrects the calculation and determines the new limit

STEP 2.8.5 Interpolate the Date/Time from the Xenon predict of step 2.8.4 that equal the xenon worth of step 2.8.3

Existing time limit with the mistake is 8/8/2004 0517

STANDARD: From the table, interpolation is:
7-AUG-2004 1820 2552.258 PCM
7-AUG-2004 1830 2531.655 PCM
Based on a required reactivity worth of 2540.03 PCM

Difference between reactivity at 1820 and 1830 = 20.603
Difference between reactivity at 1830 and 2540.03 = 8.375

8.375 / 20.603 = 0.406 or 40.6% to 1830 = 4.06 minutes.

1830 - 4 = 1826

Date/Time when SDM is lost is 8/7/2004 at 1826

Acceptable variance on the time is 1823 to 1829

COMMENTS:</td><td>CRITICAL STEP

___SAT

___UNSAT</td></tr>
<tr><td>Step 15 Based on this information, candidate determines that shutdown margin is <u>not</u> adequate and IAW T.S. 3.1.1, we must initiate boration within 15 minutes.

STANDARD: SRO determines T.S. 3.1.1 applies and states the boration requirement.</td><td>CRITICAL STEP

___SAT

___UNSAT</td></tr>
<tr><td>This JPM is complete</td><td></td></tr>
</table>

TIME STOP: ________

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

INITIAL CONDITIONS:

Unit 1 was shutdown from 100 % power at 25%/hour and entered Mode 3 on 8/6/2004 at 2225. The unit was then cooled down to 500°F and remains there now while needed repairs are completed. Shutdown margin is being maintained with Xenon credit.

Present date and time is 8/8/2004 Time: 0230

INITIATING CUE:

You are reviewing a manual shutdown margin calculation OP/0/A/6100/06 (Reactivity Balance Calculation) Enclosure 4.4 (Shutdown Margin (With or Without Xenon Credit)) done earlier. Determine if the calculated time to loss of Shutdown was correct and if necessary; determine actions for the unit if shutdown margin is not met.

Duke Power Company Catawba Nuclear Station **Reactivity Balance Calculation** **Continuous Use**	Procedure No. **OP/ 0/A/6100/006** Revision No. **066** Electronic Reference No. **CN0092MR**

PERFORMANCE

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(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 and/or misaligned RCCA's. (TS 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. (TS 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. (TS 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 ≥1000 pcm in Mode 5. (Tech Spec 3.1.1 and Enclosure 4.4)

2.4 SDM shall be ≥1300 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 T-AVG changes in Modes 3, 4 and 5 shall only be performed to a temperature where measured NC System boron concentration is ≥ boron concentration required for SDM.

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 or misaligned 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 - Untrippable / Misaligned RCCA(s) - Modes 1 and 2.

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

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.

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.

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

N/A

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.

CAUTION: SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM. {PIP C-03-04173}

G. Interpolate the Date/Time from the xenon predict of step 2.2.7.F that equals the xenon worth of step 2.2.7.A

Loss of SDM Date/Time ______/______

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.

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

Performed By: N/A Date/Time: ______/______

Verified By: N/A Date/Time: ______/______

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.

2.3 Determine the following information:

Step	Description	Reference	Value
2.3.1	Unit	N/A	1
2.3.2	Date/Time	N/A	8/6/04 2230
2.3.3	Present NC System Boron Conc	N/A	1010 ppm
2.3.4	Present NC System T-AVG	N/A	557 °F
2.3.5	Desired NC System T-AVG	N/A	500 °F
2.3.6	Present cycle burnup	P1457 or Duty Reactor Engineer	250 EFPD
2.3.7	Present Difference from Equilibrium Samarium Worth	P1475 or Duty Reactor Engineer	(-) 2.57 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	8/6/04 / 2230
2.3.9	Iodine concentration at time listed in step 2.3.8; 0 if xenon free.	P0124 or Duty Reactor Engineer	7830 atm/cc
2.3.10	Xenon concentration at time listed in step 2.3.8; 0 if xenon free.	P0125 or Duty Reactor Engineer	3290 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 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} __1213__ ppm

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	0
B. Boron Penalty per Untrippable rod	N/A	160 ppm
Untrippable RCCA Penalty	**(A) X (B)**	0 ppm

2.5.2 Enter Zero Power Physics Testing penalty; 100 ppm if physics testing is not complete, otherwise, enter 0 ppm. ____0____ ppm

2.5.3 Calculate total additional boron concentration penalty:

Description	Reference	Value
A. Untrippable RCCA Penalty	Step 2.5.1	0 ppm
B. Additional Boron Conc Penalty for ZPPT	Step 2.5.2	0 ppm
Total Boron Penalty	**(A) + (B)**	0 ppm

2.6 Calculate total required boron concentration for SDM:

Description	Reference	Value
A. Required SDM Boron	Step 2.4	1213 ppm
B. Total Boron Penalty	Step 2.5.3	0 ppm
Total Required Boron Concentration for SDM (Xenon Free)	**(A) + (B)**	1213 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	1213 ppm
B. Present NC System Boron Concentration	Step 2.3.3	1010 ppm
Boron Difference	**(A) - (B)**	203 **ppm**

NOTE: A negative boron difference in Step 2.7 implies that SDM is maintained for Xenon free conditions. A positive boron difference means that SDM is maintained using a Xenon credit and/or boration. {0-C99-0318}

N/A 2.7.1 __IF__ Boron Difference (Step 2.7) is negative, N/A Step 2.8.
/17

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. -8.11 pcm/ppm

2.8.2 Calculate the reactivity worth of the boron difference:

Description	Reference	Value
A. Boron Difference	Step 2.7	203 ppm
B. ARI Differential Boron Worth	Step 2.8.1	8.11 pcm/ppm
Reactivity Worth of Boron Difference	**(A) X (B)**	1646.33 **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	1646.33 pcm
B. Difference from Eq Sm Worth	Step 2.3.7	(-) 2.57 pcm
Xenon Worth	**{(A) - (B)} / 0.85**	1401.565 **pcm**

N/A 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.

CAUTION:	SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM. {PIP C-03-04173}

2.8.5 Interpolate the Date/Time from the xenon predict of step 2.8.4 that equals the xenon worth of step 2.8.3.

Loss of SDM Date/Time 8/8/04 / 0517

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

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

Performed By: [signature] Date/Time: 8/6/04 / 2235

Verified By: [signature] Date/Time: 8/6/04 / 2345

SRO-1 ADMIN

Duke Power Company Catawba Nuclear Station **Reactivity Balance Calculation** **Continuous Use**	Procedure No. OP/ **0**/A/6100/006 Revision No. **066** Electronic Reference No. **CN0092MR**

PERFORMANCE

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

(ISSUED) - PDF Format

KEY

SRO-1 ADMIN

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 and/or misaligned RCCA's. (TS 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. (TS 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. (TS 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 ≥1000 pcm in Mode 5. (Tech Spec 3.1.1 and Enclosure 4.4)

2.4 SDM shall be ≥1300 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 T-AVG changes in Modes 3, 4 and 5 shall only be performed to a temperature where measured NC System boron concentration is ≥ boron concentration required for SDM.

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 or misaligned 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 - Untrippable / Misaligned RCCA(s) - Modes 1 and 2.

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

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.

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.

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

N/A

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.

> **CAUTION:** SDM is ensured until the Date/Time recorded below at the present NC System boron or higher. After that time, NC System boration will be required to maintain SDM. {PIP C-03-04173}

G. Interpolate the Date/Time from the xenon predict of step 2.2.7.F that equals the xenon worth of step 2.2.7.A

Loss of SDM Date/Time ______/______

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 [illegible] results.

N/A 2.2.10 N/A the rest of this enclosure (steps 2.3 through [illegible]).

Performed By: N/A Date/Time: ______/______

Verified By: N/A Date/Time: ______/______

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.

2.3 Determine the following information:

Step	Description	Reference	Value
2.3.1	Unit	N/A	1
2.3.2	Date/Time	N/A	8/6/04 2230
2.3.3	Present NC System Boron Conc	N/A	1010 ppm
2.3.4	Present NC System T-AVG	N/A	557 °F
2.3.5	Desired NC System T-AVG	N/A	500 °F
2.3.6	Present cycle burnup	P1457 or Duty Reactor Engineer	250 EFPD
2.3.7	Present Difference from Equilibrium Samarium Worth	P1475 or Duty Reactor Engineer	(-) 2.57 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	8/6/04 / 2230
2.3.9	Iodine concentration at time listed in step 2.3.8; 0 if xenon free.	P0124 or Duty Reactor Engineer	7830 atm/cc
2.3.10	Xenon concentration at time listed in step 2.3.8; 0 if xenon free.	P0125 or Duty Reactor Engineer	3290 atm/cc

1824 ~~1825~~ RWK per OAC and stated concentrations

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.

Should be 1293 from Section 5.11

2.4 Select the highest boron concentration for the T-AVG's between 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} __1213__ ppm

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	0
B. Boron Penalty per Untrippable rod	N/A	160 ppm
Untrippable RCCA Penalty	**(A) X (B)**	0 ppm

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

2.5.3 Calculate total additional boron concentration penalty:

Description	Reference	Value
A. Untrippable RCCA Penalty	Step 2.5.1	0 ppm
B. Additional Boron Conc Penalty for ZPPT	Step 2.5.2	0 ppm
Total Boron Penalty	**(A) + (B)**	0 ppm

2.6 Calculate total required boron concentration for SDM:

1293
1293

Description	Reference	~~Value~~
A. Required SDM Boron	Step 2.4	1213 ppm
B. Total Boron Penalty	Step 2.5.3	0 ppm
Total Required Boron Concentration for SDM (Xenon Free)	**(A) + (B)**	1213 ppm

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

1293
-1010
283

Description	Reference	Value
A. Total Required Boron Concentration for SDM	Step 2.6	1213 ppm
B. Present NC System Boron Concentration	Step 2.3.3	1010 ppm
Boron Difference	**(A) - (B)**	203 ppm

NOTE: A negative boron difference in Step 2.7 implies that SDM is maintained for Xenon free conditions. A positive boron difference means that SDM is maintained using a Xenon credit and/or boration. {0-C99-0318}

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

XENON AND SAMARIUM REACTIVITY WORTH PREDICTION

Initial Values used for calculations:

250.0062	: BURNUP (EFPD)
3289.904	: XE-135 Concentration (Atoms/CC)
37001.88	: SM-149 Concentration (Atoms/CC)
16931.09	: PM-149 Concentration (Atoms/CC)
7830.452	: I-135 Concentration (Atoms/CC)

NO : Were Equilibrium Concentrations Selected?

------ Power Profile -------

DD-MMM-YYYY HH:MM	% POWER
06-AUG-2004 18:25	99.6
06-AUG-2004 19:25	75.0
06-AUG-2004 20:25	50.0
06-AUG-2004 21:25	25.0
06-AUG-2004 22:25	0.0
07-AUG-2004 02:25	0.0
07-AUG-2004 06:25	0.0
07-AUG-2004 10:25	0.0
08-AUG-2004 10:25	0.0
09-AUG-2004 10:25	0.0

DATE-TIME	%POWER	XE-135 CONC	I-135 CONC	XE WORTH PCM	XE-WORTH RATE PCM/MIN	SM-149 CONC	PM-149 CONC	SM WORTH PCM
06-AUG-2004 18:25	99.6	3289.9	7830.5	2648.486	0.000	37001.9	16931.1	904.333
6-AUG-2004 19:00	85.2	3311.6	7797.7	2665.983	0.904	37010.8	16922.2	904.551
6-AUG-2004 20:00	60.4	3434.0	7594.0	2764.475	2.214	37068.2	16864.6	905.953
6-AUG-2004 21:00	35.4	3643.0	7217.2	2932.734	3.281	37178.8	16753.7	908.657
6-AUG-2004 22:00	10.4	3928.3	6684.2	3162.441	4.296	37342.2	16590.0	912.650
6-AUG-2004 22:40	0.0	4156.3	6256.1	3345.992	4.527	37478.6	16453.6	915.984
6-AUG-2004 22:50	0.0	4210.7	6149.3	3389.731	4.323	37513.7	16418.5	916.842
6-AUG-2004 23:00	0.0	4262.5	6044.3	3431.465	4.124	37548.7	16383.4	917.698
6-AUG-2004 23:10	0.0	4311.9	5941.1	3471.246	3.930	37583.7	16348.5	918.552
6-AUG-2004 23:20	0.0	4359.0	5839.7	3509.121	3.741	37618.6	16313.6	919.404
6-AUG-2004 23:30	0.0	4403.7	5740.0	3545.140	3.556	37653.4	16278.8	920.255
6-AUG-2004 23:40	0.0	4446.2	5642.1	3579.347	3.376	37688.1	16244.1	921.104
6-AUG-2004 23:50	0.0	4486.5	5545.7	3611.791	3.201	37722.8	16209.4	921.951
7-AUG-2004 00:00	0.0	4524.7	5451.1	3642.514	3.030	37757.3	16174.8	922.796
7-AUG-2004 00:10	0.0	4560.8	5358.0	3671.562	2.863	37791.8	16140.3	923.640
7-AUG-2004 00:20	0.0	4594.8	5266.6	3698.977	2.701	37826.3	16105.9	924.481
7-AUG-2004 00:30	0.0	4626.9	5176.7	3724.801	2.543	37860.6	16071.5	925.321
7-AUG-2004 00:40	0.0	4657.0	5088.3	3749.074	2.389	37894.9	16037.2	926.159
7-AUG-2004 00:50	0.0	4685.3	5001.4	3771.839	2.239	37929.1	16003.0	926.995
7-AUG-2004 01:00	0.0	4711.8	4916.1	3793.134	2.093	37963.3	15968.9	927.830
7-AUG-2004 01:10	0.0	4736.4	4832.1	3812.996	1.951	37997.4	15934.8	928.662
7-AUG-2004 01:20	0.0	4759.4	4749.7	3831.465	1.813	38031.4	15900.8	929.493
7-AUG-2004 01:30	0.0	4780.6	4668.6	3848.578	1.678	38065.3	15866.9	930.322
7-AUG-2004 01:40	0.0	4800.3	4588.9	3864.370	1.547	38099.1	15833.0	931.150
7-AUG-2004 01:50	0.0	4818.3	4510.6	3878.876	1.419	38132.9	15799.2	931.975

XENON AND SAMARIUM REACTIVITY WORTH PREDICTION

7-AUG-2004 02:00	0.0	4834.7	4433.6	3892.133	1.295	38166.6	15765.5	932.799
7-AUG-2004 02:10	0.0	4849.7	4357.9	3904.172	1.174	38200.3	15731.9	933.621
7-AUG-2004 02:20	0.0	4863.2	4283.5	3915.027	1.056	38233.8	15698.3	934.442
7-AUG-2004 02:30	0.0	4875.2	4210.4	3924.731	0.942	38267.3	15664.8	935.260
7-AUG-2004 02:40	0.0	4885.9	4138.5	3933.316	0.831	38300.7	15631.4	936.077
7-AUG-2004 02:50	0.0	4895.2	4067.9	3940.812	0.723	38334.1	15598.1	936.892
7-AUG-2004 03:00	0.0	4903.2	3998.4	3947.250	0.618	38367.4	15564.8	937.705
7-AUG-2004 03:10	0.0	4909.9	3930.2	3952.659	0.516	38400.6	15531.6	938.517
7-AUG-2004 03:20	0.0	4915.4	3863.1	3957.069	0.416	38433.7	15498.4	939.327
7-AUG-2004 03:30	0.0	4919.7	3797.2	3960.507	0.320	38466.8	15465.4	940.135
7-AUG-2004 03:40	0.0	4922.8	3732.4	3963.002	0.226	38499.8	15432.4	940.941
7-AUG-2004 03:50	0.0	4924.7	3668.6	3964.580	0.135	38532.7	15399.5	941.746
7-AUG-2004 04:00	0.0	4925.6	3606.0	3965.270	0.047	38565.6	15366.6	942.549
7-AUG-2004 04:10	0.0	4925.4	3544.5	3965.094	-0.039	38598.3	15333.8	943.350
7-AUG-2004 04:20	0.0	4924.1	3484.0	3964.081	-0.122	38631.1	15301.1	944.150
7-AUG-2004 04:30	0.0	4921.8	3424.5	3962.254	-0.203	38663.7	15268.5	944.948
7-AUG-2004 04:40	0.0	4918.6	3366.1	3959.637	-0.281	38696.3	15235.9	945.744
7-AUG-2004 04:50	0.0	4914.4	3308.6	3956.255	-0.357	38728.8	15203.4	946.538
7-AUG-2004 05:00	0.0	4909.3	3252.1	3952.130	-0.431	38761.2	15170.9	947.331
7-AUG-2004 05:10	0.0	4903.3	3196.6	3947.285	-0.502	38793.6	15138.6	948.122
7-AUG-2004 05:20	0.0	4896.4	3142.1	3941.742	-0.571	38825.9	15106.3	948.911
7-AUG-2004 05:30	0.0	4888.6	3088.4	3935.524	-0.639	38858.1	15074.0	949.699
7-AUG-2004 05:40	0.0	4880.1	3035.7	3928.650	-0.703	38890.3	15041.9	950.485
7-AUG-2004 05:50	0.0	4870.8	2983.9	3921.143	-0.766	38922.4	15009.8	951.269
7-AUG-2004 06:00	0.0	4860.7	2933.0	3913.021	-0.827	38954.4	14977.8	952.052
7-AUG-2004 06:10	0.0	4849.9	2882.9	3904.304	-0.886	38986.3	14945.8	952.833
7-AUG-2004 06:20	0.0	4838.3	2833.7	3895.013	-0.943	39018.2	14913.9	953.612
7-AUG-2004 06:30	0.0	4826.1	2785.3	3885.166	-0.998	39050.0	14882.1	954.390
7-AUG-2004 06:40	0.0	4813.2	2737.8	3874.780	-1.052	39081.8	14850.4	955.166
7-AUG-2004 06:50	0.0	4799.6	2691.1	3863.875	-1.103	39113.5	14818.7	955.940
7-AUG-2004 07:00	0.0	4785.5	2645.1	3852.468	-1.153	39145.1	14787.1	956.713
7-AUG-2004 07:10	0.0	4770.7	2600.0	3840.575	-1.201	39176.6	14755.5	957.484
7-AUG-2004 07:20	0.0	4755.3	2555.6	3828.214	-1.248	39208.1	14724.0	958.254
7-AUG-2004 07:30	0.0	4739.4	2512.0	3815.402	-1.292	39239.5	14692.6	959.021
7-AUG-2004 07:40	0.0	4723.0	2469.1	3802.152	-1.336	39270.9	14661.3	959.787
7-AUG-2004 07:50	0.0	4706.0	2427.0	3788.483	-1.377	39302.2	14630.0	960.552
7-AUG-2004 08:00	0.0	4688.5	2385.6	3774.409	-1.417	39333.4	14598.8	961.315
7-AUG-2004 08:10	0.0	4670.5	2344.9	3759.944	-1.456	39364.5	14567.6	962.076
7-AUG-2004 08:20	0.0	4652.1	2304.8	3745.104	-1.493	39395.6	14536.6	962.836
7-AUG-2004 08:30	0.0	4633.2	2265.5	3729.901	-1.529	39426.6	14505.5	963.594
7-AUG-2004 08:40	0.0	4613.9	2226.8	3714.351	-1.564	39457.6	14474.6	964.350
7-AUG-2004 08:50	0.0	4594.2	2188.8	3698.467	-1.597	39488.4	14443.7	965.105
7-AUG-2004 09:00	0.0	4574.0	2151.5	3682.261	-1.628	39519.3	14412.9	965.858
7-AUG-2004 09:10	0.0	4553.5	2114.8	3665.748	-1.659	39550.0	14382.1	966.609
7-AUG-2004 09:20	0.0	4532.6	2078.7	3648.938	-1.688	39580.7	14351.5	967.359
7-AUG-2004 09:30	0.0	4511.4	2043.2	3631.846	-1.716	39611.3	14320.8	968.108
7-AUG-2004 09:40	0.0	4489.8	2008.3	3614.482	-1.743	39641.9	14290.3	968.854
7-AUG-2004 09:50	0.0	4468.0	1974.0	3596.858	-1.769	39672.4	14259.8	969.599
7-AUG-2004 10:00	0.0	4445.8	1940.4	3578.986	-1.793	39702.8	14229.4	970.343
7-AUG-2004 10:10	0.0	4423.3	1907.2	3560.876	-1.817	39733.1	14199.0	971.085
7-AUG-2004 10:20	0.0	4400.5	1874.7	3542.541	-1.839	39763.4	14168.7	971.826
7-AUG-2004 10:30	0.0	4377.4	1842.7	3523.988	-1.860	39793.7	14138.5	972.564
7-AUG-2004 10:40	0.0	4354.1	1811.3	3505.230	-1.881	39823.8	14108.3	973.301
7-AUG-2004 10:50	0.0	4330.6	1780.3	3486.277	-1.900	39853.9	14078.2	974.037
7-AUG-2004 11:00	0.0	4306.8	1750.0	3467.138	-1.918	39884.0	14048.2	974.771
7-AUG-2004 11:10	0.0	4282.8	1720.1	3447.822	-1.936	39913.9	14018.2	975.504
7-AUG-2004 11:20	0.0	4258.6	1690.7	3428.339	-1.952	39943.8	13988.3	976.235
7-AUG-2004 11:30	0.0	4234.2	1661.9	3408.698	-1.968	39973.7	13958.5	976.964
7-AUG-2004 11:40	0.0	4209.6	1633.5	3388.908	-1.983	40003.5	13928.7	977.692
7-AUG-2004 11:50	0.0	4184.9	1605.7	3368.977	-1.997	40033.2	13899.0	978.418

XENON AND SAMARIUM REACTIVITY WORTH PREDICTION

7-AUG-2004	12:00	0.0	4160.0	1578.3	3348.913	-2.010	40062.8	13869.3	979.143
7-AUG-2004	12:10	0.0	4134.9	1551.3	3328.726	-2.022	40092.4	13839.7	979.866
7-AUG-2004	12:20	0.0	4109.7	1524.9	3308.423	-2.033	40122.0	13810.2	980.588
7-AUG-2004	12:30	0.0	4084.3	1498.8	3288.011	-2.044	40151.4	13780.7	981.308
7-AUG-2004	12:40	0.0	4058.8	1473.3	3267.498	-2.054	40180.8	13751.3	982.027
7-AUG-2004	12:50	0.0	4033.2	1448.1	3246.892	-2.063	40210.2	13722.0	982.744
7-AUG-2004	13:00	0.0	4007.5	1423.4	3226.199	-2.071	40239.4	13692.7	983.459
7-AUG-2004	13:10	0.0	3981.7	1399.1	3205.427	-2.079	40268.7	13663.5	984.173
7-AUG-2004	13:20	0.0	3955.8	1375.3	3184.581	-2.086	40297.8	13634.4	984.885
7-AUG-2004	13:30	0.0	3929.9	1351.8	3163.670	-2.093	40326.9	13605.3	985.596
7-AUG-2004	13:40	0.0	3903.8	1328.7	3142.699	-2.099	40355.9	13576.3	986.306
7-AUG-2004	13:50	0.0	3877.7	1306.1	3121.674	-2.104	40384.9	13547.3	987.014
7-AUG-2004	14:00	0.0	3851.5	1283.8	3100.601	-2.108	40413.8	13518.4	987.720
7-AUG-2004	14:10	0.0	3825.3	1261.9	3079.487	-2.112	40442.6	13489.5	988.425
7-AUG-2004	14:20	0.0	3799.0	1240.3	3058.337	-2.116	40471.4	13460.8	989.128
7-AUG-2004	14:30	0.0	3772.7	1219.2	3037.156	-2.119	40500.1	13432.0	989.830
7-AUG-2004	14:40	0.0	3746.4	1198.4	3015.951	-2.121	40528.8	13403.4	990.531
7-AUG-2004	14:50	0.0	3720.0	1177.9	2994.725	-2.123	40557.4	13374.8	991.230
7-AUG-2004	15:00	0.0	3693.6	1157.8	2973.485	-2.124	40585.9	13346.3	991.927
7-AUG-2004	15:10	0.0	3667.2	1138.1	2952.235	-2.125	40614.4	13317.8	992.623
7-AUG-2004	15:20	0.0	3640.8	1118.7	2930.980	-2.126	40642.8	13289.4	993.317
7-AUG-2004	15:30	0.0	3614.4	1099.6	2909.725	-2.125	40671.2	13261.0	994.010
7-AUG-2004	15:40	0.0	3588.0	1080.8	2888.475	-2.125	40699.4	13232.7	994.702
7-AUG-2004	15:50	0.0	3561.6	1062.4	2867.233	-2.124	40727.7	13204.5	995.392
7-AUG-2004	16:00	0.0	3535.3	1044.2	2846.004	-2.123	40755.8	13176.3	996.080
7-AUG-2004	16:10	0.0	3508.9	1026.4	2824.792	-2.121	40784.0	13148.2	996.767
7-AUG-2004	16:20	0.0	3482.6	1008.9	2803.601	-2.119	40812.0	13120.2	997.453
7-AUG-2004	16:30	0.0	3456.3	991.7	2782.435	-2.116	40840.0	13092.2	998.137
7-AUG-2004	16:40	0.0	3430.0	974.8	2761.298	-2.113	40867.9	13064.2	998.820
7-AUG-2004	16:50	0.0	3403.8	958.2	2740.193	-2.110	40895.8	13036.4	999.501
7-AUG-2004	17:00	0.0	3377.7	941.8	2719.125	-2.106	40923.6	13008.6	1000.180
7-AUG-2004	17:10	0.0	3351.5	925.8	2698.095	-2.102	40951.4	12980.8	1000.859
7-AUG-2004	17:20	0.0	3325.5	910.0	2677.109	-2.098	40979.1	12953.1	1001.536
7-AUG-2004	17:30	0.0	3299.4	894.4	2656.167	-2.093	41006.7	12925.5	1002.211
7-AUG-2004	17:40	0.0	3273.5	879.2	2635.276	-2.088	41034.3	12897.9	1002.885
7-AUG-2004	17:50	0.0	3247.6	864.2	2614.436	-2.083	41061.8	12870.4	1003.558
7-AUG-2004	18:00	0.0	3221.8	849.4	2593.651	-2.077	41089.2	12842.9	1004.229
7-AUG-2004	18:10	0.0	3196.0	835.0	2572.925	-2.071	41116.6	12815.5	1004.898
7-AUG-2004	18:20	0.0	3170.4	820.7	2552.258	-2.065	41144.0	12788.2	1005.566
7-AUG-2004	18:30	0.0	3144.8	806.7	2531.655	-2.059	41171.3	12760.9	1006.233
7-AUG-2004	18:40	0.0	3119.3	793.0	2511.117	-2.052	41198.5	12733.7	1006.899
7-AUG-2004	18:50	0.0	3093.8	779.4	2490.647	-2.045	41225.7	12706.5	1007.563
7-AUG-2004	19:00	0.0	3068.5	766.1	2470.248	-2.038	41252.8	12679.4	1008.225
7-AUG-2004	19:10	0.0	3043.3	753.1	2449.921	-2.031	41279.8	12652.4	1008.886
7-AUG-2004	19:20	0.0	3018.1	740.2	2429.669	-2.023	41306.8	12625.4	1009.546
7-AUG-2004	19:30	0.0	2993.0	727.6	2409.495	-2.016	41333.7	12598.4	1010.204
7-AUG-2004	19:40	0.0	2968.1	715.2	2389.399	-2.008	41360.6	12571.5	1010.861
7-AUG-2004	19:50	0.0	2943.2	703.0	2369.385	-1.999	41387.4	12544.7	1011.517
7-AUG-2004	20:00	0.0	2918.5	691.0	2349.453	-1.991	41414.2	12518.0	1012.171
7-AUG-2004	20:10	0.0	2893.8	679.2	2329.606	-1.983	41440.9	12491.3	1012.823
7-AUG-2004	20:20	0.0	2869.3	667.6	2309.845	-1.974	41467.6	12464.6	1013.475
7-AUG-2004	20:30	0.0	2844.8	656.3	2290.173	-1.965	41494.2	12438.0	1014.125
7-AUG-2004	20:40	0.0	2820.5	645.1	2270.590	-1.956	41520.7	12411.5	1014.773
7-AUG-2004	20:50	0.0	2796.3	634.1	2251.099	-1.947	41547.2	12385.0	1015.420
7-AUG-2004	21:00	0.0	2772.2	623.3	2231.700	-1.938	41573.6	12358.6	1016.066
7-AUG-2004	21:10	0.0	2748.2	612.6	2212.395	-1.928	41600.0	12332.2	1016.711
7-AUG-2004	21:20	0.0	2724.3	602.2	2193.186	-1.919	41626.3	12305.9	1017.354
7-AUG-2004	21:30	0.0	2700.6	591.9	2174.074	-1.909	41652.5	12279.7	1017.995
7-AUG-2004	21:40	0.0	2677.0	581.8	2155.060	-1.899	41678.7	12253.5	1018.635
7-AUG-2004	21:50	0.0	2653.5	571.9	2136.145	-1.889	41704.9	12227.3	1019.274

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7-AUG-2004 22:00	0.0	2630.1	562.2	2117.330	-1.879	41730.9	12201.2	1019.912
7-AUG-2004 22:10	0.0	2606.9	552.6	2098.616	-1.869	41757.0	12175.2	1020.548
7-AUG-2004 22:20	0.0	2583.7	543.2	2080.005	-1.859	41783.0	12149.2	1021.183
7-AUG-2004 22:30	0.0	2560.8	533.9	2061.497	-1.848	41808.9	12123.3	1021.817
7-AUG-2004 22:40	0.0	2537.9	524.8	2043.094	-1.838	41834.7	12097.4	1022.449
7-AUG-2004 22:50	0.0	2515.2	515.8	2024.795	-1.827	41860.6	12071.6	1023.079
7-AUG-2004 23:00	0.0	2492.6	507.1	2006.603	-1.817	41886.3	12045.9	1023.709
7-AUG-2004 23:10	0.0	2470.1	498.4	1988.517	-1.806	41912.0	12020.2	1024.337
7-AUG-2004 23:20	0.0	2447.8	489.9	1970.539	-1.795	41937.6	11994.5	1024.964
7-AUG-2004 23:30	0.0	2425.6	481.6	1952.668	-1.784	41963.2	11968.9	1025.589
7-AUG-2004 23:40	0.0	2403.5	473.4	1934.906	-1.773	41988.8	11943.4	1026.213
7-AUG-2004 23:50	0.0	2381.6	465.3	1917.253	-1.763	42014.3	11917.9	1026.836
8-AUG-2004 00:00	0.0	2359.8	457.4	1899.711	-1.751	42039.7	11892.5	1027.457
8-AUG-2004 00:10	0.0	2338.1	449.6	1882.279	-1.740	42065.1	11867.1	1028.077
8-AUG-2004 00:20	0.0	2316.6	441.9	1864.957	-1.729	42090.4	11841.8	1028.696
8-AUG-2004 00:30	0.0	2295.2	434.4	1847.747	-1.718	42115.6	11816.5	1029.314
8-AUG-2004 00:40	0.0	2274.0	427.0	1830.649	-1.707	42140.8	11791.3	1029.930
8-AUG-2004 00:50	0.0	2252.9	419.7	1813.662	-1.696	42166.0	11766.2	1030.545
8-AUG-2004 01:00	0.0	2231.9	412.5	1796.788	-1.685	42191.1	11741.1	1031.158
8-AUG-2004 01:10	0.0	2211.1	405.5	1780.026	-1.673	42216.2	11716.0	1031.771
8-AUG-2004 01:20	0.0	2190.4	398.6	1763.378	-1.662	42241.1	11691.0	1032.381
8-AUG-2004 01:30	0.0	2169.9	391.8	1746.842	-1.651	42266.1	11666.1	1032.991
8-AUG-2004 01:40	0.0	2149.5	385.1	1730.420	-1.639	42291.0	11641.2	1033.599
8-AUG-2004 01:50	0.0	2129.2	378.6	1714.112	-1.628	42315.8	11616.4	1034.206
8-AUG-2004 02:00	0.0	2109.1	372.1	1697.917	-1.617	42340.6	11591.6	1034.812
8-AUG-2004 02:10	0.0	2089.1	365.8	1681.836	-1.605	42365.3	11566.9	1035.416
8-AUG-2004 02:20	0.0	2069.3	359.5	1665.869	-1.594	42390.0	11542.2	1036.019
8-AUG-2004 02:30	0.0	2049.6	353.4	1650.016	-1.582	42414.6	11517.6	1036.621
8-AUG-2004 02:40	0.0	2030.1	347.4	1634.277	-1.571	42439.2	11493.0	1037.222
8-AUG-2004 02:50	0.0	2010.7	341.5	1618.651	-1.560	42463.7	11468.5	1037.821
8-AUG-2004 03:00	0.0	1991.4	335.7	1603.140	-1.548	42488.2	11444.0	1038.419
8-AUG-2004 03:10	0.0	1972.3	330.0	1587.742	-1.537	42512.6	11419.6	1039.016
8-AUG-2004 03:20	0.0	1953.3	324.3	1572.459	-1.526	42537.0	11395.2	1039.611
8-AUG-2004 03:30	0.0	1934.4	318.8	1557.289	-1.514	42561.3	11370.9	1040.205
8-AUG-2004 03:40	0.0	1915.7	313.4	1542.232	-1.503	42585.5	11346.7	1040.798
8-AUG-2004 03:50	0.0	1897.2	308.0	1527.289	-1.491	42609.8	11322.4	1041.390
8-AUG-2004 04:00	0.0	1878.8	302.8	1512.460	-1.480	42633.9	11298.3	1041.981
8-AUG-2004 04:10	0.0	1860.5	297.6	1497.744	-1.469	42658.0	11274.2	1042.570
8-AUG-2004 04:20	0.0	1842.3	292.6	1483.141	-1.457	42682.1	11250.1	1043.158
8-AUG-2004 04:30	0.0	1824.3	287.6	1468.650	-1.446	42706.1	11226.1	1043.744
8-AUG-2004 04:40	0.0	1806.5	282.7	1454.273	-1.435	42730.0	11202.2	1044.330
8-AUG-2004 04:50	0.0	1788.8	277.9	1440.007	-1.424	42753.9	11178.3	1044.914
8-AUG-2004 05:00	0.0	1771.2	273.2	1425.854	-1.413	42777.8	11154.4	1045.497
8-AUG-2004 05:10	0.0	1753.7	268.5	1411.812	-1.401	42801.6	11130.6	1046.078
8-AUG-2004 05:20	0.0	1736.4	263.9	1397.882	-1.390	42825.3	11106.9	1046.659
8-AUG-2004 05:30	0.0	1719.3	259.4	1384.063	-1.379	42849.0	11083.2	1047.238
8-AUG-2004 05:40	0.0	1702.2	255.0	1370.355	-1.368	42872.7	11059.6	1047.816
8-AUG-2004 05:50	0.0	1685.3	250.7	1356.758	-1.357	42896.3	11036.0	1048.392
8-AUG-2004 06:00	0.0	1668.6	246.4	1343.271	-1.346	42919.8	11012.4	1048.968
8-AUG-2004 06:10	0.0	1652.0	242.2	1329.893	-1.335	42943.3	10988.9	1049.542
8-AUG-2004 06:20	0.0	1635.5	238.1	1316.625	-1.324	42966.8	10965.5	1050.115
8-AUG-2004 06:30	0.0	1619.1	234.0	1303.467	-1.313	42990.1	10942.1	1050.687
8-AUG-2004 06:40	0.0	1602.9	230.1	1290.417	-1.302	43013.5	10918.7	1051.257
8-AUG-2004 06:50	0.0	1586.9	226.2	1277.475	-1.291	43036.8	10895.4	1051.827
8-AUG-2004 07:00	0.0	1570.9	222.3	1264.641	-1.281	43060.0	10872.2	1052.395
8-AUG-2004 07:10	0.0	1555.1	218.5	1251.914	-1.270	43083.2	10849.0	1052.962
8-AUG-2004 07:20	0.0	1539.4	214.8	1239.295	-1.259	43106.4	10825.9	1053.527
8-AUG-2004 07:30	0.0	1523.9	211.2	1226.782	-1.249	43129.5	10802.8	1054.092
8-AUG-2004 07:40	0.0	1508.5	207.6	1214.375	-1.238	43152.5	10779.7	1054.655
8-AUG-2004 07:50	0.0	1493.2	204.0	1202.074	-1.228	43175.5	10756.7	1055.217

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8-AUG-2004 08:00	0.0	1478.0	200.6	1189.877	-1.217	43198.5	10733.8	1055.778
8-AUG-2004 08:10	0.0	1463.0	197.1	1177.786	-1.207	43221.4	10710.9	1056.338
8-AUG-2004 08:20	0.0	1448.1	193.8	1165.798	-1.196	43244.2	10688.0	1056.896
8-AUG-2004 08:30	0.0	1433.4	190.5	1153.915	-1.186	43267.0	10665.2	1057.453
8-AUG-2004 08:40	0.0	1418.7	187.3	1142.134	-1.175	43289.8	10642.5	1058.010
8-AUG-2004 08:50	0.0	1404.2	184.1	1130.456	-1.165	43312.5	10619.8	1058.564
8-AUG-2004 09:00	0.0	1389.9	180.9	1118.880	-1.155	43335.1	10597.1	1059.118
8-AUG-2004 09:10	0.0	1375.6	177.9	1107.405	-1.145	43357.7	10574.5	1059.671
8-AUG-2004 09:20	0.0	1361.5	174.9	1096.032	-1.135	43380.3	10551.9	1060.222
8-AUG-2004 09:30	0.0	1347.5	171.9	1084.759	-1.125	43402.8	10529.4	1060.772
8-AUG-2004 09:40	0.0	1333.6	169.0	1073.586	-1.115	43425.3	10507.0	1061.321
8-AUG-2004 09:50	0.0	1319.8	166.1	1062.512	-1.105	43447.7	10484.6	1061.869
8-AUG-2004 10:00	0.0	1306.2	163.3	1051.537	-1.095	43470.1	10462.2	1062.416
8-AUG-2004 10:10	0.0	1292.7	160.5	1040.661	-1.085	43492.4	10439.9	1062.961
8-AUG-2004 10:20	0.0	1279.3	157.8	1029.882	-1.075	43514.6	10417.6	1063.506
8-AUG-2004 10:30	0.0	1266.0	155.1	1019.200	-1.066	43536.9	10395.4	1064.049
8-AUG-2004 10:40	0.0	1252.9	152.4	1008.615	-1.056	43559.0	10373.2	1064.591
8-AUG-2004 10:50	0.0	1239.9	149.9	998.126	-1.047	43581.2	10351.1	1065.132
8-AUG-2004 11:00	0.0	1226.9	147.3	987.732	-1.037	43603.3	10329.0	1065.671
8-AUG-2004 11:10	0.0	1214.2	144.8	977.433	-1.028	43625.3	10306.9	1066.210
8-AUG-2004 11:20	0.0	1201.5	142.4	967.228	-1.018	43647.3	10285.0	1066.747
8-AUG-2004 11:30	0.0	1188.9	139.9	957.117	-1.009	43669.2	10263.0	1067.284
8-AUG-2004 11:40	0.0	1176.5	137.6	947.099	-1.000	43691.1	10241.1	1067.819
8-AUG-2004 11:50	0.0	1164.1	135.2	937.173	-0.990	43713.0	10219.3	1068.353
8-AUG-2004 12:00	0.0	1151.9	132.9	927.339	-0.981	43734.8	10197.5	1068.886
8-AUG-2004 12:10	0.0	1139.8	130.7	917.596	-0.972	43756.5	10175.7	1069.417
8-AUG-2004 12:20	0.0	1127.8	128.5	907.944	-0.963	43778.2	10154.0	1069.948
8-AUG-2004 12:30	0.0	1116.0	126.3	898.382	-0.954	43799.9	10132.3	1070.477
8-AUG-2004 12:40	0.0	1104.2	124.1	888.909	-0.945	43821.5	10110.7	1071.006
8-AUG-2004 12:50	0.0	1092.5	122.0	879.525	-0.936	43843.1	10089.2	1071.533
8-AUG-2004 13:00	0.0	1081.0	120.0	870.230	-0.927	43864.6	10067.6	1072.059
8-AUG-2004 13:10	0.0	1069.5	117.9	861.022	-0.919	43886.1	10046.2	1072.584
8-AUG-2004 13:20	0.0	1058.2	115.9	851.901	-0.910	43907.5	10024.7	1073.108
8-AUG-2004 13:30	0.0	1047.0	114.0	842.866	-0.901	43928.9	10003.3	1073.630
8-AUG-2004 13:40	0.0	1035.9	112.0	833.917	-0.893	43950.2	9982.0	1074.152
8-AUG-2004 13:50	0.0	1024.9	110.1	825.054	-0.884	43971.5	9960.7	1074.672
8-AUG-2004 14:00	0.0	1014.0	108.3	816.275	-0.876	43992.8	9939.5	1075.192
8-AUG-2004 14:10	0.0	1003.2	106.4	807.579	-0.867	44014.0	9918.2	1075.710
8-AUG-2004 14:20	0.0	992.5	104.6	798.968	-0.859	44035.2	9897.1	1076.227
8-AUG-2004 14:30	0.0	981.9	102.9	790.438	-0.851	44056.3	9876.0	1076.743
8-AUG-2004 14:40	0.0	971.4	101.1	781.991	-0.843	44077.3	9854.9	1077.258
8-AUG-2004 14:50	0.0	961.0	99.4	773.626	-0.835	44098.4	9833.9	1077.772
8-AUG-2004 15:00	0.0	950.7	97.7	765.341	-0.826	44119.3	9812.9	1078.285
8-AUG-2004 15:10	0.0	940.5	96.1	757.136	-0.818	44140.3	9792.0	1078.796
8-AUG-2004 15:20	0.0	930.4	94.4	749.012	-0.810	44161.2	9771.1	1079.307
8-AUG-2004 15:30	0.0	920.4	92.8	740.966	-0.803	44182.0	9750.2	1079.816
8-AUG-2004 15:40	0.0	910.5	91.3	732.999	-0.795	44202.8	9729.4	1080.325
8-AUG-2004 15:50	0.0	900.7	89.7	725.109	-0.787	44223.6	9708.7	1080.832
8-AUG-2004 16:00	0.0	891.0	88.2	717.297	-0.779	44244.3	9688.0	1081.338
8-AUG-2004 16:10	0.0	881.4	86.7	709.561	-0.772	44264.9	9667.3	1081.843
8-AUG-2004 16:20	0.0	871.9	85.2	701.902	-0.764	44285.6	9646.7	1082.347
8-AUG-2004 16:30	0.0	862.5	83.8	694.318	-0.757	44306.2	9626.1	1082.850
8-AUG-2004 16:40	0.0	853.1	82.4	686.809	-0.749	44326.7	9605.6	1083.352
8-AUG-2004 16:50	0.0	843.9	81.0	679.374	-0.742	44347.2	9585.1	1083.853
8-AUG-2004 17:00	0.0	834.8	79.6	672.013	-0.734	44367.6	9564.6	1084.353
8-AUG-2004 17:10	0.0	825.7	78.3	664.724	-0.727	44388.0	9544.2	1084.851
8-AUG-2004 17:20	0.0	816.7	76.9	657.508	-0.720	44408.4	9523.9	1085.349
8-AUG-2004 17:30	0.0	807.9	75.6	650.365	-0.713	44428.7	9503.5	1085.846
8-AUG-2004 17:40	0.0	799.1	74.4	643.292	-0.705	44449.0	9483.3	1086.341
8-AUG-2004 17:50	0.0	790.4	73.1	636.290	-0.698	44469.2	9463.0	1086.836

XENON AND SAMARIUM REACTIVITY WORTH PREDICTION

8-AUG-2004 18:00	0.0	781.8	71.9	629.358	-0.691	44489.4	9442.8	1087.329
8-AUG-2004 18:10	0.0	773.3	70.7	622.496	-0.684	44509.6	9422.7	1087.821
8-AUG-2004 18:20	0.0	764.8	69.5	615.703	-0.678	44529.6	9402.6	1088.313
8-AUG-2004 18:30	0.0	756.5	68.3	608.978	-0.671	44549.7	9382.5	1088.803
8-AUG-2004 18:40	0.0	748.2	67.1	602.321	-0.664	44569.7	9362.5	1089.292
8-AUG-2004 18:50	0.0	740.0	66.0	595.731	-0.657	44589.7	9342.5	1089.780
8-AUG-2004 19:00	0.0	731.9	64.9	589.208	-0.651	44609.6	9322.6	1090.267
8-AUG-2004 19:10	0.0	723.9	63.8	582.751	-0.644	44629.5	9302.7	1090.753
8-AUG-2004 19:20	0.0	715.9	62.7	576.359	-0.638	44649.4	9282.9	1091.239
8-AUG-2004 19:30	0.0	708.1	61.7	570.032	-0.631	44669.2	9263.1	1091.723
8-AUG-2004 19:40	0.0	700.3	60.6	563.770	-0.625	44688.9	9243.3	1092.205
8-AUG-2004 19:50	0.0	692.6	59.6	557.572	-0.618	44708.6	9223.6	1092.687
8-AUG-2004 20:00	0.0	685.0	58.6	551.437	-0.612	44728.3	9203.9	1093.168
8-AUG-2004 20:10	0.0	677.4	57.6	545.365	-0.606	44748.0	9184.3	1093.648
8-AUG-2004 20:20	0.0	670.0	56.6	539.355	-0.599	44767.6	9164.7	1094.127
8-AUG-2004 20:30	0.0	662.6	55.7	533.406	-0.593	44787.1	9145.1	1094.605
8-AUG-2004 20:40	0.0	655.3	54.8	527.519	-0.587	44806.6	9125.6	1095.082
8-AUG-2004 20:50	0.0	648.0	53.8	521.692	-0.581	44826.1	9106.2	1095.558
8-AUG-2004 21:00	0.0	640.9	52.9	515.926	-0.575	44845.5	9086.7	1096.032
8-AUG-2004 21:10	0.0	633.8	52.0	510.219	-0.569	44864.9	9067.4	1096.506
8-AUG-2004 21:20	0.0	626.8	51.2	504.570	-0.563	44884.2	9048.0	1096.979
8-AUG-2004 21:30	0.0	619.8	50.3	498.981	-0.558	44903.5	9028.7	1097.451
8-AUG-2004 21:40	0.0	613.0	49.5	493.449	-0.552	44922.8	9009.4	1097.922
8-AUG-2004 21:50	0.0	606.2	48.6	487.975	-0.546	44942.0	8990.2	1098.391
8-AUG-2004 22:00	0.0	599.4	47.8	482.557	-0.540	44961.2	8971.0	1098.860
8-AUG-2004 22:10	0.0	592.8	47.0	477.196	-0.535	44980.3	8951.9	1099.328
8-AUG-2004 22:20	0.0	586.2	46.2	471.891	-0.529	44999.4	8932.8	1099.794
8-AUG-2004 22:30	0.0	579.7	45.4	466.641	-0.524	45018.5	8913.8	1100.260
8-AUG-2004 22:40	0.0	573.2	44.7	461.446	-0.518	45037.5	8894.7	1100.725
8-AUG-2004 22:50	0.0	566.8	43.9	456.305	-0.513	45056.5	8875.8	1101.189
8-AUG-2004 23:00	0.0	560.5	43.2	451.219	-0.507	45075.4	8856.8	1101.652
8-AUG-2004 23:10	0.0	554.2	42.5	446.185	-0.502	45094.3	8837.9	1102.113
8-AUG-2004 23:20	0.0	548.1	41.8	441.205	-0.497	45113.2	8819.1	1102.574
8-AUG-2004 23:30	0.0	541.9	41.1	436.276	-0.492	45132.0	8800.3	1103.034
8-AUG-2004 23:40	0.0	535.9	40.4	431.400	-0.486	45150.8	8781.5	1103.493
8-AUG-2004 23:50	0.0	529.9	39.7	426.575	-0.481	45169.5	8762.7	1103.951
9-AUG-2004 00:00	0.0	524.0	39.0	421.801	-0.476	45188.2	8744.1	1104.407
9-AUG-2004 00:10	0.0	518.1	38.4	417.077	-0.471	45206.8	8725.4	1104.863
9-AUG-2004 00:20	0.0	512.3	37.7	412.404	-0.466	45225.5	8706.8	1105.318
9-AUG-2004 00:30	0.0	506.5	37.1	407.779	-0.461	45244.0	8688.2	1105.772
9-AUG-2004 00:40	0.0	500.9	36.5	403.204	-0.456	45262.6	8669.7	1106.225
9-AUG-2004 00:50	0.0	495.2	35.9	398.678	-0.451	45281.1	8651.2	1106.677
9-AUG-2004 01:00	0.0	489.7	35.3	394.199	-0.447	45299.5	8632.7	1107.128
9-AUG-2004 01:10	0.0	484.2	34.7	389.768	-0.442	45317.9	8614.3	1107.578
9-AUG-2004 01:20	0.0	478.7	34.1	385.385	-0.437	45336.3	8595.9	1108.028
9-AUG-2004 01:30	0.0	473.3	33.5	381.048	-0.433	45354.7	8577.6	1108.476
9-AUG-2004 01:40	0.0	468.0	33.0	376.757	-0.428	45372.9	8559.3	1108.923
9-AUG-2004 01:50	0.0	462.7	32.4	372.512	-0.423	45391.2	8541.0	1109.369
9-AUG-2004 02:00	0.0	457.5	31.9	368.313	-0.419	45409.4	8522.8	1109.815
9-AUG-2004 02:10	0.0	452.4	31.4	364.159	-0.414	45427.6	8504.6	1110.259
9-AUG-2004 02:20	0.0	447.2	30.8	360.049	-0.410	45445.8	8486.5	1110.703
9-AUG-2004 02:30	0.0	442.2	30.3	355.983	-0.405	45463.9	8468.4	1111.145
9-AUG-2004 02:40	0.0	437.2	29.8	351.961	-0.401	45481.9	8450.3	1111.587
9-AUG-2004 02:50	0.0	432.3	29.3	347.982	-0.397	45500.0	8432.3	1112.027
9-AUG-2004 03:00	0.0	427.4	28.8	344.046	-0.393	45517.9	8414.3	1112.467
9-AUG-2004 03:10	0.0	422.5	28.4	340.152	-0.388	45535.9	8396.3	1112.906
9-AUG-2004 03:20	0.0	417.7	27.9	336.300	-0.384	45553.8	8378.4	1113.343
9-AUG-2004 03:30	0.0	413.0	27.4	332.490	-0.380	45571.7	8360.5	1113.780
9-AUG-2004 03:40	0.0	408.3	27.0	328.721	-0.376	45589.5	8342.7	1114.216
9-AUG-2004 03:50	0.0	403.7	26.5	324.993	-0.372	45607.3	8324.9	1114.651

XENON AND SAMARIUM REACTIVITY WORTH PREDICTION

9-AUG-2004 04:00	0.0	399.1	26.1	321.306	-0.368	45625.1	8307.2	1115.085
9-AUG-2004 04:10	0.0	394.6	25.7	317.658	-0.364	45642.8	8289.4	1115.518
9-AUG-2004 04:20	0.0	390.1	25.2	314.050	-0.360	45660.5	8271.7	1115.950
9-AUG-2004 04:30	0.0	385.7	24.8	310.481	-0.356	45678.1	8254.1	1116.382
9-AUG-2004 04:40	0.0	381.3	24.4	306.950	-0.352	45695.7	8236.5	1116.812
9-AUG-2004 04:50	0.0	377.0	24.0	303.458	-0.348	45713.3	8218.9	1117.241
9-AUG-2004 05:00	0.0	372.7	23.6	300.005	-0.344	45730.8	8201.4	1117.670
9-AUG-2004 05:10	0.0	368.4	23.2	296.588	-0.341	45748.3	8183.9	1118.098
9-AUG-2004 05:20	0.0	364.2	22.8	293.210	-0.337	45765.8	8166.4	1118.524
9-AUG-2004 05:30	0.0	360.1	22.5	289.867	-0.333	45783.2	8149.0	1118.950
9-AUG-2004 05:40	0.0	356.0	22.1	286.562	-0.330	45800.6	8131.6	1119.375
9-AUG-2004 05:50	0.0	351.9	21.7	283.293	-0.326	45817.9	8114.3	1119.799
9-AUG-2004 06:00	0.0	347.9	21.4	280.059	-0.322	45835.3	8097.0	1120.222
9-AUG-2004 06:10	0.0	343.9	21.0	276.861	-0.319	45852.5	8079.7	1120.644
9-AUG-2004 06:20	0.0	340.0	20.7	273.698	-0.315	45869.8	8062.5	1121.066
9-AUG-2004 06:30	0.0	336.1	20.3	270.569	-0.312	45887.0	8045.3	1121.486
9-AUG-2004 06:40	0.0	332.3	20.0	267.475	-0.309	45904.1	8028.1	1121.905
9-AUG-2004 06:50	0.0	328.5	19.7	264.415	-0.305	45921.3	8011.0	1122.324
9-AUG-2004 07:00	0.0	324.7	19.3	261.389	-0.302	45938.4	7993.9	1122.742
9-AUG-2004 07:10	0.0	321.0	19.0	258.396	-0.298	45955.4	7976.8	1123.158
9-AUG-2004 07:20	0.0	317.3	18.7	255.436	-0.295	45972.4	7959.8	1123.574
9-AUG-2004 07:30	0.0	313.7	18.4	252.508	-0.292	45989.4	7942.8	1123.989
9-AUG-2004 07:40	0.0	310.1	18.1	249.613	-0.289	46006.3	7925.9	1124.403
9-AUG-2004 07:50	0.0	306.5	17.8	246.750	-0.286	46023.3	7909.0	1124.817
9-AUG-2004 08:00	0.0	303.0	17.5	243.919	-0.282	46040.1	7892.1	1125.229
9-AUG-2004 08:10	0.0	299.5	17.2	241.119	-0.279	46057.0	7875.3	1125.640
9-AUG-2004 08:20	0.0	296.1	17.0	238.349	-0.276	46073.8	7858.5	1126.051
9-AUG-2004 08:30	0.0	292.7	16.7	235.611	-0.273	46090.5	7841.7	1126.461
9-AUG-2004 08:40	0.0	289.3	16.4	232.903	-0.270	46107.3	7825.0	1126.870
9-AUG-2004 08:50	0.0	286.0	16.1	230.225	-0.267	46123.9	7808.3	1127.278
9-AUG-2004 09:00	0.0	282.7	15.9	227.577	-0.264	46140.6	7791.6	1127.685
9-AUG-2004 09:10	0.0	279.4	15.6	224.958	-0.261	46157.2	7775.0	1128.091
9-AUG-2004 09:20	0.0	276.2	15.4	222.368	-0.258	46173.8	7758.4	1128.496
9-AUG-2004 09:30	0.0	273.0	15.1	219.807	-0.255	46190.4	7741.8	1128.901
9-AUG-2004 09:40	0.0	269.9	14.9	217.275	-0.253	46206.9	7725.3	1129.305
9-AUG-2004 09:50	0.0	266.8	14.6	214.770	-0.250	46223.4	7708.9	1129.708
9-AUG-2004 10:00	0.0	263.7	14.4	212.294	-0.247	46239.8	7692.4	1130.109
9-AUG-2004 10:10	0.0	260.7	14.2	209.846	-0.244	46256.2	7676.0	1130.510
9-AUG-2004 10:20	0.0	257.7	13.9	207.424	-0.241	46272.6	7659.6	1130.910

XENON AND SAMARIUM REACTIVITY WORTH PREDICTION

FXS	=	0.836631E+01 (CM(-1) x 10(-2))	- Macro Fission X-Sect
YX	=	0.518772E-02	- XE-135 Yeilds/Fission
YI	=	0.643346E-01	- I-135 Yields/Fission
YP	=	0.172559E-01	- PM-149 Yields/Fission
AXSX	=	0.128266E+02 CM(-1) x 10(-19)	- XE-135 Micro Absorption X-Sect
AXSS	=	0.390157E+00 CM(-1) x 10(-10)	- SM-149 Micro Absorption X-Sect
XWH	=	0.821145E-12 (PCM/XE cm(3)) x 10(-12)	- XE-135 Reactivity Worth
SWH	=	0.244402E-13 (PCM/SM cm(3)) x 10(-12)	- SM-149 Reactivity Worth
ATE	=	0.304604E+05 x 10(-2)	- Fissions/MW Sec
XSIGMA	=	0.987909E+00	- XE-135 Micro X-Sect Correction
XRHO	=	0.980380E+00	- XE-135 Worth/Atom Correction

3.1 REACTIVITY CONTROL SYSTEMS

3.1.1 SHUTDOWN MARGIN (SDM)

LCO 3.1.1 SDM shall be within the limit specified in the COLR.

APPLICABILITY: MODE 2 with $k_{eff} < 1.0$,
MODES 3, 4, and 5.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SDM not within limit.	A.1 Initiate boration to restore SDM to within limit.	15 minutes

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.1.1 Verify SDM is within the limit specified in the COLR.	24 hours

UNIT ONE
REACTOR OPERATING DATA
SECTION 5.3
ARI DIFFERENTIAL BORON WORTH

Source: CNEI-0400-26
Prepared By: M.W. Hawes
Revision Number: 418
Date: 12/11/03

(PCM/PPM)

TEMPERATURE

BURNUP (EFPD)	68	100	150	200	250	300	350	400	450	500	510	520	530	540	550	557
0	-9.30	-9.25	-9.12	-8.95	-8.73	-8.50	-8.23	-7.95	-7.59	-7.22	-7.13	-7.04	-6.96	-6.87	-6.78	-6.72
20	-9.28	-9.23	-9.09	-8.92	-8.70	-8.47	-8.19	-7.92	-7.56	-7.20	-7.11	-7.02	-6.93	-6.83	-6.74	-6.68
40	-9.25	-9.20	-9.06	-8.90	-8.67	-8.44	-8.16	-7.89	-7.54	-7.19	-7.09	-6.99	-6.90	-6.80	-6.70	-6.63
60	-9.23	-9.18	-9.04	-8.87	-8.64	-8.40	-8.13	-7.86	-7.52	-7.17	-7.07	-6.97	-6.87	-6.76	-6.66	-6.59
80	-9.22	-9.17	-9.03	-8.86	-8.63	-8.39	-8.12	-7.85	-7.51	-7.16	-7.06	-6.95	-6.85	-6.75	-6.64	-6.57
100	-9.28	-9.23	-9.08	-8.91	-8.68	-8.44	-8.17	-7.90	-7.53	-7.17	-7.07	-6.97	-6.88	-6.78	-6.68	-6.61
120	-9.33	-9.28	-9.14	-8.96	-8.73	-8.49	-8.22	-7.94	-7.56	-7.18	-7.09	-6.99	-6.90	-6.81	-6.71	-6.65
140	-9.38	-9.33	-9.19	-9.01	-8.78	-8.54	-8.26	-7.99	-7.59	-7.19	-7.10	-7.01	-6.92	-6.84	-6.75	-6.69
160	-9.46	-9.40	-9.26	-9.08	-8.83	-8.59	-8.31	-8.04	-7.63	-7.23	-7.14	-7.06	-6.97	-6.89	-6.81	-6.75
180	-9.55	-9.49	-9.35	-9.17	-8.90	-8.64	-8.36	-8.09	-7.70	-7.30	-7.22	-7.13	-7.05	-6.97	-6.88	-6.82
200	-9.64	-9.58	-9.43	-9.25	-8.97	-8.69	-8.42	-8.14	-7.76	-7.38	-7.29	-7.21	-7.12	-7.04	-6.95	-6.90
220	-9.72	-9.67	-9.52	-9.33	-9.04	-8.75	-8.47	-8.19	-7.82	-7.46	-7.37	-7.29	-7.20	-7.11	-7.03	-6.97
240	-9.81	-9.76	-9.61	-9.42	-9.11	-8.80	-8.52	-8.24	-7.89	-7.53	-7.45	-7.36	-7.27	-7.19	-7.10	-7.04
260	-9.91	-9.85	-9.70	-9.51	-9.20	-8.89	-8.60	-8.32	-7.97	-7.62	-7.53	-7.45	-7.36	-7.28	-7.19	-7.13
280	-10.00	-9.94	-9.79	-9.60	-9.30	-9.00	-8.71	-8.43	-8.08	-7.72	-7.64	-7.55	-7.46	-7.37	-7.29	-7.23
300	-10.10	-10.03	-9.88	-9.69	-9.40	-9.11	-8.82	-8.53	-8.18	-7.83	-7.74	-7.65	-7.56	-7.47	-7.39	-7.32
320	-10.20	-10.13	-9.97	-9.78	-9.50	-9.22	-8.93	-8.64	-8.28	-7.93	-7.84	-7.75	-7.66	-7.57	-7.48	-7.42
340	-10.29	-10.22	-10.07	-9.87	-9.60	-9.33	-9.04	-8.75	-8.39	-8.03	-7.94	-7.85	-7.76	-7.67	-7.58	-7.52
360	-10.42	-10.35	-10.19	-10.00	-9.73	-9.46	-9.17	-8.87	-8.51	-8.15	-8.06	-7.97	-7.88	-7.79	-7.70	-7.63
380	-10.57	-10.50	-10.34	-10.14	-9.88	-9.61	-9.31	-9.01	-8.64	-8.28	-8.19	-8.10	-8.00	-7.91	-7.82	-7.76
400	-10.73	-10.66	-10.50	-10.30	-10.02	-9.75	-9.45	-9.15	-8.78	-8.41	-8.32	-8.23	-8.13	-8.04	-7.95	-7.89
420	-10.88	-10.82	-10.65	-10.45	-10.17	-9.89	-9.59	-9.29	-8.92	-8.54	-8.45	-8.36	-8.26	-8.17	-8.08	-8.01
440	-11.03	-10.97	-10.81	-10.59	-10.32	-10.04	-9.73	-9.43	-9.05	-8.67	-8.58	-8.49	-8.39	-8.30	-8.20	-8.14
460	-11.20	-11.14	-10.97	-10.76	-10.48	-10.20	-9.89	-9.58	-9.20	-8.81	-8.71	-8.61	-8.51	-8.41	-8.31	[illegible]
480	-11.39	-11.32	-11.15	-10.94	-10.65	-10.37	-10.06	-9.75	-9.35	-8.95	-8.84	-8.73	-8.63	-8.52	-8.41	-8.33
509	-11.65	-11.58	-11.41	-11.20	-10.90	-10.61	-10.30	-9.99	-9.57	-9.15	-9.03	-8.91	-8.79	-8.67	-8.55	-8.46
524	-11.79	-11.72	-11.54	-11.33	-11.04	-10.74	-10.43	-10.11	-9.68	-9.26	-9.13	-9.00	-8.88	-8.75	-8.62	-8.53
539	-11.94	-11.87	-11.69	-11.47	-11.18	-10.88	-10.56	-10.24	-9.79	-9.33	-9.20	-9.07	-8.95	-8.82	-8.69	-8.60

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

NOTI

Source: CNEI-0400-26, C1C15 SOR
Prepared By: MW Hawes
Revision Number: 416
Date: 11/17/03
Page 2 of 2

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	1594	1591	1587	1583	1577	1570	1561	1549	1536	1522	1505	1483	1454	1418	1372	1358
20	1608	1606	1604	1601	1596	1590	1582	1572	1560	1547	1530	1509	1482	1448	1406	1392
40	1617	1616	1615	1613	1609	1603	1596	1587	1576	1564	1548	1528	1502	1469	1429	1416
60	1621	1621	1621	1619	1616	1611	1604	1596	1585	1573	1559	1539	1514	1482	1443	1430
80	1620	1621	1621	1620	1617	1612	1606	1598	1587	1576	1562	1543	1518	1487	1448	1435
100	1615	1616	1616	1615	1612	1608	1601	1593	1582	1572	1558	1540	1515	1484	1444	1431
120	1604	1606	1606	1605	1602	1597	1591	1582	1572	1562	1548	1529	1504	1472	1432	1418
140	1589	1590	1590	1589	1586	1581	1574	1566	1555	1545	1531	1512	1487	1453	1411	1397
160	1567	1569	1569	1567	1564	1559	1552	1543	1532	1521	1507	1487	1461	1426	1382	1368
180	1541	1542	1542	1540	1537	1532	1524	1515	1503	1491	1476	1455	1427	1391	1345	1330
200	1509	1510	1510	1508	1504	1499	1491	1481	1469	1456	1440	1417	1388	1350	1301	1286
220	1474	1474	1474	1471	1468	1462	1454	1443	1430	1416	1398	1374	1343	1302	1252	1236
240	1435	1435	1434	1431	1427	1421	1412	1401	1386	1371	1352	1326	1293	1250	1197	1180
260	1393	1392	1390	1387	1383	1376	1366	1354	1339	1323	1302	1274	1239	1194	1139	1121
280	1348	1347	1345	1341	1335	1327	1317	1304	1287	1270	1248	1219	1182	1136	1078	1060
300	1301	1299	1296	1292	1285	1276	1265	1250	1233	1214	1191	1161	1122	1074	1014	995
320	1251	1249	1245	1240	1232	1222	1210	1194	1175	1156	1131	1099	1059	1009	947	927
340	1199	1196	1192	1186	1177	1166	1153	1136	1116	1095	1069	1036	994	942	878	858
360	1145	1141	1136	1130	1120	1108	1094	1076	1054	1033	1006	971	928	872	804	782
380	1088	1085	1079	1072	1062	1049	1034	1015	992	970	942	906	860	801	727	703
400	1031	1027	1021	1012	1002	989	972	953	929	906	877	839	791	729	651	626
420	973	968	961	952	941	927	910	889	865	841	811	771	721	657	578	553
440	914	908	901	892	880	865	847	826	800	775	742	702	651	588	511	486
460	855	848	840	830	818	803	784	762	736	707	673	631	581	521	450	428
480	796	789	780	769	756	740	721	698	671	638	601	559	511	458	399	382
509	711	703	694	682	668	651	630	606	578	538	496	453	412	375	344	337
524	667	659	649	638	623	605	584	559	530	486	440	398	362	337	326	326
539	623	616	606	594	579	561	539	513	483	433	384	342	313	302	316	325

NOTES: **1) Tech Spec Refueling boron concentration is 2700 ppmB (per C1C15 COLR)**

2) Fill and Vent Boron concentration is 1584 ppmB.

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

NRC –SRO-2/Admin

Determine the availability of operators to meet proper staffing levels.

CANDIDATE ____

EXAMINER ____

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Determine the availability of operators to meet proper staffing levels.

Alternate Path: N/A

Facility JPM #: NEW

K/A Rating(s): Generic KA 2.1.4 (2.3/3.4)

Task Standard:

Candidate determines that Reactor operator #1 has to stay, the Senior Reactor Operator must stay but cannot be the Fire Brigade Captain, and the NLO must stay and be the Fire Brigade Captain.

Preferred Evaluation Location: Simulator X In-Plant _____

Preferred Evaluation Method: Perform X Simulate _____

References:
OMP 1-10 (Shift Manning and Overtime Requirements)
Selected License Commitments 16.13-1 (Fire Brigade)
Selected License Commitments 16.13-4 (Minimum Station staffing Requirements)

Validation Time: 10 min. **Time Critical:** No

==

Candidate: ________________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ________________________ ________________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

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 in Mode 1 at 100% power.
Unit 2 is in Mode 5 at 150 °F.

INITIATING CUE:

Today is October 4, at 1745. Night shift is beginning to conduct turnover from dayshift.

The following is a list of night shift personnel who reported for night shift:

1. Two (2) Reactor operators. Both operators have an active license and are Fire Brigade Captain qualified.
2. One (1) Senior Reactor Operator with an inactive license and is not Fire Brigade Captain qualified.
3. One (1) Operations Shift Manager with an active license and is not Fire Brigade Captain qualified.
4. One (1) Shift Work Manager (STA) with an inactive license and is not Fire Brigade Captain qualified
5. All other shift members reported to work; however, none are Fire Brigade Captain qualified.

The missing individuals will arrive 4 hours from now.

Using the status of the off going dayshift individuals, determine which personnel will be required to stay beyond their dayshift scheduled time and fill any empty positions for night shift without using extension approvals. (See attached personnel status sheet).

STEP 1	The Candidate reviews the available operator information and determines the following:	**CRITICAL STEP**
STANDARD:	RO #1 must stay and fill in a Reactor Operator required positions. (SLC 16.13-4). RO #2 cannot stay without getting an extension. The SRO who showed cannot be the Control Room SRO. The dayshift shift SRO must stay and stay in the control room at all times (SLC 16.13-4), so he cannot be the Fire Brigade Captain The NLO is the only available Fire Brigade Captain and must stay after.	___SAT ___UNSAT
COMMENTS:		
	This JPM is complete	

TIME STOP: ________

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

INITIAL CONDITIONS:

Unit 1 is in Mode 1 at 100% power.
Unit 2 is in Mode 5 at 150 °F.

INITIATING CUE:

Today is October 4, at 1745. Night shift is beginning to conduct turnover from dayshift.

The following is a list of night shift personnel who reported for night shift:

1. Two (2) Reactor operators. Both operators have an active license and are Fire Brigade Captain qualified.
2. One (1) Senior Reactor Operator with an inactive license and is not Fire Brigade Captain qualified.
3. One (1) Operations Shift Manager with an active license and is not Fire Brigade Captain qualified.
4. One (1) Shift Work Manager (STA) with an inactive license and is not Fire Brigade Captain qualified
5. All other shift members reported to work; however, none are Fire Brigade Captain qualified.

The missing individuals will arrive 4 hours from now.

Using the status of the off going dayshift individuals, determine which personnel will be required to stay beyond their dayshift scheduled time and fill any empty positions for night shift without using extension approvals. (See attached personnel status sheet).

Personnel Status Sheets

The following is the work history (excluding shift turnover time) of the off going operators who agreed to stay over if required.

Their work always began at 0600 each day and all the operators did receive a break of at least 8 hours occurred between all work periods.

DAY	1	2	3	4	5	6	7	8 (today)
RO #1	0	0	12	12	12	12	12	8
RO #2	0	0	12	12	12	12	12	12
NLO #1 Note 2	0	0	0	0	12	12	12	8
SRO #1 Note 1,2	0	0	0	0	12	12	12	8

Note 1: SRO #1 has been on medical leave from June 1st to September 17th of this year. Assume today's date is October 4th, 2004. His work history from September 18-30 was 8-12 hour shifts to reactivate his license. All other medical requirements were verified by medical. On October 1, the license reactivation was signed by the Shift Operation Manager.

Note 2: NLO #1 and SRO #1 are the only Fire Brigade Captain qualified individuals on site.

16.13 CONDUCT OF OPERATIONS

16.13-4 Minimum Station Staffing Requirements

COMMITMENT Minimum station staffing shall be as indicated in Table 16.13-4-1.

APPLICABILITY: According to Table 16.13-4-1.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Minimum station staffing requirements not met.	A.1 Initiate action to fill required positions. AND A.2 Restore minimum station staffing levels.	Immediately 2 hours

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.13-4-1 Verify station staffing levels.	12 hours

Table 16.13-4-1

Minimum Station Staffing Requirements

POSITION	BOTH UNITS IN MODES 1-4	ONE UNIT IN MODES 1-4	BOTH UNITS IN MODES 5, 6, OR NO MODE
Operations Shift Manager (OSM)	1	1	1
Shift Technical Advisor (STA)	1	1	1
Senior Reactor Operator (SRO)(1)(2)(3)	2	2	1
Reactor Operator (RO)(1)(4)	3	3	2
Non-Licensed Operator (NLO)(1)	5	5	4
Chemistry Technician	1	1	1
Radiation Protection Technician	3	3	3
Mechanical Maintenance Technician	1	1	1
Instrumentation and Electrical Technician	2	2	2
Medical Emergency Response Team (MERT)	2	2	2
Security Personnel	Per Security Plan	Per Security Plan	Per Security Plan

(1) Either a SRO (active or inactive), RO, or other designated personnel (NLO) may be designated as the fire brigade leader. The totals for the appropriate position shall be increased by one, depending upon which position is being used to fulfill the role of fire brigade leader.

(2) In addition to these requirements, during CORE ALTERATIONS (including fuel loading or transfer), a SRO or SRO limited to fuel handling shall be present to directly supervise the activity. During this time, no other duties shall be assigned to this person.

(3) With any unit in MODES 1-4, a SRO shall be present in the control room at all times.

(4) For each fueled unit, a RO shall be present at the controls at all times.

BASES

The requirements of this SLC consolidate Catawba station staffing requirements into one document. This SLC includes the unit staff requirements of the Catawba Facility Operating Licenses, Technical Specification (TS) 5.2.2, 10 CFR 50.54(m), applicable Operations Management Procedures (OMPs), Nuclear System Directive (NSD) 112, "Fire Brigade Organization, Training and Responsibilities," the Catawba Fire Protection Program, the Catawba Emergency Plan, and SLC 16.13-1, "Fire Brigade." The total requirement for each position was obtained by summing the various individual requirements for that position. The bases for the numbers in the first column of Table 16.13-4-1 are as follows:

1 OSM (active SRO) – Required by 10 CFR 50.54(m)(2)(ii) and implemented via OMP.

1 STA (active or inactive SRO) – Required by TS 5.2.2g, which indicates that the individual fulfilling the STA position is the Shift Work Manager, and implemented via OMP. Note that old TS (pre-Improved TS) Table 6.2-1, which implemented the requirements of NUREG-0737, "Clarification of TMI Action Plan Requirements," did not require an STA on shift when both units were in MODE 5, 6, or defueled. Table 16.13-4-1 is more restrictive in that it requires an STA on shift at all times.

2 SROs (active SRO) – Required by 10 CFR 50.54(m)(2)(i). Per TS 5.2.2b and 10 CFR 50.54(m)(2)(iii), at least 1 SRO must be in the control room.

3 ROs – Required by 10 CFR 50.54(m)(2)(i).

3 NLOs – Required by TS 5.2.2a and Section B, Figure B-1 of the Emergency Plan and implemented via OMP.

2 NLOs – Required by the Fire Protection Program and implemented via NSD and OMP.

Fire Brigade Leader – Required by the Catawba Facility Operating Licenses and Fire Protection Program and implemented via NSD and OMP. The individual fulfilling this position shall be a SRO, RO, or other designated personnel (NLO) who is qualified to be a fire brigade leader. This individual functions as the fire brigade leader and is not available for other activities when directing the fire brigade. No regulations explicitly specify that the fire brigade leader be a SRO or RO. However, the fire brigade leader shall have sufficient training in or knowledge of plant safety related systems to understand the effects of a fire and fire suppression systems on safe shutdown capability.

1 Chemistry Technician (ERO) – Required by Section B, Figure B-1 of the Emergency Plan. Implemented via EP Group Manual Guideline 5.1.3. Any technician who is qualified may be credited towards fulfilling the ERO requirement.

BASES (continued)

3 Radiation Protection Technicians (2 technicians and 1 off-site dose assessor) (ERO) – Required by Section B, Figure B-1 of the Emergency Plan. Implemented via EP Group Manual Guideline 5.1.3. 1 is required by TS 5.2.2d and may be counted towards fulfilling the ERO requirement. Any technician who is qualified may be credited towards fulfilling the ERO requirement. In the event of a fire, the technician will respond to the fire for radiological monitoring purposes until directed otherwise.

1 Mechanical Maintenance Technician (ERO) – Required by Section B, Figure B-1 of the Emergency Plan. Implemented via EP Group Manual Guideline 5.1.3. Any technician who is fire brigade qualified may be credited towards fulfilling the ERO requirement and the fire brigade requirement. In the event of a fire, the technician will respond to the fire until directed otherwise.

2 Instrumentation and Electrical Technicians (ERO) – Required by Section B, Figure B-1 of the Emergency Plan. Implemented via EP Group Manual Guideline 5.1.3. Any technician who is fire brigade qualified may be credited towards fulfilling the ERO requirement and the fire brigade requirement. In the event of a fire, the technician will respond to the fire until directed otherwise.

2 MERT (ERO) – Required by Section B, Figure B-1 of the Emergency Plan. Implemented via EP Group Manual Guideline 5.1.3. Any technician who is qualified may be credited towards fulfilling the ERO requirement. In the event of a fire, the technician will respond to the fire for security purposes until directed otherwise.

Minimum station staffing totals for the SRO and RO positions in Table 16.13-4-1 are a function of the number of units in MODES 1-4. The totals for the remaining positions in Table 16.13-4-1 are not a function of the operational MODES of the units.

10 CFR 50.54(m)(2)(i) requires 2 SROs when both units are in MODES 1-4, 2 SROs when one unit is in MODES 1-4, and 1 SRO when no units are in MODES 1-4.

10 CFR 50.54(m)(2)(i) requires 3 ROs when both units are in MODES 1-4, 3 ROs when one unit is in MODES 1-4, and 2 ROs when no units are in MODES 1-4.

The primary purpose of the Fire Protection Program is to minimize both the probability and consequence of postulated fires. Despite designed active and passive fire protection systems installed throughout the plant, a properly trained and equipped fire brigade organization of at least 5 members is required to provide immediate response to fires that may occur at the site. The fire brigade requirement is met by using personnel from Operations and

BASES (continued)

SPOC. 3 personnel from Operations are required (including the fire brigade leader) and the other 2 personnel are from SPOC.

The 2-hour REMEDIAL ACTION for restoring minimum station staffing levels is consistent with TS 5.2.2c and 5.2.2d, which allow 2 hours to accommodate unexpected absence of on-duty shift crew members provided immediate action is taken to restore the shift crew composition to within the minimum requirements.

REFERENCES

1. Catawba Facility Operating Licenses for Units 1 and 2, NPF-35 and NPF-52.
2. Catawba TS 5.2.2.
3. 10 CFR 50.54(m).
4. OMP 1-10, "Shift Manning and Overtime Requirements."
5. NSD 112, "Fire Brigade Organization, Training and Responsibilities."
6. CNS-1465.00-00-0006, "Plant Design Basis Specification for Fire Protection."
7. Catawba Emergency Plan.
8. SLC 16.13-1, "Fire Brigade."
9. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports For Nuclear Power Plants, LWR Edition," Section 9.5.1C3.
10. EP Group Manual Guideline 5.1.3.

16.13 CONDUCT OF OPERATIONS

16.13-1 Fire Brigade

COMMITMENT

---NOTE---
The Fire Brigade shall not include three members of the minimum shift crew necessary for safe shutdown of the unit(s) and any personnel required for other essential functions during a fire emergency.

A site Fire Brigade of at least five members shall be maintained onsite.

APPLICABILITY: At all times.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Fire Brigade composition requirements not met.	A.1 Initiate action to fill required positions.	Immediately
	AND	
	A.2 Restore minimum Fire Brigade composition.	2 hours

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.13-1-1 Verify Fire Brigade composition.	12 hours

BASES The primary purpose of the Fire Brigade Training Program is to develop a group of station employees skilled in fire prevention, fire fighting techniques, first aid procedures, and emergency response. They are trained and equipped to function as a team for the fighting of fires. The station Fire Brigade organization is intended to be self-sufficient with respect to fire fighting activities.

BASES (continued)

The Fire Brigade Training Program provides for initial training of all new Fire Brigade members, quarterly classroom training and drills, annual practical training, and leadership training for Fire Brigade leaders.

This SLC is part of the Catawba Facility Operating License Conditions #8 for NPF-35 and #6 for NPF-52.

REFERENCES

1. Catawba UFSAR, Chapter 13.2.
2. Catawba SER, Section 9.5.1 and Appendix D.
3. Catawba Fire Protection Review, as revised.
4. Catawba Fire Protection Commitment Index.
5. Operations Management Procedure 1-10.

Duke Power Company Catawba Nuclear Station **Shift Manning and Overtime Requirements** **Information Use**	Procedure No. **OMP 1-10** Revision No. **026** Electronic Reference No. **CP0094HX**

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

ISSUED

Approval ____________________________

Rev 26 Date ________________________

DUKE POWER COMPANY

CATAWBA NUCLEAR STATION

SHIFT MANNING AND OVERTIME REQUIREMENTS

1. Purpose

To provide guidance for shift manning requirements to ensure compliance with regulations and enhance the safe operation of Catawba Nuclear Station.

2. References

2.1. 10CFR50.54 (m), 10CFR55

2.2. ANSI/ANS-3.4-1983 (Medical Certification and Monitoring of Personnel Requiring Operator License for Nuclear Plants)

2.3. UFSAR 1.8 (Response to TMI Concerns)

2.4. Technical Specifications, Section 5.2.2 (Unit Staff)

2.5. SLC 16.13-1 (Fire Brigade)

2.6. SLC 16.13-4 (Minimum Station Staffing Requirements)

2.7. NSD 112 (Fire Brigade Organization, Training and Responsibilities)

2.8. NSD 117 (Emergency Response Organization, Training, and Responsibilities)

2.9. NSD 200 (Overtime Control)

2.10. OMP 2-22 (Shift Turnover)

2.11. CNS Emergency Plan

3. Description

3.1. This procedure identifies the:

- Administrative Shift Manning Requirements
- Fire Brigade Manning Requirements

3.2. This procedure states the Operations overtime policy.

4. Responsibilities

4.1. The Operations Shift Manager (OSM) shall ensure the administrative shift manning requirements are met.

4.2. The Shift Operations Manager (SOM)/Operations Shift Manager (OSM) shall be responsible for scheduling relief for shift personnel.

5. Reporting Requirements

5.1. Inability to meet the shift manning requirements per Step 6.1 and 6.3 shall be reported to:

A. SOM or his designee, and

B. Safety Assurance Group.

6. Guidelines

NOTE:	Any deviation from the provisions of this procedure may result in a violation of Tech Specs and SLCs. Tech Specs and SLCs shall be reviewed prior to any deviation from this procedure.

6.1. Shift Manning During Normal Operations

A. The on duty shift should be comprised of the administrative shift manning requirements listed in Enclosure 7.1. These numbers include the requirements of Tech Spec 5.2.2 (Unit Staff), SLC 16.13-1 (Fire Brigade), and 16.13-4 (Minimum Station Staffing Requirements) plus an extra SRO, RO, and NLO. This establishes administrative minimums.

B. Three (3) active licensed SROs (one being the OSM) must be present on shift at all times. This ensures adequate Control Room supervision should a dual unit event occur.

C. A Nuclear Shift Supervisor may serve as an OSM in the event the OSM becomes incapacitated and an ETQS qualified OSM is unavailable providing immediate action is taken to call in a relief OSM.

D. The OSM will <u>not</u> serve as the CR SRO, except in emergency relief situations (sickness, restroom breaks <u>not</u> to exceed 15 minutes, etc.). When these situations arise, relief will be called in to remove the OSM from this assignment as soon as practical.

E. During startup, scheduled shutdown or recovery from a reactor trip, two (2) NCOs shall be in the Control Room for the affected unit.

F. During activities which have a high risk of causing a plant transient, four (4) NCOs shall be in the Control Room. (PIP C-03-00541)

6.2. Shift Manning During Emergency Operations

A. Refer to NSD 117 (Emergency Response Organization, Training, and Responsibilities).

B. Refer to CNS Emergency Plan.

- The Offsite Communicator shall respond to the Control Room to ensure required notifications are completed.
- The Offsite Communicator shall not be concurrently assigned as Primary Fire Brigade Member.

6.3. Fire Brigade Manning Requirements

A. Fire Brigade member minimum requirements are derived from NSD 112 (Fire Brigade Organization, Training and Responsibilities).

B. Five (5) Fire Brigade qualified individuals shall be designated as first responders. These five shall include the Fire Brigade Leader, who shall be an Operations person, and two individuals from Operations. The other two members may be from SPOC.

C. First responders shall be able to respond within a reasonable time to a fire event. Fire Brigade members can be assigned other duties, but shall not be assigned work that would prevent them from responding in a timely manner.

D. Fire Brigade first responders shall not be part of the minimum shift crew necessary for safe shutdown.

E. Three (3) additional Fire Brigade qualified individuals shall be designated as supplemental brigade members. These members are a requirement of NSD 112 (Fire Brigade Organization, Training and Responsibilities). Two of the members should be from Operations and the third from SPOC.

F. The supplemental Fire Brigade members can have other duties that would preclude them from being able to respond with the first responders. They shall respond as quickly and safely as possible.

G. It is acceptable to use any combination of OPS/SPOC, provided the Fire Brigade Leader and two other members from Operations are designated as the required first responders.

H. Each Fire Brigade member will be logged on the Shift Assignment Sheet per OMP 2-22 (Shift Turnover).

I. All Fire Brigade members shall wear a Fire Brigade beeper at all times. If for any reason the beeper can not be worn, an alternative means of contacting the member must exist.

6.4. Fire Brigade Drills

A. All Fire Brigade members are expected to respond as if it were a real event meeting the criteria of Step 6.3.

B. All members shall report to the fire scene fully dressed in their fire brigade uniform. If for any reason a fire brigade member can not respond, they should notify the Control Room immediately. A replacement decision will be made by the Control Room staff.

6.5. Overtime Policy

Operations overtime policy is seniority. This seniority is defined as time with Duke Energy Company. The OSM, at his discretion, may elect to mandate overtime to a more experienced operator due to plant conditions. Experience is defined as time in position.

7. Enclosures

7.1. Shift Manning Requirements

Enclosure 7.1
Administrative Shift Manning Requirements

Position	Both Units in Modes 1, 2, 3, 4 (Number Required)	One Unit in Mode 1-4 AND One Unit in Mode 5, 6 (Number Required))	Both Units in Modes 5, 6 (Number Required)
Operations Shift Manager (SRO) *+	1	1	1
Nuclear Shift Supervisor (SRO) * +	3	3	2
NCO (RO) * +	4(a)	4(a)	3(a)
NLO	6(a)	6(a)	5(a)
STA +	1	1	1
Fuel Handling Supv. (SRO) +	0	##	##
Fire Brigade Member +	8(b)	8(b)	8(b)

* One of these individuals must assume the Control Room Command Function.

\## One required for each unit in Mode 6 during Core Alterations. This individual shall have no other concurrent responsibilities, possess an Active SRO License and be present in the Reactor Building to supervise fuel handling activities.

(a) At least one of the required individuals must be assigned to the designated position for each unit.

\+ Shall be clean shaven with respiratory and SCBA qualifications up-to-date.

(b) The three NLOs assigned to safe shutdown positions shall not be included as Fire Brigade first responders.

Changes to SRO-3 evaluate a request to perform maintenance during an outage period.

Based on Catawba Technical Specification 3.8.2 (A.C Sources -- Shutdown) 1B diesel generator can be tagged for maintenance.

Page 2: updated the Task Standard to say that Technical Specifications will allow the diesel maintenance to occur. Removed the word "not".

Page 4 JPM step 1: corrected the bullet for 1B diesel generator refurbishment to a **"YES"**

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

NRC –SRO-3/Admin

Evaluate a request to perform maintenance during an outage period.

CANDIDATE ______________________________

EXAMINER ______________________________

**CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE**

Task: Evaluate a request to perform maintenance during an outage period.

Alternate Path: N/A

Facility JPM #: NEW

K/A Rating(s): Generic KA 2.2.18 (2.3/3.6)

Task Standard:

Candidate determines the unit is in a Mode 5 High Decay Heat; Loops Not filled condition, determines that Tech Specs will allow the diesel generator maintenance, and Site Directives 3.1.30 Section 5.2 will not allow KC pump and diesel maintenance.

Preferred Evaluation Location:

Simulator __X__ In-Plant _____

Preferred Evaluation Method:

Perform __X__ Simulate _____

References:
Site Directive 3.1.30 (Shutdown Risk Management (Modes 4, 5, 6, and No-Mode))
Technical Specifications 3.8.2, 3.7.7
Selected License Commitments 16.9-11

Validation Time: 10 min. **Time Critical:** No

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Candidate: ____ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT _______ UNSAT ______ Performance Time _______

Examiner: _____________________________ __________________________/_______
NAME SIGNATURE DATE

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COMMENTS

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 in day 5 of a refueling outage. A status sheet on Unit 1 equipment is attached.
Unit 2 is in Mode 1 at 100% power.

INITIATING CUE:

You are the WCCSRO reviewing 3 of the day's work list items:

- Boric Acid (BAT) storage tank is to be isolated to replace an outlet isolation valve.
- 1A1 KC pump will be shutdown and tagged to replace inboard pump bearing RTD.
- 1B diesel generator will be tagged out for refurbishment as part of the "B" Train Main power work items.

You are to consider the following:

1. Determine the current plant status of Unit 1 per Section 4 of Site Directive 3.1.30
2. For each maintenance item state which Technical Specifications/Selected License Commitments requirements applies and then determine if the work can begin.
3. For each maintenance item determine decide whether or not you can allow the maintenance based Site Directive 3.1.30, Recommended Equipment for Shutdown Evolutions.

<table>
<tr><td>STEP 1: The Candidate reviews the available information and determines the following:
1. Determine the current plant status of Unit 1 per Section 4 of Site Directive 3.1.30.
2. For each maintenance item determine decide whether or not you <u>can allow</u> the maintenance based on Technical Specifications/Selected License Commitments requirements.
3. For each maintenance item determine decide whether or not you <u>can allow</u> the maintenance based Site Directive 3.1.30, Recommended Equipment for Shutdown Evolutions.

STANDARD:

Candidate determines each of the following items:
1. Site Directive 3.1.30 Section 4: Mode 5, Heat Decay Heat, Loops not Filled.
2. Can the maintenance be allowed per Technical Specification or Selected License Commitments (SLC) on the following equipment?
• Boric Acid Storage Tank Isolation: YES per SLC 16.9-11
• 1A1 KC pump shutdown and tagged: YES per T.S 3.7.7
• 1B Diesel Generator Refurbishment: YES per T.S. 3.8.2
3. Can the maintenance be allowed per Site Directive 3.1.30, Recommended Equipment for Shutdown Evolutions?
• Boric Acid Storage Tank Isolation: YES
• 1A1 KC pump shutdown and tagged: NO (required for ND)
• 1B Diesel Generator Refurbishment: NO (required for ND)

COMMENTS:</td><td>CRITICAL STEP

___SAT

___UNSAT</td></tr>
<tr><td>This JPM is complete</td><td></td></tr>
</table>

TIME STOP: ________

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

INITIAL CONDITIONS:

Unit 1 is in day 5 of a refueling outage. A status sheet on Unit 1 equipment is attached.
Unit 2 is in Mode 1 at 100% power.

INITIATING CUE:

You are the WCCSRO reviewing 3 of the day's work list items:

- Boric Acid (BAT) storage tank is to be isolated to replace an outlet isolation valve.
- 1A1 KC pump will be shutdown and tagged to replace inboard pump bearing RTD.
- 1B diesel generator will be tagged out for refurbishment as part of the "B" Train Main power work items.

You are to consider the following:

1. Determine the current plant status of Unit 1 per Section 4 of Site Directive 3.1.30
2. For each maintenance item state which Technical Specifications/Selected License Commitments requirements applies and then determine if the work can begin.
3. For each maintenance item determine decide whether or not you can allow the maintenance based Site Directive 3.1.30, Recommended Equipment for Shutdown Evolutions.

Unit 1 Pant Status, 0700 Outage day 5

Unit 1: Mode 5, NC system temperature 165 °F

- Reactor Coolant System level drained to 28%
- 1A and 1B ND Trains in service maintaining current temperature.
- 1A and 2B RN pumps in service
- 1A1 and 1B1 KC pumps in service
- 1A NV pump in service

NC Boron concentration 2950 ppm

Equipment Inoperable

1B NV pump
1A NI pump
1B NI pump
"B" Train Offsite Power
1B2 KC pump
1B Boric Acid Transfer pump
1B Reactor Makeup Water Pump
Boron Dilution Mitigation both trains

Makeup and Inventory Control System Status
Operable BAT; 7500 ppm boron
Operable FWST; 2800 ppm boron

Other System Status

- Two trains of Source Range Instruments
- Containment Closure established with 3 exceptions
- Equipment Hatch is closed
- Fire Protection and Detection operable per Selected License Commitments 16.9-6 and 16.9-2.
- Steam Generators in wet lay-up

16.9 AUXILIARY SYSTEMS

16.9-11 Boration Systems Borated Water Source - Shutdown

COMMITMENT One of the following borated water sources shall be OPERABLE:

a. A Boric Acid Tank (BAT) with:

1) A minimum contained borated water volume as specified in the CORE OPERATING LIMITS REPORT (COLR),

2) A minimum boron concentration as specified in the COLR, and

3) A minimum solution temperature of 65°F,

OR

b. The Refueling Water Storage Tank (RWST) with:

1) A minimum contained borated water volume as specified in the COLR,

2) A minimum boron concentration as specified in the COLR, and

3) A minimum solution temperature of 70°F.

APPLICABILITY: MODE 4 with any Reactor Coolant System (RCS) cold leg temperature ≤ 210°F,
MODES 5 and 6.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required Boration System Borated Water Source inoperable.	A.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2 Suspend operations that would cause introduction of coolant into the RCS, with boron concentration less than required to meet the SHUTDOWN MARGIN of Technical Specification LCO 3.1.1 and maintain k_{eff} < 0.99, or required boron concentration.	Immediately

TESTING REQUIREMENTS

TEST		FREQUENCY
TR 16.9-11-1	Verify that the RWST solution temperature is ≥ 70°F when the outside air temperature is < 70°F.	24 hours, when the RWST is the source of borated water
TR 16.9-11-2	Verify that the BAT solution temperature is ≥ 65°F.	7 days, when the BAT is the source of borated water
TR 16.9-11-3	Verify that the boron concentration of the required borated water source is within the limits specified in the COLR.	7 days
TR 16.9-11-4	Verify that the borated water volume of the required borated water source is within the limits specified in the COLR.	7 days

3.7 PLANT SYSTEMS

3.7.7 Component Cooling Water (CCW) System

LCO 3.7.7 Two CCW trains shall be OPERABLE*.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One CCW train inoperable.	A.1 -------------NOTE------------- Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops—MODE 4," for residual heat removal loops made inoperable by CCW. ----------------------------------- Restore CCW train to OPERABLE status.	 72 hours*
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

*For each Unit, the Completion Time that CCW train 'A' can be inoperable, as specified by Required Action A.1 may be extended beyond the 72 hours up to 168 hours as part of the NSWS system upgrades. System upgrades include maintenance and modification activities associated with replacement of portions of the train 'A' NSWS piping via modification CE-71424. Upon completion of the pipe replacement and system restoration this footnote is no longer applicable.

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.7.7.1	-------------------------------------NOTE--------------------------- Isolation of CCW flow to individual components does not render the CCW System inoperable. --- Verify each CCW manual, power operated, and automatic valve in the flow path servicing safety related equipment, that is not locked, sealed, or otherwise secured in position, is in the correct position.	 31 days
SR 3.7.7.2	Verify each CCW automatic valve in the flow path servicing safety related equipment that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	18 months
SR 3.7.7.3	Verify each CCW pump starts automatically on an actual or simulated actuation signal.	18 months

3.8 ELECTRICAL POWER SYSTEMS

3.8.2 AC Sources—Shutdown

LCO 3.8.2 The following AC electrical power sources shall be OPERABLE:

a. One qualified circuit between the offsite transmission network and the Onsite Essential Auxiliary Power distribution system required by LCO 3.8.10, "Distribution Systems—Shutdown"; and

b. One diesel generator (DG) capable of supplying one train of the Onsite Essential Auxiliary Power distribution system required by LCO 3.8.10.

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required offsite circuit inoperable.	------------------NOTE------------------ Enter applicable Conditions and Required Actions of LCO 3.8.10, with one required train de-energized as a result of Condition A. --	
	A.1 Declare affected required feature(s) with no offsite power available inoperable.	Immediately
	<u>OR</u>	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>	
		(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
	A.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or required boron concentration.	Immediately
	AND	
	A.2.4 Initiate action to restore required offsite power circuit to OPERABLE status.	Immediately
B. One required DG inoperable.	B.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	B.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
	B.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or required boron concentration.	Immediately
	AND	
	B.4 Initiate action to restore required DG to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.2.1	-----NOTE----- The following SRs are not required to be performed: SR 3.8.1.3, SR 3.8.1.9, SR 3.8.1.10, SR 3.8.1.11, SR 3.8.1.13, SR 3.8.1.14, SR 3.8.1.15, SR 3.8.1.16, and SR 3.8.1.18. ---------- For AC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.1.1 SR 3.8.1.6 SR 3.8.1.13 SR 3.8.1.2 SR 3.8.1.7 SR 3.8.1.14 SR 3.8.1.3 SR 3.8.1.9 SR 3.8.1.15 SR 3.8.1.4 SR 3.8.1.10 SR 3.8.1.16 SR 3.8.1.5 SR 3.8.1.11 SR 3.8.1.18	In accordance with applicable SRs

5. CONTROLS USED TO MAINTAIN DEFENSE IN DEPTH FOR SHUTDOWN KEY SAFETY FUNCTIONS

This section serves to document the logic, bases, and detailed instructions for ensuring that the requirements listed in Section 4.0 are met.

5.1 Decay Heat Removal

5.1.1 Residual Heat Removal System General Guidance

To minimize the possibility of loss of ND as a result of ND pump cavitation, Operations shall maintain the proper ND flow based on NC system level. Industry experience and analysis has shown that as ND flow is increased during **Midloop** operation, vortexing will begin at the interface between the NC hotleg and ND suction piping. The relationship of ND flow vs. NC level is specified in Operations procedure OP/1(2)/A/6150/06 (Draining the Reactor Coolant System).

Prior to draining the NC system to < 16% NC level with fuel in the core, the reactor should have been subcritical for a minimum of seven days. Draining the NC system to < 16% in less than seven days may be conducted if Engineering has provided a required subcritical time based on plant operating history, NC system temperature, and actual reduced NC System level such that the operating ND pump and heat exchanger configuration can carry the decay heat load.

Protective tagging should be used where appropriate to maintain decay heat removal system alignments and prevent inadvertent misalignment of system valves.

5.1.2 Residual Heat Removal Support Systems

ND support system requirements are as follows for one Train of ND:

- An **Operable** D/G associated with the **Operable** train of ND
- The KC Heat Exchanger associated with the **Operable** train of ND
- 2 KC Pumps associated with the **Operable** train of ND
- 1 RN Pump associated with the **Operable** train of ND (either Unit)
    - o RN pump must be associated with an operable D/G
- RN flow paths to the KC Heat Exchanger

4.3 Recommended Equipment for Mode 5- High Decay Heat-Loops Not Filled – Level Greater than Reduced Inventory.

4.3.1 Decay Heat Removal

4.3.1.1 Two **Operable** trains of ND and their support systems **Available** per Section 5.1.2

4.3.1.2 At least two incore thermocouples for reactor coolant temperature indication

4.3.2 Inventory Control

4.3.2.1 One **Operable** NV (Centrifugal Charging) Pump

4.3.2.2 One NI or additional NV Pump **Available**

4.3.2.3 One train of Containment Sump Recirculation shall be **Available**. The Containment Sump Recirculation path shall be associated with an **Operable** ND train and an **Operable** D/G.

4.3.2.4 The FWST or BAT shall be **Operable** per Mode 5, SLC Section 16.9-11 requirements.

4.3.2.5 NC System level monitoring capabilities shall be maintained per requirements of Section 5.2.3

4.3.3 Reactivity Control

4.3.3.1 One **Operable** Boration System Flow Path. Refer to SLC 16.9-7 for more guidance on boration flow paths.

4.3.3.2 One **Operable** Boration System Pump. Refer to SLC 16.9-9 for more guidance on boration system pumps.

4.3.3.3 Two **Operable** trains of either Source Range detectors or Boron Dilution Mitigation.

4.3.4 Containment Control

4.3.4.1 **Containment Closure** shall be established per either PT/1(2)/A/4200/002C or PT/1(2)/4200/002I.

4.3.4.2 The number of allowable **Containment Closure** Exceptions and requirements for these exceptions may be determined from the table in Enclosure 9.3 and Section 5.4

Recommended Equipment for Mode 5- High Decay Heat-Loops Not Filled – Level Greater than Reduced Inventory

4.3.5 Spent Fuel Pool Cooling

4.3.5.1 One KF train should be **Available.**

4.3.5.2 One **Available** train of assured makeup to the pool

4.3.5.3 Fuel Building Closure during movement of irradiated fuel assemblies per Section 5.5.

4.3.5.4 One **Available** train of fuel handling area ventilation system, with associated radiation release monitoring during movement of irradiated fuel assemblies per Section 5.5.

4.3.5.5 During movement of irradiated fuel assemblies (in the fuel building), both Control Room Area Ventilation System outside air intakes should normally be open per Section 5.5.

4.3.6 Power Availability

4.3.6.1 Two Offsite power sources. (1 **Operable** and one **Available**) An **Available** D/G or temporary D/G may be substituted for the **Available** offsite power supply.

4.3.6.2 One **Operable** D/G

4.3.6.3 Vital DC Channels

4.3.6.3.1 Two **Operable** channels (either Channels 1 and 3 **or** Channels 2 and 4) associated with the **Operable** D/G per Section 5.6. (Tech Specs 3.8.5, 3.8.6 and 3.8.10.)

4.3.6.3.2 If additional Vital DC Channels are required to support operability or availability of additional equipment (such as an NV Train, or an ND Train) then these channels are required to be energized with a battery backup. If these components are not required by tech specs or defense in depth analysis, then the available channels are not required. See Section 5.6.

4.3.6.4 Vital AC Buses and Inverters

4.3.6.4.1 Two **Operable** channels (either Channels 1 and 3 **or** Channels 2 and 4) associated with the **Operable** D/G per Section 5.6. (Tech Spec 3.8.8 and 3.8.10.)

4.3.6.4.2 If additional Vital AC Channels are required to support the operability or availability of additional equipment (such as an NV Train, or an ND Train), then these channels are required to be energized from the associated inverter or the constant voltage source transformer (VRD). If these components are not required by tech specs or defense in depth analysis, then the available channel is not required. See Section 5.6. (PIP C-02-1626)

4.3.6.5 Ensure compliance with Section 5.6.3 concerning electrical power sources.

4.3.7 Fire protection capabilities shall be maintained per Section 5.7.

4.4 Recommended Equipment for Mode 5 - High Decay Heat-Reduced Inventory or Midloop.

4.4.1 Decay Heat Removal

4.4.1.1 Two **Operable** trains of ND and their support systems **Available** per Section 5.1.2.

4.4.1.2 One **Available** Gravity Fill Path when a Gravity Fill Vent Path is available per Section 5.1.5.

4.4.1.3 At least two incore thermocouples for Reactor coolant temperature indication.

4.4.1.4 Prior to draining the NC system to < 16% NC level with fuel in the core, the reactor should have been subcritical for a minimum of seven days unless Engineering has provided an analysis that one operating ND pump and heat exchanger configuration can carry the decay heat load.

4.4.1.5 During midloop operations, a dedicated SRO and RO will be required to support operations in the Control Room

4.4.2 Inventory Control

4.4.2.1 One **Operable** NV (Centrifugal Charging) Pump

4.4.2.2 One NI or additional NV Pump **Available**. .

4.4.2.3 The FWST or BAT shall be **Operable** per SLC Section 16.9-11 requirements.

4.4.2.4 During midloop operations, NC system level disturbances must be minimized, (per Section 5.2.1)

4.4.2.5 NC System level monitoring capabilities shall be maintained per requirements of Section 5.2.3

4.4.3 Reactivity Control

4.4.3.1 One **Operable** Boration System Flow Path. Refer to SLC 16.9-7 for more guidance on boration flow paths.

4.4.3.2 One **Operable** Boration System Pump. Refer to SLC 16.9-9 for more guidance on boration system pumps.

4.4.3.3 Two **Operable** trains of either Source Range detectors or Boron Dilution Mitigation.

4.4.4 Containment Control

4.4.4.1 **Containment Closure** shall be established per either PT/1(2)/A/ 4200/002C or PT/1(2)/4200/002I.

4.4.4.2 The number of allowable **Containment Closure** Exceptions and requirements for these exceptions may be determined from the table in Enclosure 9.3 and Section 5.4

4.4.5 Spent Fuel Pool Cooling

4.4.5.1 One KF train should be **Available.**

4.4.5.2 One **Available** train of assured makeup to the pool

4.4.5.3 Fuel Building Closure during movement of irradiated fuel assemblies per Section 5.5

4.4.5.4 One **Available** train of fuel handling area ventilation system, with associated radiation release monitoring during movement of irradiated fuel assemblies per Section 5.5

4.4.5.5 During movement of irradiated fuel assemblies (in the fuel building or containment), both Control Room Area Ventilation System outside air intakes should normally be open per Section 5.5.

4.4.6 Power Availability

4.4.6.1 Two Offsite power sources (One **Operable** and one **Available**)

4.4.6.2 Two D/G power sources, (One **Operable** and one **Available**)

4.4.6.3 Vital DC Channels

4.4.6.3.1 Two **Operable** channels (either Channels 1 and 3 **or** Channels 2 and 4) associated with the **Operable** D/G per Section 5.6. (Tech Specs 3.8.5, 3.8.6 and 3.8.10.)

4.4.6.3.2 If additional Vital DC Channels are required to support operability or availability of additional equipment (such as an NV Train, or an ND Train) then these channels are required to be energized with a battery backup. If these components are not required by tech specs or defense in depth analysis, then the available channels are not required. See Section 5.6.

4.4.6.4 Vital AC Buses and Inverters

4.4.6.4.1 Two **Operable** channels (either Channels 1 and 3 **or** Channels 2 and 4) associated with the **Operable** D/G per Section 5.6. (Tech Spec 3.8.8 and 3.8.10.)

4.4.6.4.2 If additional Vital AC Channels are required to support the operability or availability of additional equipment (such as an NV Train, or an ND Train), then these channels are required to be energized from the associated inverter or the constant voltage source transformer (VRD). If these components are not required by tech specs or defense in depth analysis, then the available channel is not required. See Section 5.6. (PIP C-02-1626)

4.4.6.5 Ensure compliance with Section 5.6.3 concerning electrical power sources.

4.4.7 Fire protection capabilities shall be maintained per Section 5.7.

ND support system requirements are as follows for two Trains of ND:

- 2 KC Heat Exchangers
- 3 KC Pumps (PIP C-00-6448 Corrective Actions 23, and 273)
- An **Operable** D/G associated with one **Operable** train of ND
- 1 RN pump associated with an **Operable** D/G (either Unit)
- 1 RN Pump on the opposite train (either Unit)
- RN flow paths to both KC Heat Exchangers

5.1.3 Pumped Makeup Flow Paths and LTOP Vent Paths

To mitigate or prevent boiling in the core following a loss of ND flow, at least two independent pumped makeup paths of borated water should be maintained to keep the core covered. Of the two required flow paths, at least one shall include an **Operable** high head pump. The other pumped makeup flow path must be **Available** with power racked out in compliance with **LTOP** Tech Spec Surveillance Requirements 3.4.12.1. (Ref. PIP 0-C97-1639.) The Low Temperature Overpressure Tech Spec is in place to prevent possible Reactor Coolant System damage from brittle fracture when the system is at less than approximately 210 F.

LTOP Vent Paths are in place to limit the maximum pressure that the RCS will undergo during conditions where the system is more susceptible to brittle fracture. The vent paths also serve as a flow path to support Decay Heat Removal during the recovery of a Loss of Decay Heat Removal accident.

LTOP Vent Paths

LTOP Vent Paths are required for overpressure protection in the applicable modes with consideration of a single failure. An **LTOP Vent Path** must meet a 4.5 in^2 vent space requirement.

When a **LTOP Vent Path** is established by removal of a primary system pressure boundary (e.g. PZR Safety valve removed.), the Reactor Coolant system is **not** intact to support **Natural Circulation** and the unit enters **NC Loops <u>Not</u> Filled** status.

SRO/SR-4 Calculate low pressure service water discharge flow for liquid radioactive release.

The JPM was not changed, but a correction to the key was made to include the procedure required extra pressure. Value should be 78.6 and not 73. This was the only change to this package.

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

NRC-SRO/RO-4/ADMIN

Calculate Low Pressure Service Water Discharge Flow for Liquid Radioactive Release

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

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

Alternate Path: N/A

Facility JPM #: REPEAT FROM 2003

K/A Rating(s): GEN 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 039

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

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Candidate: ____________________________________
NAME

Time Start : ________
Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ 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: _______

AMINER CUE: Provide a copy of PT/0/A/4250/011, data sheet, 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 73 + 5.6 = **78.6 psi** (78.6 psig X 2.311 ft/psig) + (577.25 – 569 ft) = **189.89 ft Total Discharge Head** RL Pump A Flow **21000** gpm (obtained from Encl. 13.7 for Pump "A") RL Pump B Flow **25000** gpm (obtained from Encl. 13.7 for Pump "B") _ Pump C Flow **18000** gpm (obtained from Encl. 13.7 for Pump "C") Total RL Supply **64000** gpm (A) **EXAMINER NOTE: The following ranges on the flow calculations are acceptable:** **RL pump A: 20000 to 22000 gpm** **RL pump B: 24000 to 26000 gpm** **RL pump C: 17000 to 19000 gpm** **Total Flow range 61000 to 67000 gpm** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 2: To obtain Total RN Flow perform the following: ANDARD: Calculates Total RN Flow with the following: RN Pump 1B is the only pump in service, Train B meter = **17,000** gpm RN Pump Train A Flow = (1RNP7520) + (2RNP7520) = 0 gpm RN Pump Train B Flow = (1RNP7510) + (2RNP7510) = 17000 gpm Total RN Flow = **17000 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: (**3385.578** - **1222** +19) x 6.837 gpm = **14922.28** gpm Total Tower Evaporation C1P1355 C1A1632 mw OAC is in service for Unit 2 Cooling Tower evaporation, perform the following calculation: (**3381.399** - **1219** +19) x 6.837 gpm = **14914.22** gpm Total Tower Evaporation C1P1355 C1A1632 mw Total Evaporation = 14922.28 + 14914.22 = **29836.5** gpm (C) **EXAMINER NOTE: Due to potential for rounding, a range of 29836.5 +/- 100 gpm is acceptable.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 4: To obtain Total RL Disch Flow, perform the following. ANDARD: Calculates Total Cooling Tower evaporation using the following: Total RL Supply 64000 (A) gpm + Total RN Flow 17000 (B) gpm - RL Disch Total Evaporation 29836.5 (C) gpm = Total Flow **51163.5** gpm **EXAMINER NOTE: Based on previous acceptable values, a range of 48163.5 gpm to 54163.5 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 21000 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) 1222 MW
Reactor thermal Power, Best (PID C1P1355) 3385.578 MW

Unit 2 Generator Megawatts (PID C2A1632) 1219 MW
Reactor thermal Power, Best (PID C2P1355) 3381.399 MW

Low Pressure Service Water Status:

RL Pumps A, B, and C in service
Lake Wylie Level (ORNP7380) 569 feet
RL Header Pressure (ORLP5030) 73 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) = 17000 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 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.

SRO/RO-4 ADMIN 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

RL Disch Pressure — Lake Elevation — Total Discharge Head

(78.6 psig X 2.311 ft/psig) + (577.25 - 569 ft) = 189.89 ft

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

21,000 gpm + 25,000 gpm + 18,000 gpm = 64,000 gpm (A)
(20000 - 22000) (24,000 - 26,000) (17,000 - 19,000) (61,000 - 67,000)

- 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 + 17,000 gpm = 17,000 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:

(3385.578 C1P1355 - 1222 C1A1632 +19) x 6.837 gpm/mw = 14922.28 Cooling Tower Evaporation

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

(3381.399 C2P1355 - 1219 C2A1632 +19) x 6.837 gpm/mw = 14914.22 Cooling Tower Evaporation {PIP 96-0822}

14922.28 Unit 1 Evaporation + 14914.22 Unit 2 Evaporation = 29,836.5 Total Evaporation (C)

SRO/RO-4 ADMIN KEY

SRO/RO-4 ADMIN KEY

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

Cooling Tower Evaporation = ((3411MW) (%Rx Power) + 19 - Gen MW)(6.837 $\frac{gpm}{MW}$)

Unit 1 Cooling Tower Evaporation =((3411MW) (____) + 19 - ____) (6.837 $\frac{gpm}{MW}$)= ______
% Rx Power (ex. 95%=0.95) | Gen MW | Unit 1 Evaporation (gpm)

Unit 2 Cooling Tower Evaporation =((3411MW) (____) + 19 - ____) (6.837 $\frac{gpm}{MW}$)= ______
% Rx Power (ex. 95%=0.95) | Gen 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	
64,000	gpm +	17,000	gpm -	29,836.5	gpm =	51,163.5	gpm
(A)		(B)		(C)		(48163.5 - 54163.5)	

Data Recorded By ____________________ ___________
Operator/Initials Date/Time

Data IV By ____________________ ___________
Operator/Initials Date/Time

SRO/RO-4 ADMIN KEY

LIQUID WASTE RELEASE PERMIT REPORT

LWR Number: 2004196
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: 2004196

----- 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 .... 8.43E+03
Trip 1 setpoint (cpm) .... 8.40E+04
Trip 2 setpoint (cpm) .... 1.20E+05

----- SPECIAL INSTRUCTIONS FOR RELEASE -----
RECOMMENDED RL FLOW INTERLOCK: 21000 GPM.

Performed by: ________________ Date: ________

Verified by: ________________ Date: ________

Duke Power Company Catawba Nuclear Station	Procedure No. PT/ 0/A/4250/011
	Revision No. 039
RL Temperature And Discharge Flow Determinations	
Continuous Use	Electronic Reference No. CN005FUH

PERFORMANCE

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

(ISSUED) - PDF Format

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 (ΔT) 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 2.0.4, Operator Aid Computer Use And Software Control

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 51 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 (ΔT) 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 (ΔT) 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 (ΔT) Calculation) is being performed, the RL Heat Rise (ΔT) is calculated once per 24 hours and action is taken to correct over limit conditions. Limits: $\Delta T \leq 10.0°F$ (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 (ΔT) 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 (ΔT) 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 **<u>IF</u>** 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 **<u>IF</u>** Unit 1 OAC is operable **<u>AND</u>** 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 **<u>IF</u>** Unit 2 OAC is operable **<u>AND</u>** 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 **<u>IF</u>** Unit 1 OAC is operable **<u>AND</u>** 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 **<u>IF</u>** Unit 1 OAC is operable **<u>AND</u>** 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 **<u>IF</u>** Unit 2 OAC is operable **<u>AND</u>** 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 **<u>IF</u>** Unit 2 OAC is operable **<u>AND</u>** 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 (RL Line B Discharge Flow - Hourly Average), remove the inserted value from Unit 2 OAC.

NOTE:
- One transmitter provides both units OAC point values for a given train.
- A failed transmitter could return unrealistic values for both units train related OAC points and yield invalid calculation results.

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/mw = ______________
C1P1355 — C1A1632 — Cooling Tower Evaporation

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

(________ - ________ +19) x 6.837 gpm/mw = ______________ {PIP 96-0822}
C2P1355 — C2A1632 — 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:

$$\text{Cooling Tower Evaporation} = ((3411MW)\ (\%Rx\ Power) + 19 - Gen\ MW)(6.837\ \frac{gpm}{MW})$$

Unit 1 Cooling Tower Evaporation =((3411MW) (______) + 19 - ______) (6.837 gpm/MW)= ______

% Rx Power (ex. 95%=0.95)	Gen MW	MW	Unit 1 Evaporation (gpm)

Unit 2 Cooling Tower Evaporation =((3411MW) (______) + 19 - ______) (6.837 gpm/MW)= ______

% 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	
____________ (A)	gpm +	____________ (B)	gpm -	____________ (C)	gpm =	____________	gpm

Data Recorded By ______________________________ ______________
Operator/Initials Date/Time

Data IV By ______________________________ ______________
Operator/Initials Date/Time

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 ________________ ________
Operator/Initials Date/Time

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

1. Procedure

1.1 **<u>IF</u>** both the OAC points for RL intake temperature C1P1521 (Low Press Service Wtr Inlet Temp - Hr Avg) **<u>AND</u>** C2P1521 (Low Pressure Service Wtr Intake Temp - Hr Avg) **<u>OR</u>** 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 **<u>IF</u>** 0RLTT7420 (RL Intake Temperature) is operable, obtain reading from chart recorder 0RLCR5060 point (1) (RL Intake Temp (°F)).

1.1.2 **<u>IF</u>** 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 **<u>IF</u>** 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 **<u>WHEN</u>** RL intake temperature OAC point **<u>OR</u>** 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:

NOTE:	Combination for the lock at RL Discharge Structure Gate 22A is **5619**

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

1.1.1.1 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.

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

1.1.1.3 Ensure RL Discharge Structure Gate 22A is closed.

1.1.1.4 Ensure RL Discharge Structure Gate 22A is locked.

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:

NOTE:	Combination for the lock at RL Discharge Structure Gate 22A is **5619**

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

1.2.1.1 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 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.

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

1.2.1.3 Ensure RL Discharge Structure Gate 22A is closed.

1.2.1.4 Ensure RL Discharge Structure Gate 22A is locked.

1.2.2 **<u>IF</u>** 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 **<u>WHEN</u>** the following OAC points **<u>AND</u>** 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)

Enclosure 13.5

RL Discharge Temperature Determination

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.

1.2.1 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 (ΔT).

$$\frac{(\underset{RLADT}{\_\_\_\_\_} \times \underset{RLAF}{\_\_\_\_\_}) + (\underset{RLBDT}{\_\_\_\_\_} \times \underset{RLBF}{\_\_\_\_\_})}{(\underset{RLAF}{\_\_\_\_\_} + \underset{RLBF}{\_\_\_\_\_})} - \underset{RLIT}{\_\_\_\_\_} = \underset{\text{RL Heat Rise } (\Delta T)}{\_\_\_\_\_\_\_\_\_\_}\ ^{\circ}F$$

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

RL Heat Rise (ΔT) ≤ 10.0°F (Apr. 1 - Sep. 30)
≤ 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 (ΔT) 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.

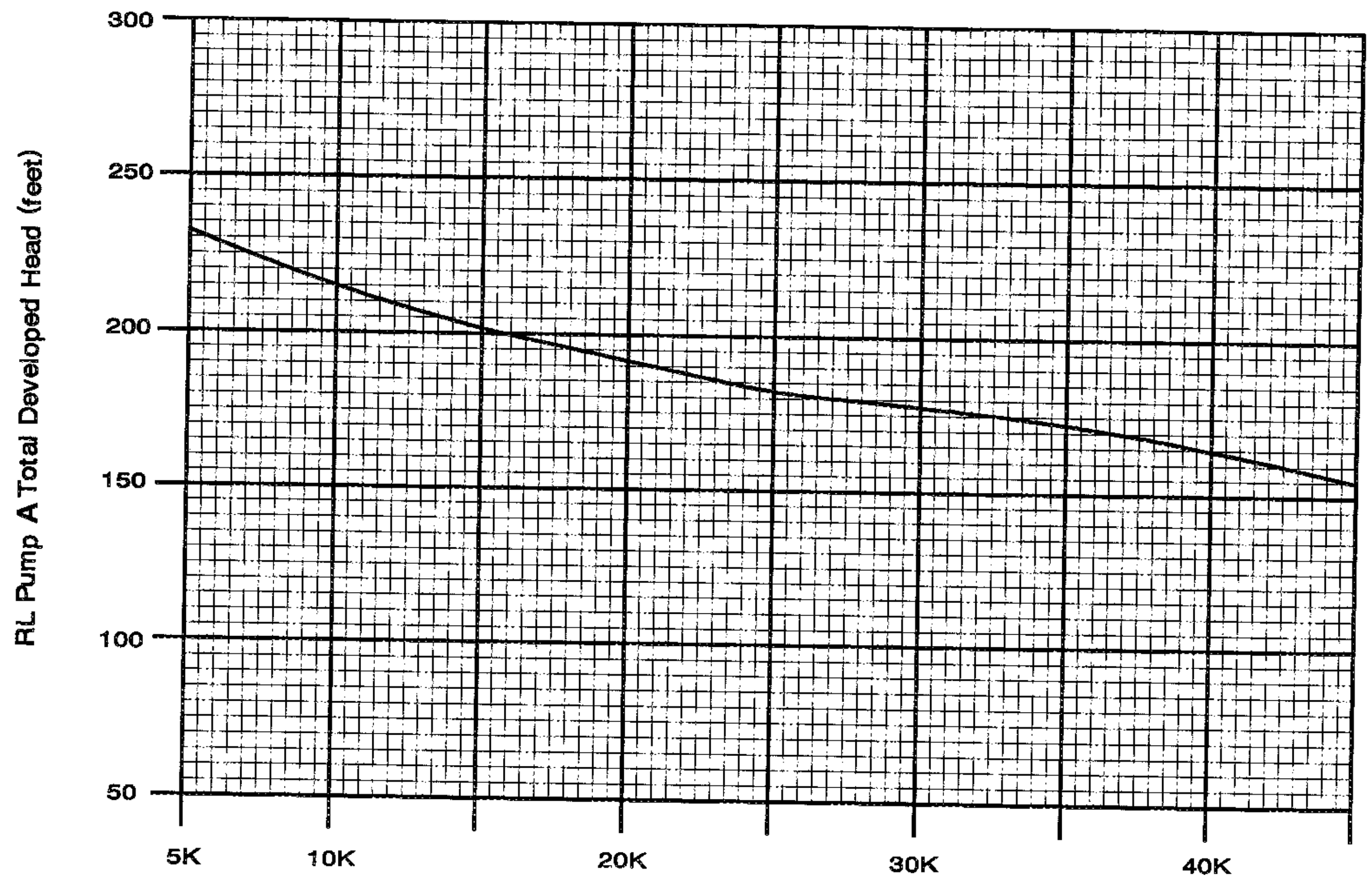
____ 1.5 Make 2 copies of this enclosure and:

- 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

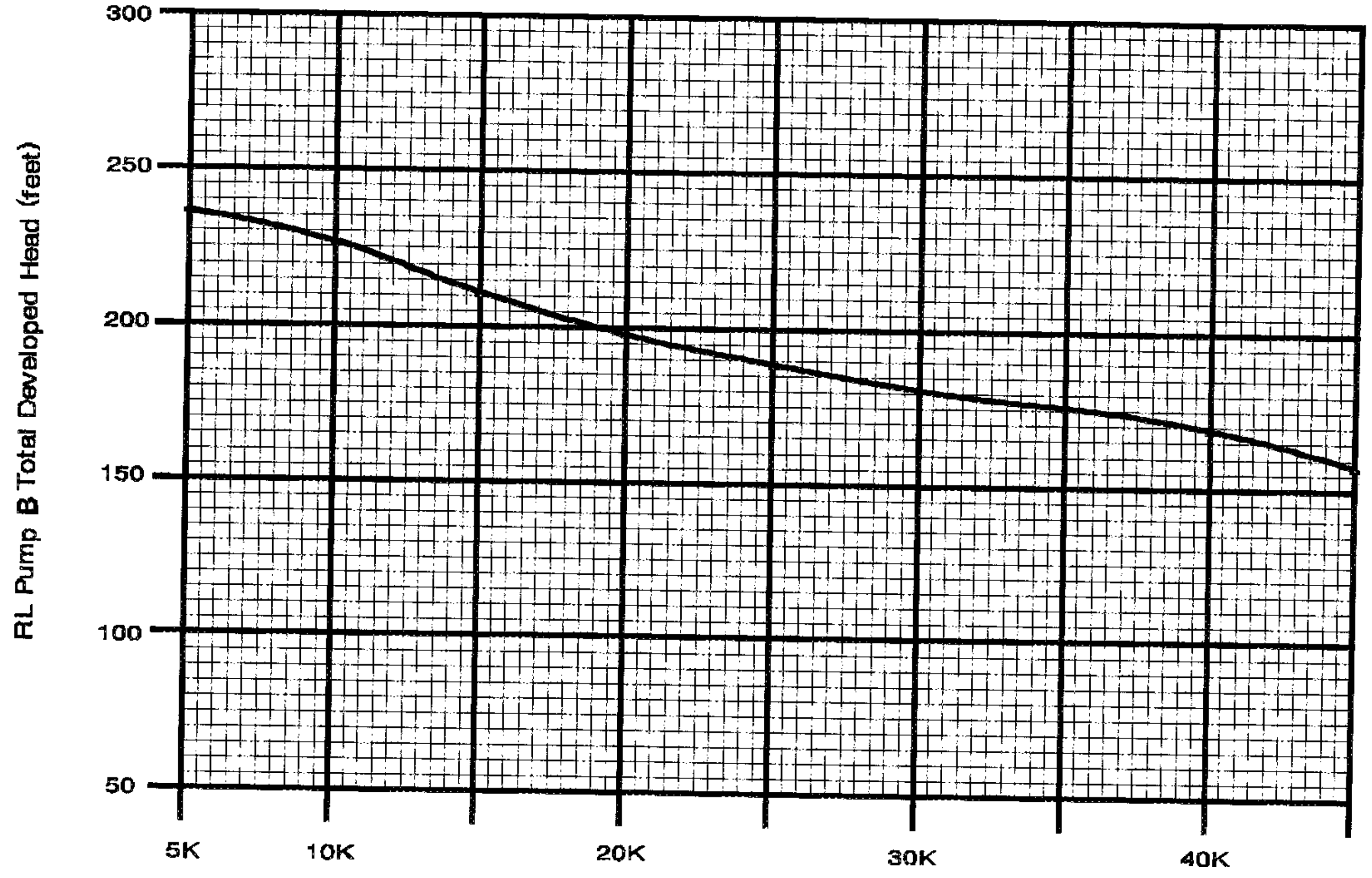


$TDH = [\text{Disch Press (psig)} \times 2.311] + [577.25 - \text{Lake Level Elevation in feet}]$

Enclosure 13.7

RL Pump Head-Capacity Curve

RL PUMP B HEAD-CAPACITY CURVE

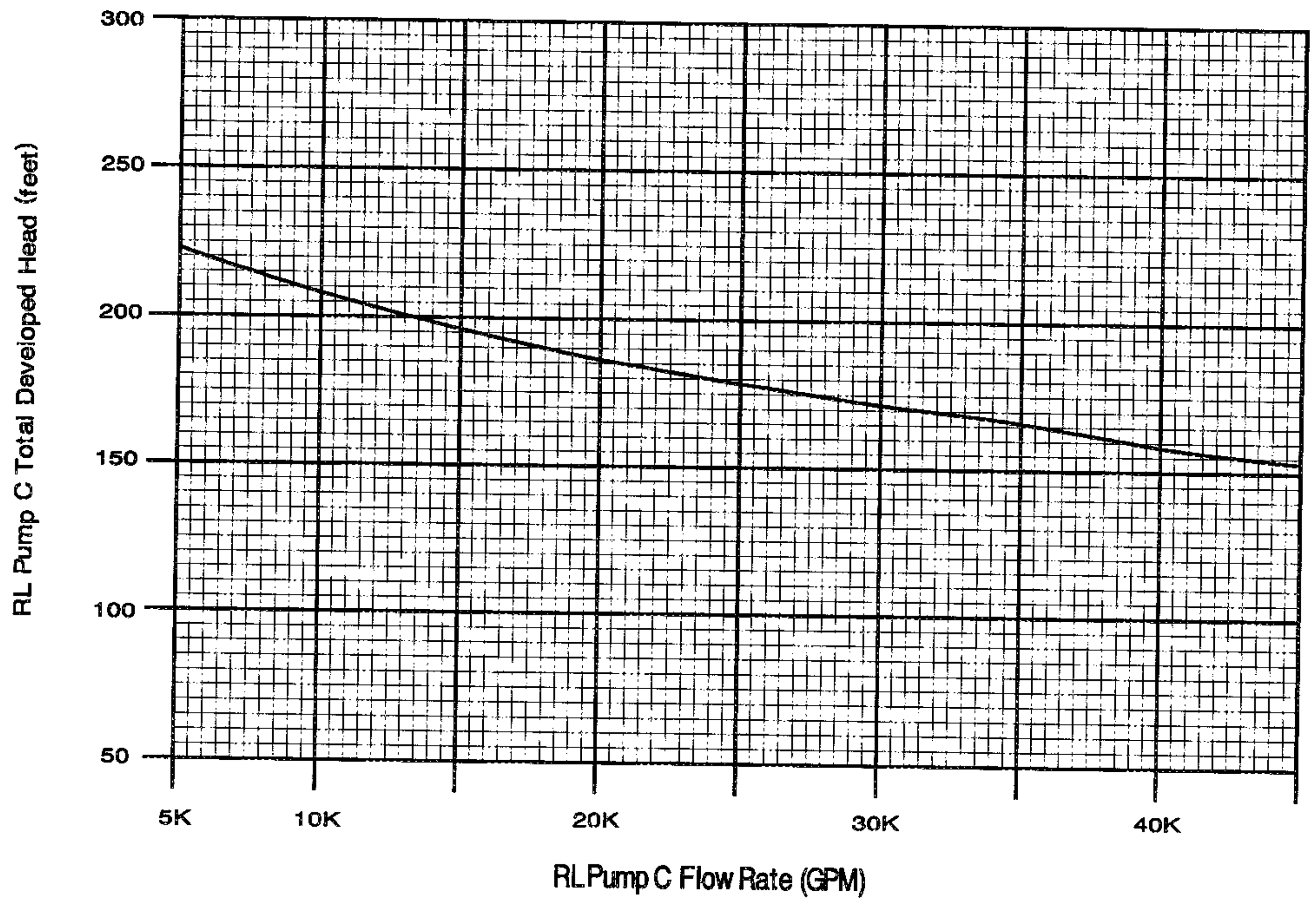


TDH = [Disch Press (psig) x 2.311] + [577.25 - Lake Level Elevation in feet]

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]

2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

NRC-SRO-5/Admin

Classify an event and complete a notification form

CANDIDATE ____

EXAMINER ____

**CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE**

Task: Classify an event and complete a notification form.

Alternate Path: N/A

Facility JPM #: NEW

K/A Rating(s): Generic KA 2.4.30 (2.3/3.6)

Task Standard:

Candidate determines that insufficient fire damage has occurred to onsite equipment to warrant an event classification. Candidate determines that injuries and an environmental news release does require a hour notification to the NRC per RP/013. An Event Notification Report is completed per the attached key..

Preferred Evaluation Location:

Simulator __X_ In-Plant __X___

Preferred Evaluation Method:

Perform __X__ Simulate _____

References:

RP/0/A/5000/001, Classification of Emergency
RP/0/B/5000/013, NRC Notification Requirements

Validation Time: 20 min. **Time Critical:** No

==

Candidate: ____________________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ___________________________ __________________________/_________
NAME SIGNATURE DATE

==

COMMENTS

___

___

___

Tools/Equipment/Procedures Needed:

RP/0/A/5000/001, Classification of Emergency
RP/0/B/5000/013, NRC Notification Requirements

READ TO OPERATOR

DIRECTIONS TO STUDENT:

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 no-mode 1EOC13 refueling outage and Unit 2 is at 100% RTP.

One hour ago the following information was called into the control room:

1. Fire in warehouse number 2
2. One employee was killed and another has sustained a serious injury while trying to exit the building. MERT team has stabilized the injured employee who was transported to Piedmont Emergency 30 minutes ago.
3. Bethel Fire was called and arrived on site to assist site fire brigade team. The fire was extinguished 47 minutes after it was discovered.
4. The fire brigade captain has requested additional assistance to contain what appear to be oil and other solvents flowing out of the building along with the water used to extinguish the fire. The Oil Spill response procedures have been initiated.
5. Due to the amount of smoke seen by area residents and the possibility of an oil spill into the lake, a news release has been broadcast on local television stations.

INITIATING CUE:

You are the Operations Shift Manager, based on the event determine the classification per RP/0/A/5000/001, Classification of Emergency and any required notifications per RP/0/B/5000/013, NRC Notification Requirements.

IF a classification and/or notification are warranted, **THEN** complete any required forms for transmittal to the offsite agencies.

START TIME: _______

STEP 1: Based on the supplied information, determine appropriate event classification per RP/0/A/5000/001 STANDARD: Candidate determines that there is **no** classification required. COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2: RP/0/A/5000/013 Step 2.1 Based on supplied information, determine required notifications per RP/0/A/5000/013. STANDARD: Candidate uses RP-13 and from the initial conditions, determines that a 4-Hour notification is required per Enclosure 4.3 10CFR50.72(b)(2)(xi) **Offsite Notification (News Release)** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 3: 2.2: Select one of the following enclosures based on the circumstances of the event: · Enclosure 4.10, "Safeguards ENS Event Report" **OR** · Enclosure 4.11, "Event Notification Report" **OR** · Enclosure 4.13, "Fitness for Duty Event Notification Report" STANDARD: Candidate choose Enclosure 4.11 COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
Step 4: 2.3 **IF** the Event Notification Report is being prepared for an "Immediate" or a "1-Hour" NRC notification, perform the following: STANDARD: Step does not apply COMMENTS:	___ SAT ___ UNSAT
NOTE: 1. A request for emergency response support (except an ambulance from an off-site agency) requires a 4-hour notification of the NRC as an "Off-site Notification." 2. A request for ambulance support for a "contaminated injury" is an 8-hour notification and the request for transport of a "clean injury" does not require a NRC notification.	

STEP 5: **IF** a "4-Hour," "8-Hour," or "24-Hour" NRC notification may be required, perform the following: 2.4.1 Notify the following individuals: STANDARD: Candidate reads step **EXAMINER CUE: All required personnel have been called and have agreed to notify the NRC, the media, and the states and counties.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 6: 2.4.2 Complete the Event Notification Report based on the decision reached during the conference call. STANDARD: Grade Enclosure 4.11 per the attached key **EXAMINER CUE: If asked, the following information may be supplied.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
This JPM is complete.	

TIME STOP: ________

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

INITIAL CONDITIONS:

Unit 1 is in no-mode 1EOC13 refueling outage and Unit 2 is at 100% RTP.

One hour ago the following information was called into the control room:

1. Fire in warehouse number 2
2. One employee was killed and another has sustained a serious injury while trying to exit the building. MERT team has stabilized the injured employee who was transported to Piedmont Emergency 30 minutes ago.
3. Bethel Fire was called and arrived on site to assist site fire brigade team. The fire was extinguished 47 minutes after it was discovered.
4. The fire brigade captain has requested additional assistance to contain what appear to be oil and other solvents flowing out of the building along with the water used to extinguish the fire. The Oil Spill response procedures have been initiated.
5. Due to the amount of smoke seen by area residents and the possibility of an oil spill into the lake, a news release has been broadcast on local television stations.

INITIATING CUE:

You are the Operations Shift Manager, based on the event determine the classification per RP/0/A/5000/001, Classification of Emergency and any required notifications per RP/0/B/5000/013, NRC Notification Requirements.

IF a classification and/or notification are warranted, **THEN** complete any required forms for transmittal to the offsite agencies.

SRO-5 ADMIN KEY

CRITICAL ITEMS

Enclosure 4.11

Event Notification Report

STATE: "THIS IS THE CATAWBA NUCLEAR SITE IN NRC REGION 2 MAKING AN EVENT NOTIFICATION REPORT" EN # 1

NOTIFICATION TIME/DATE	UNIT	CALLER'S NAME	CALLBACK TELEPHONE #:	NRC OPERATIONS OFFICER CONTACTED
TODAY / NOW	1/2	CANDIDATE	ENS 1-803-831-3920 (C/R) or 1-803-831-2674 (TSC)	

NRC OPERATION TELEPHONE NUMBER: PRIMARY - 1-301-816-5100 or 1-800-532-3469; BACKUPS - [1st] 1-301-951-0550 or 1-800-449-3694; [2nd] 1-301-415-0550; and [3rd] 1-301-415-0553

EVENT TIME & ZONE	EVENT DATE	POWER/MODE BEFORE	POWER/MODE AFTER
____ (time) Region II (zone) 1 HOUR AGO	TODAY	100% / MODE 1	100% / MODE 1

	EVENT CLASSIFICATIONS		1-HR NON-EMERGENCY 10CFR5072(b)(1)		8-HR NON-EMERGENCY
	GENERAL EMERGENCY		TS Deviation pursuant to 10 CFR 50.54(x)		(ii)(A) Degraded Condition
	SITE AREA EMERGENCY		Accidental Criticality or Loss/Theft of Material		(ii)(B) Unanalyzed Condition
	ALERT		Physical Protection of Plant or Materials		(iv)(A) Valid System Actuation
	UNUSUAL EVENT				(v)(A) Safe S/D Capability
X	5072 NON-EMERGENCY (see next columns)				(v)(B) RHR Capability
	PHYSICAL SECURITY (73.71)		**4-HR NON-EMERGENCY 10 CFR 50.72(b)(2)**		(v)(C) Control of Radiological
	TRANSPORTATION (10 CFR 20)		(i) TS Required S/D		(v)(D) Accident Mitigation
	MATERIAL/EXPOSURE (10 CFR 20)		(iv)(A) ECCS Discharge to RCS		(xii) Offsite Medical
	RETRACTION		(iv)(B) RPS Actuation when Rx is critical		(xiii) Lost ENS
		X	(xi) Offsite Notification		(xiii) Lost Emergency Assessment
					(xiii) Lost Offsite Communications.
					(xiii) Emergency Siren Inoperable
	OTHER UNSPECIFIED REQUIREMENT (IDENTIFY)		**60-DAY OPTIONAL 10CFR50.73(a)(1)** Invalid Specified System Actuation		**24 HOUR NON EMERGENCY**
					Radiological Exposure 10CFR20.2202
					Fitness For Duty 10CFR26.73
					Operating License Deviation

EVENT DESCRIPTION (Include: Systems affected, actuations & their initiating signals, causes, effect of event on plant, actions taken or planned, PARs etc.)

CATEGORY **INITIATION SIGNAL**

____ REACTOR TRIP ____
____ ESF ACTUATION ____
____ ECCS ACTUATION ____
____ SI FLOW ____
____ LCO ____

N/A

SYSTEM ____

COMPONENT ____

CAUSE: ____ MECHANICAL ____ ELECTRICAL
____ PERSONNEL ERROR ____ OTHER

INFORMATION SUMMARIZED FROM CUE SHEET:
- NO EFFECT ON STATION EQUIPMENT
- FIRE IN OUTSIDE WAREHOUSE
- 1 DEATH, 1 INJURY TRANSPORT TO HOSPITAL
- POTENTIAL ENVIRONMENTAL RELEASE, SPILL RESPONSE IN PROGRESS
- LOCAL FIRE DEPARTMENT ASSISTED
- DENSE SMOKE
- NEW RELEASE
- FIRE OUT

Continue on Enclosures 4.11 page 2 of 2 if necessary.

NOTIFICATIONS	YES	NO	WILL BE
NRC RESIDENT			X
STATE(s) NC SC			X
LOCAL York County Gaston County Mecklenburg County			X
GOV AGENCIES			
MEDIA/PRESS RELEASE	X		

ANYTHING UNUSUAL OR NOT UNDERSTOOD? ☐ YES ☒ NO (Explain above)

DID ALL SYSTEMS FUNCTION AS REQUIRED? ☒ YES ☐ NO (Explain above)

MODE OF OPERATION UNTIL CORRECTED:	ESTIMATED RESTART DATE
MODE 1	N/A

SRO-5 ADMIN KEY

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/PLT-1

Restore power to 2ERPB using swing inverter 2EIF.

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Restore power to 2ERPB using swing inverter 2EIF.

Alternate Path: NO

Facility JPM #: NEW

K/A Rating(s): Safety Function 6 APE: 057 AA1.01 (3.7/3.7)

Task Standard:

Startup inverter 2EIF and connect it to 2ERPB.

Preferred Evaluation Simulator: **Preferred Evaluation Perform**

Control Room ______ In-Plant __X__ Perform ______ Simulate __X__

References:

AP/1/A/5500/029 Loss of Vital or Aux Control Power Revision 16

Validation Time: 15 min. **Time Critical:** NO

==

Candidate: ______________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ______________________ ______________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

Tools/Equipment/Procedures Needed:

Copy of AP/2/A/5500/029 Enclosure 11, Restoring power to 2ERPB

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.

INITIATING CUES:

A fault in Unit 2 Inverter 2EIB has resulted in a loss of power to Vital Instrument buss 2ERPB. Repairs are in effect for the inverter. The Control Room SRO instructs you to use AP1/A/5500/029 (Loss of Vital or Aux Control Power) and use "swing inverter" 2EIF to restore power to 2ERPB by performing step 8 of Enclosure 11, Restoring Power to 2ERPB.

START TIME: _______

EXAMINER NOTE: If the candidates notes the need for Key #264 provide the cue now. **EXAMINER CUE: You have obtained Key #264**	
STEP 1: 8a: Notify CEN Power System Engineer of the intent to restore from the swing inverter. STANDARD: Candidate states the need to inform the CEN engineer. **EXAMINER CUE: The Power System Engineer has been informed.** COMMENTS:	___ SAT ___ UNSAT
EXAMINER NOTE: IF not evaluating the candidate in acquiring the key, use the cue. STEP 2: 8b: Obtain key #264 from WCC. STANDARD: Candidate makes statement and heads to WCC for key. **EXAMINER CUE: You have obtained Key #264** COMMENTS:	___ SAT ___ UNSAT
STEP 3: 8c: Verify the following breakers on swing inverter 2EIF – OFF: • 2EIF B1 (2EIF DC Input From 2EDB) • 2EIF B3 (2EIF DC Input From 2EDD) • 2EIF B2 (2EIF Inverter AC Output) STANDARD: Candidate breakers B1, B3 and B2 are positioned down towards "OFF". **EXAMINER CUE: 2EIF B1, 2EIF-B2, 2EIF-B3 are positioned towards "OFF"** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 4: 8d: Verify IAE actions required in Step 3 are complete. STANDARD: Candidate inquires if IAE has performed step 3. **EXAMINER CUE: IAE has performed step 3.** COMMENTS:	___ SAT ___ UNSAT
NOTE Both 2VRD-F01E and inverter 2EIF route power through 2EMF to supply 2ERPB or 2ERPD. Only one power supply at a time can be in service through 2EMF.	
STEP 5: 8e: IF 2VRD is not supplying 2ERPD THEN ensure breaker 2VRD-F01E (Alternate Power Supply For 120VAC Power Pnlbd 2ERPB Or 2ERPD) - OFF. STANDARD: Candidate locates 2VRD to determine output breaker status to 2ERPD by verifying 2VRD-F01E is selected to "OFF". **EXAMINER CUE: Breaker 2VRD-F01E is positioned to "OFF"** COMMENTS:	___ SAT ___ UNSAT
STEP 6: 8f: Unlock breaker 2EDB-F01D. STANDARD: Candidate uses key to unlock and remove padlock. **EXAMINER CUE: Padlock has been removed on 2EDB-F01D.** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 7: 8g: Ensure breaker 2EDB-F01D - ON STANDARD: Candidate rotates 2EDB-F01D to the "ON" position. **EXAMINER CUE: 2EDB-F01D is positioned to "ON"** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
NOTE Step 8.i must be performed immediately after Step 8.h is completed. Failure to close breaker 2EIF B1 (2EIF DC Input From 2EDB) immediately after the "PRECHARGE" switch is released may result in blown inverter input fuses.	
STEP 8: 8h: Turn and hold the "PRECHARGE" switch on the swing inverter 2EIF in the "EDB-LEFT position until the "PRECHARGE" indicator lamp has been illuminated for a minimum of 5 seconds. STANDARD: Candidate rotates the "EDB-LEFT" switch Counter clockwise and looks for the AMBER lamp to light then holds switch for at least 5 seconds. **EXAMINER CUE: The "PRECHARGE" switch has been rotated to the EDB-LEFT position, the AMBER lamp is lit, and switches then held for 5 seconds.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 9: 8i: Close breaker 2EIF B1 (2EIF DC Input From 2EDB) on 2EIF STANDARD: Candidate pushes 2EIF B1 up to the "ON" position without delay. **EXAMINER CUE: Breaker 2EIF B1 is positioned to "ON".** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 10: 8j: Close breaker 2EIF B2 (2EIF Inverter AC Output) on 2EIF STANDARD: Candidate pushes 2EIF B2 up to the "ON" position. **EXAMINER CUE: Breaker 2EIF B2 is positioned to "ON".** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 11: 8k: Unlock breaker 2EMF B4 (2ENF Output To 2EMB) on 2EMF (Manual Bypass Switch for Swing Inverter 2EIF) STANDARD: Candidate unlocks padlock on 2EMF B4 breaker and removes. **EXAMINER CUE: Padlock on 2EMF B4 has been removed.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 12: 8l: Ensure breaker 2EMF B4 (2EMF Output To 2EMB) on 2EMF - ON STANDARD: Candidate pushes 2EMF B4 up to the "ON" position. **EXAMINER CUE: Breaker 2EMF B4 is positioned to "ON".** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 13: 8m: Ensure the "MANUAL BYPASS SWITCH" on 2EMF selected to the "INVERTER TO LOAD" position. STANDARD: Candidate rotates Manual Bypass Switch on 2EMF Counter Clockwise to the "INVERTER TO LOAD" position. **EXAMINER CUE: Manual Bypass switch on 2EMF is rotated to the "INVERTER TO LOAD" position.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 14: 8n: Ensure the "MANUAL BYPASS SWITCH" on 2EMB selected to "ALTERNATE AC SOURCE TO LOAD" position. STANDARD: Candidate rotates the Manual Bypass switch on 2EMB clockwise to the "ALTERNATE AC SOURCE TO LOAD" position. **EXAMINER CUE: Manual Bypass switch on 2EMB has been rotated clockwise to the "ALTERNATE AC SOURCE TO LOAD" position.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 15: 8o: Verify "AC OUTPUT VOLTAGE" volts on 2EMB – Greater than or equal to 115 AC volts. STANDARD: Candidate locates AC OUTPUT VOLTAGE meter on 2EMB and verifies voltage greater than or equal to 115 VAC **EXAMINER CUE: AC OUTPUT VOLTAGE meter on 2EMB voltage meter is 121 VAC.** COMMENTS:	___ SAT ___ UNSAT
STEP 16: 8p: Dispatch IAE to close the following breakers located inside the front/middle bay of "2PCC2 Process Control Cab 2 Protection Set 2": 1. "CAB 2 26 VDC PWR Supply BKR" 2. "CAB 2 24 VDC PWR Supply BKR" STANDARD: Candidate makes statement that IAE must perform action. **EXAMINER CUE: IAE has closed the 2 breakers in the front/middle bay of "2PCC2 Process Control Cab 2 Protection Set 2"** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 17: 8q: Activate swing inverter 2EIF alarm circuits as follows: • Rotate 2EIF alarm bypass keyswitch counterclockwise • Rotate 2EMF alarm bypass keyswitch clockwise STANDARD: Candidate rotates the 2EIF alarm bypass keyswitch to the counterclockwise position. Candidate rotates the 2EMF alarm bypass keyswitch to the clockwise position. **EXAMINER CUE: The 2EIF alarm bypass keyswitch is rotated to the counterclockwise position. The 2EMF alarm bypass keyswitch is rotated to the clockwise position.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 18: 8r: Return this enclosure to the Control Room SRO **EXAMINER CUE: Control Room SRO has been given the enclosure.**	___ SAT ___ UNSAT
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)

INITIATING CUES:

A fault in Unit 2 Inverter 2EIB has resulted in a loss of power to Vital Instrument buss 2ERPB. Repairs are in effect for the inverter. The Control Room SRO instructs you to use AP1/A/5500/029 (Loss of Vital or Aux Control Power) and use "swing inverter" 2EIF to restore power to 2ERPB by performing step 8 of Enclosure 11, Restoring Power to 2ERPB.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/PLT-2

Start a Main Vacuum Pump.

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Start a Main Vacuum Pump

Alternate Path: NO

Facility JPM #: NEW

K/A Rating(s): Safety Function 4(Secondary) APE: 051 AA1.01 (1.9/1.9)

Task Standard:

Main vacuum pump A is started and then aligned to the Unit 1 main condenser.

Preferred Evaluation Simulator: Control Room _______ In-Plant __X__

Preferred Evaluation Perform Perform _____ Simulate __X__

References:

AP/1/A/5500/023 Loss of Condenser Vacuum Revision 15

Validation Time: 15 min. **Time Critical:** NO

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Candidate: ____________________________________ Time Start : _________
NAME Time Finish: _________

Performance Rating: SAT _______ UNSAT _______ Performance Time _______

Examiner: ____________________________ ____________________________/_________
NAME SIGNATURE DATE

===

COMMENTS

____

____

____

Tools/Equipment/Procedures Needed:

Copy of AP/1/A/5500/023 Loss of Condenser Vacuum Revision 15 , Enclosure 4

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.

INITIATING CUES:

Unit 1 has experienced a loss of condenser vacuum. The control room has instructed you to start the main vacuum pumps and align them to the condenser in accordance with AP/1A/5500/023 (Loss of Condenser Vacuum) Enclosure 4.

START TIME: _______

STEP 1: 1: Start Main Vacuum Pump A as follows: a. **IF** Main Vacuum Pump B is not in service, **THEN** ensure 1ZJ-43 (CSAE X-Over Between Units 1 & 2) (SB-568, T-27) is closed. **EXAMINER CUE: Main vacuum pump B is shutdown.** STANDARD: Based on CUE, candidate checks 1ZJ-43 closed by attempting to rotate handwheel chain clockwise. **EXAMINER CUE: 1ZJ-43 handwheel chain does not move in the clockwise direction.** COMMENTS:	___ SAT ___ UNSAT
EXAMINER NOTE: This step requires that a ladder be located and used to operate 1ZM-15. STEP 2: 1b: Throttle open 1ZM-15 (Main Vacuum Pump A Seal Water Solenoid Valve Bypass) (SB-578, T-26) to maintain seal water pressure between 10 PSIG and 15 PSIG as read on gauge 0ZMPG5030 (YF To Main Vacuum Pump A Inlet Pressure) (SB-573, T-26). STANDARD: Candidate first checks gauge 0ZMPG5030 to verify whether to make the adjustment. Based on cue, adjustment is not required. **EXAMINER CUE: WHEN gauge 0ZMPG5030 is located state: Pressure is 0 psig.** STANDARD: Candidate rotates 1ZM-15 handwheel counter clockwise to establish flow. **EXAMINER CUE: WHEN gauge 0ZMPG5030 is check again, Pressure is 13 psig.** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 3: 1c: **IF** seal water pressure cannot be established between 10 PSIG and 15 PSIG, **THEN**: STANDARD: Candidate determines that step does not apply and continues to step 1d. COMMENTS:	___ SAT ___ UNSAT
STEP 4: 1d: Start Main Vacuum Pump A (1TBOX0064) (SB-573, T-27). STANDARD: Candidate locates 1TBOX0064 and depresses the red "START" pushbutton for Vacuum pump A and verifies the red "ON" light is lit. **EXAMINER CUE: Vacuum pump A "START" pushbutton is depressed and the red "ON" light is lit.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
EXAMINER NOTE: When the pump is started, a solenoid valve opens to supply seal water. The operator only need to ensure proper flow as 1ZM-15 is closed. 1ZM-6 should not have to be adjusted. STEP 5: 1e: While closing 1ZM-15, adjust 1ZM-6 (Main Vacuum Pump A Seal Water Adjusting Valve) (SB -578, U-26) to maintain seal water pressure between 10 PSIG and 15 PSIG. STANDARD: Candidate rotates 1ZM-15 handwheel clockwise to close while ensuring seal water pressure on gauge 0ZMPG5030 is maintained between 10 and 15 psig. **EXAMINER CUE: 1ZM-15 handwheel was rotated clockwise to close. Pressure on gauge 0ZMPG5030 is 13 psig.** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 6: 1f: **WHEN** gauge 0ZMPG5000 (CSAE To Main Vacuum Pump A Pressure) (SB-573, T-26) reads 25.5 in. Hg, **THEN** verify seal water leakage from the Main Vacuum Pump A shaft is at least a constant drip. STANDARD: Candidate locates gauge OZMPG5000 to check vacuum at 25.5 in. HG. Then locates the pump shaft, on both ends, to check for proper leakage which must be a constant drip. **EXAMINER CUE: When vacuum gauge OZMPG5000 is located: state that vacuum is 24.5 in. Hg.** **When the vacuum pump shaft is located: state that water is leaking out at a constant drip.** COMMENTS:	___ SAT ___ UNSAT
STEP 8: 1g: **WHEN** vacuum is between 24 in. Hg and 25 in. Hg, **THEN**: STANDARD: Candidate locates vacuum gauge OZMPG5000 and checks vacuum to see if it's 24 to 25 in. Hg. **EXAMINER CUE: WHEN OZMPG5000 is located: state that vacuum is 24.5 in. Hg.** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 9: 1) Verify 1ZM-3 (Main Vacuum Pump A Vacuum Relief) (SB-575, U-27) - OPENS. STANDARD: Candidate locates 1ZM-3 and verifies the valve is open per the shaft mounted disc or notes air being sucked in through screened pipe. **EXAMINER CUE: 1ZM-3 disc is raised up to the upper line. Air is felt being drawn into the screen covered pipe.** *2) Open 1ZJ-42 (Unit 1 CSAE X-Over No 2) (SB-568, U-27). STANDARD: Candidate locates 1ZJ-42 and rotates handwheel chain counterclockwise to open the valve. **EXAMINER CUE: 1ZJ-42 handwheel chain rotated counterclockwise then stopped.** *3) Open the following valves: • 1ZJ-18 (1C CSAE X-Over) (TB-594, 1L-20) • 1ZJ-17 (1B CSAE X-Over) (TB-594, 1L-20) • 1ZJ-16 (1A CSAE X-Over) (TB-594, 1L-21). STANDARD: Candidate goes to turbine building and locates each valve listed. Rotates their handwheel chains counter clockwise until 1ZJ-18, 1ZJ-17, and 1ZJ-16 are opened. **EXAMINER CUE: As candidate locates each valve:** **1ZJ-18 handwheel chain rotated counterclockwise then stopped.** **1ZJ-17 handwheel chain rotated counterclockwise then stopped.** **1ZJ-16 handwheel chain rotated counterclockwise then stopped.** COMMENTS:	***CRITICAL STEPS in Italics** ___ SAT ___ UNSAT

Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.

STEP 10: 1h: Notify Control Room that Main Vacuum Pump A is in service. STANDARD: Candidate locates nearest phone and informs the control room A main vacuum pump is in service. **EXAMINER CUE: Control Room acknowledges that Main Vacuum pump A is in service.** **EXAMINER CUE: Main condenser vacuum has improved; you do not need to start the B main vacuum pump.** COMMENTS:	___ SAT ___ UNSAT
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)

INITIATING CUES:

Unit 1 has experienced a loss of condenser vacuum. The control room has instructed you to start the main vacuum pumps and align them to the condenser in accordance with AP/1A/5500/023 (Loss of Condenser Vacuum) Enclosure 4.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/PLT-3

Borate the reactor coolant system from outside the control room

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Borate the reactor coolant system from outside the control room..

Alternate Path: NO

Facility JPM #: OP-CN-PS-NV-078 (Modified to Unit 2)

K/A Rating(s): Safety Function 8 APE 068 AA2.02 (3.7/4.2)

Task Standard:

Boric Acid is being added to the NCS from the ASP with total to be added calculated to be between 15126 and 16061 gallons and the time to add the boric acid calculated by dividing by the observed boric acid flow rate on the ASP.

Preferred Evaluation Simulator: **Preferred Evaluation Perform**

Control Room ______ In-Plant X___ Perform _____ Simulate X____

References:

AP/2/A/5500/017 (Loss of Control Room) Revision 039
Unit 2 Boration and Dilution Tables

Validation Time: 10 min. **Time Critical:** No

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Candidate: ________________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ______________________ ______________________/________
NAME SIGNATURE DATE

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COMMENTS

____

____

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Tools/Equipment/Procedures Needed:

Auxiliary Shutdown Panel Room key checked out as needed
AP/2/A/5500/017 Enclosure 6
Unit 2 Rod Book Section 4.1

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:

A fire has been reported in the cable spread room and the fire brigade has been dispatched to respond. The Reactor was tripped from the control room and is currently at 558 °F and 2235 psig. The control room SRO has determined that the control room is uninhabitable and is directing actions per AP/2/A/5500/017 (Loss of Control Room).

INITIATING CUES:

You have been instructed to take the key box, abandon the control room and report to Auxiliary Shutdown Panel 2A. Once there, perform AP/2/A/5500/017,Enclosure 6 (Shutdown Margin and Boration)

START TIME: _______
A Key is required to enter ASP Room 2A, it can be obtained from the WCCSRO

STEP 1: When the candidate arrives at the ASP rooms, he/she locates the procedure box, for Enclosure 6 and Rod Book Section 4.1. STANDARD: Operator locates the stored copies of Enclosure 6 and Rod Book Section 4.1. **EXAMINER CUE: If asked about steps 1 – 21 of Enclosure 1, cue candidate:** **Using time compression, another operator has already performed Steps 1 thru 21 of Enclosure 1.** **EXAMINER CUE: Hand copies of Enclosure 6 and the Rod Book Section 4.1 to the operator as he/she locates the document.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.

STEP 2: **Determine amount of boric acid to be added as follows:** 1a. In the following steps, borate the NC System to greater than or equal to 2850 PPM. 1b. Determine the amount of boric acid to be added using the last known NC System boron concentration. **REFER TO** ROD Book Section 4.1. **EXAMINER CUE: Current boron concentration is 1500 ppm.** STANDARD: For "1b", operator determines the needed gallons of boric acid based on CUE'd value of 1500 ppm and required concentration of 2850 ppm or greater. From ROD Book Section 4.1, operator should calculate the following: 1500 – 1780 ppm = 2924 gallons 1780 – 1980 ppm = 2177 gallons 1980 – 2180 ppm = 2258 gallons 2180 – 2380 ppm = 2344 gallons 2380 – 2580 ppm = 2438 gallons 2580 – 2760 ppm = 2280 gallons Interpolation for 2840 – 2880 = 1173 gallons Total = 15594 gallons An acceptable range ± 3% = 15126 to 16061 gallons of boric acid COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

***Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.**

STEP 3:	**Align boric acid pumps to NV pump(s) suction as follows:** 2a. Ensure following valves - OPEN: • 2NV-238A (B/A Xfer Pmp To Blender Ctrl) (AB-550, HH-JJ, 53-54, Rm 234) • 2NV-186A (B/A Blender Otlt To VCT Otlt) (AB-586, KK-50, Rm 419).	**CRITICAL STEP** ___ SAT ___ UNSAT
STANDARD:	Operator opens the valves: • Positions the switch for 2NV-238A to the "OPEN" position and verifies the red "OPEN" light is LIT.	
*****CUE: The switch for 2NV-238A is selected to OPEN, the RED "OPEN" light is lit.***		
	• Depresses the "OPEN" pushbutton for 1NV-286A and verifies the red "OPEN" light is LIT.	
*****CUE: The OPEN pushbutton for 2NV-186A is depressed and the RED "OPEN" light is lit.***		
COMMENTS:		

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 4: 2b. Start the boric acid pump(s)

CRITICAL STEP

STANDARD: Operator depresses the "ON" pushbutton for "B/A XFER PMP 2A" on Auxiliary Shutdown Panel 2A and verifies red "ON" light LIT.
If checked, B/A BLENDER FLOW will be show 44 GPM.

____ SAT

*****CUE: The ON pushbutton for Boric Acid pump 2A is depressed and the RED "ON" light is lit.***

____ UNSAT

IF CHECKED **CUE: B/A BLENDER FLOW meter indicates 44 GPM.

EXAMINER NOTE: **The operator may elect to go to ASP 2B to start the second boric acid pump. If he/she does, then provide the following cue as needed. The procedure step allows one or both pumps.**

STANDARD: Operator depresses the "ON" pushbutton for "B/A XFER PMP 2B" on Auxiliary Shutdown Panel 2B and verifies red "ON" light is LIT.
If checked, B/A BLENDER FLOW will now be 65 GPM.

*****CUE: The ON pushbutton for Boric Acid pump 2B is depressed and the RED "ON" light is lit.***

IF CHECKED **CUE: B/A BLENDER FLOW meter indicates 65 GPM.

COMMENTS:

EXAMINER NOTE: When any pump is on, the boric acid flow rate can be read on either panel.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 5: **WHEN desired amount of boric acid has been added, THEN:** 3a. Stop boric acid pump(s). STANDARD: Based on the amount of acid determined in JPM step 2: • For one Boric Acid Pump: 15594 gallons/44 gpm = 354.4 minutes or 5.9 hours. ± 3% = 343.76 to 365.03 minutes • For two Boric Acid pumps: 15594 gallons/65 gpm = 239.9 minutes or 3.998 hours. ± 3% = 247.09 to 232.70 minutes **EXAMINER CUE: Time compression, the required pump run time has been completed.** STANDARD: Operator depresses the "OFF" pushbutton for "B/A XFER PMP 2A" on Auxiliary Shutdown Panel 2A and verifies the RED "ON" light is dark and GREEN "OFF" light is lit. *****CUE: The OFF pushbutton for Boric Acid pump 2A is depressed and the RED "ON" light is dark and GREEN "OFF" light is lit..*** **EXAMINER NOTE: If the operator used the second boric acid pump then provide the following cue as needed.** STANDARD: Operator depresses the "OFF" pushbutton for "B/A XFER PMP 2B" on Auxiliary Shutdown Panel 2B and verifies the RED "ON" light is dark and GREEN "OFF" light is lit. *****CUE: The OFF pushbutton for Boric Acid pump 2B is depressed and the RED "ON" light is dark and GREEN "OFF" light is lit.*** COMMENTS:	**CRITICAL STEP** ____ SAT ____ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 6: 3b. Close the following valves: • 2NV-238A (B/A Xfer Pmp To Blender Ctrl) (AB-550, HH-JJ, 53-54, Rm 234) • 2NV-186A (B/A Blender Otlt To VCT Otlt) (AB-586, KK-50, Rm 419). STANDARD: Operator closes the valves: • Positions the switch for 2NV-238A to the "CLOSE" position and verifies the green "CLOSE" light is lit and the red "OPEN" light is dark. ****CUE: The switch for 2NV-238A is selected to CLOSE, and the green "CLOSE" light is lit and the red "OPEN" light is dark.*** • Depresses the "OPEN" pushbutton for 1NV-286A and verifies the green "CLOSE" light is lit and the red "OPEN" light is dark. *****CUE: The CLOSE pushbutton for 2NV-186A is depressed and verifies the green "CLOSE" light is lit and the red "OPEN" light is dark.*** COMMENTS:	___ SAT ___ UNSAT
STEP 7: **Maintain shutdown margin as follows:** 4a. Notify Chemistry to initiate periodic sampling for NC System boron concentration. 4b. Adjust NC System boron concentration to maintain S/D margin greater than the required shutdown margin. STANDARD: For step 4a, operator contacts Chemistry by phone to initiate periodic sampling for the NC system boron concentration. **EXAMINER CUE: Chemistry has been contacted and will periodically sample the NC system for boron..** For step 4b. Operator makes statement concerning need to adjust boron concentration as needed. **EXAMINER CUE: The SRO will monitor boron concentration and ensure shutdown margin is being maintained.** COMMENTS:	___ SAT ___ UNSAT
This JPM is complete.	

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

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:

A fire has been reported in the cable spread room and the fire brigade has been dispatched to respond. The Reactor was tripped from the control room and is currently at 558 °F and 2235 psig. The control room SRO has determined that the control room is uninhabitable and is directing actions per AP/2/A/5500/017 (Loss of Control Room).

INITIATING CUES:

You have been instructed to take the key box, abandon the control room and report to Auxiliary Shutdown Panel 2A. Once there, perform AP/2/A/5500/017,Enclosure 6 (Shutdown Margin and Boration)

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/SIM-1

Realign a control rod

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Realign a control rod.

Alternate Path: YES

Facility JPM #: Modified OP-CN-IC-IRE-001

K/A Rating(s): Safety Function 1 SYSTEM 001 A2.03 (3.5/4.2)

Task Standard:

1. Control Bank D is disconnected for all rods except D-12 in preparation to realign the control rod.
2. Operator correctly recognizes an uncontrolled reactivity addition from Rod D-12 and manually performs a reactor trip and performs EP/1/A/5000/E-0 (Reactor Trip or Safety Injection) Immediate action steps 2 and 3 from memory.

Preferred Evaluation Simulator: Simulator _X____ In-Plant _____

Preferred Evaluation Perform Perform __X___ Simulate _______

References:

OP/1/A/6150/008, Rod Control, Enclosure 4.6, Rod Retrieval, Enclosure 4.7, Master Cycler Position, Revision 049
EP/1/A/5000/E-0, Reactor Trip or Safety Injection Revision 024

Validation Time: 15 min. **Time Critical:** No

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Candidate: _______________________________________ Time Start : _________
NAME Time Finish: _________

Performance Rating: SAT _______ UNSAT _______ Performance Time ______

Examiner: ______________________________ ______________________________/________
NAME SIGNATURE DATE

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COMMENTS

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____

SIMULATOR SETUP SHEET

1. Init to IC #1 and place simulator on Run
2. Insert **MAL-IRX003B**, Uncontrolled Rod Withdrawal
3. Drive control banks in 6-12 steps to see the position change on DRIPI
4. Insert **MAL-IRX016D12, Immovable Rod D-12**.
5. Restore control banks to stabilize temperature and create mismatch with Rod D-12.
6. Delete **MAL-IRX016D12**
7. **FREEZE** simulator.
8. Write to Protected IC.

SNAP No.: 104

SIMULATOR OPERATOR INSTRUCTIONS:

ENSURE STEP DEMAND COUNTERS FOR BANK D ARE SET TO 217 STEPS.

Tools/Equipment/Procedures Needed:

OP/1/A/6150/008, Rod Control, Enclosure 4.6, Rod Retrieval
Enclosure 4.7, Master Cycler Position
Enclosure 4.8, Rod Control Data 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 is in Mode 1 with temperature and power stable.
- During a control rod bank insertion for testing, Rod D-12 became misaligned with Control Bank D.
- IAE technicians and the Reactor Engineer have recommended that the rod be realigned with its control bank.

INITIATING CUES:

The Rod Control procedure OP/1/A/6150/008, Enclosure 4.6 has been completed through step 2.5. An NLO is standing by on the phone to provide rod control cabinet information. The Control Room SRO instructs you to complete the rod realignment by performing Enclosure 4.6, steps 2.6 through 2.13.

START TIME: ______

STEP 1: 2. 6: Dispatch operator to Rod Control Power Cabinets to verify the following: 2.6.1 The "MASTER CYCLER" displays per Enclosure 4.7 (Master Cycler Position). 2.6.2 Verify the selected banks "GRP SELECT" lights illuminate per Enclosure 4.14 (Rod Control Power Cabinet GRP Select Lights). STANDARD: Operator standing by per the initial cue. **EXAMINER CUE: This is Fred standing by at the rod control cabinets.** COMMENTS:	___ SAT __ UNSAT
STEP 2: Record the following on Enclosure 4.8 (Rod Control Data Sheet) 2.7.1: Step Demand counter readings for each rod group in affected bank. 2.7.2: The step demand counter reading for all of the other rod groups NOT affected STANDARD: For Step 2.7.1 data is entered for Bank D Group 1 and Group 2 *****CUE: Rod Group 1 is 217 and Rod Group 2 is 217 steps.*** For step 2.7.2 data is entered for Shutdown Banks A,B,C,D,E and Control Banks A,B,C *****CUE: All Shutdown Banks and Control Banks A,B, and C are 230 steps.*** COMMENTS:	___ SAT __ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 3: Notify the dispatched operator to report the following: 2.7.3.1 The "MASTER CYCLER" display (located in the Logic Cabinet) for the affected bank (except Shutdown Banks C, D, E). Record on Enclosure 4.8 (Rod Control Data Sheet). 2.7.3.2 The "BANK OVERLAP DISPLAY" as seen on the digital readout inside the Logic Cabinet. Record on Enclosure 4.8 (Rod Control Data Sheet). STANDARD: For step 2.7.3.1, requests MASTER CYCLER display for Control Bank D and records on Enclosure 4.8. **EXAMINER CUE: Bank "D" Master Cycler Display reads "LIT LIT OFF".** **For step 2.7.3.2, requests** BANK OVERLAP DISPLAY" as seen on the digital readout inside the Logic Cabinet record on Enclosure 4.8. **EXAMINER CUE: Bank Overlap Display reads 565.** COMMENTS:	___ SAT ___ UNSAT
STEP 4: **WHEN** steady-state plant conditions are obtained, turn the "CRD BANK SELECT" switch to the bank that contains the affected rod. STANDARD: Locates Tavg and power indications and determines that unit is stable then rotates the "CRD BANK SELECT" switch to Control Bank "D" *****CUE: Unit 1 power and temperature are stable. "CRD BANK SELECT" switch is rotated to Control Bank "D"*** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 5: Notify dispatched operator to verify the selected banks "GRP SELECT" light illuminates. STANDARD: Acknowledges local operators reply for Bank "D". **EXAMINER CUE: Control Bank "D" "GRP SELECT" light is LIT.** COMMENTS:	___ SAT __ UNSAT
STEP 6: **IF** the affected rod is in a control bank: 2.10.1 Position the "BANK POSITION DISPLAY" switch (located inside the P/A Converter Cabinet) to the affected bank. 2.10.2 Record the "BANK POSITION DISPLAY" on Enclosure 4.8 (Rod Control Data Sheet). STANDARD: Step 2.10 applies. For step 2.10.1, directs operator to position the "BANK POSITION DISPLAY" to Control Bank "D" For Step 2.10.2, requests the position of Control Bank "D" and records on Enclosure 4.8. **EXAMINER CUE: BANK POSITION DISPLAY is selected to BANK "D"** **EXAMINER CUE: Bank "D" position reads 217.** COMMENTS:	___ SAT __ UNSAT

Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.

	CRITICAL STEP
STEP 7: Disconnect all lift coils in the affected bank, except for the affected rod, by placing the control rod disconnect switches in the "DISCONNECTED" position. (These are located in the "CONTROL ROD DISCONNECT SWITCH BOX" on 1MC5.) STANDARD: Candidate locates CONTROL ROD DISCONNECT SWITCH BOX and positions the switches for RODS: D4, M12, M4, H8 to the disconnect position. *****CUE: RODS D4, M12, M4, H8 disconnect switches are in the DISCONNECT position.*** COMMENTS:	___ SAT __ UNSAT
STEP 8: IF the rod is dropped, then proceed to Step 2.14. to retrieve the dropped rod. STANDARD: Rod is not dropped, candidate goes to step 2.13. COMMENTS:	___ SAT __ UNSAT
STEP 9: IF the rod is misaligned, then perform the following: 2.13.1 Adjust turbine load to maintain T-Avg $\pm$ 2°F of T-Ref STANDARD: Candidate checks current value of T-Avg and T-Ref to determine difference. Since difference is less than 2°F, no action necessary. *****CUE: The difference between T-Avg and T-Ref is -0.2°F.*** COMMENTS:	___ SAT __ UNSAT
NOTE: When the misaligned rod motion begins, a "ROD CONTROL URGENT FAILURE" alarm will occur (except for Shutdown Banks C, D, or E).	

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 10: 2.13.2 Bring the misaligned rod into alignment with its bank using the "ROD MOTION" lever, observing that only the affected rod moves per DRPI. STANDARD: Operator positions Rod motion lever to the "OUT" position to align rod "D12". When operator releases ROD MOTION lever, determines that the rod is continuing to withdrawal uncontrollably. ****CUE: "ROD MOTION lever is selected to "OUT" and rod D12 is withdrawing. ROD MOTION lever is released, rod D12 continues to step OUT and cannot be stopped.*** COMMENTS:	___ SAT __ UNSAT
STEP 11: Operator takes actions allowed per Operations Management Procedure 1-8 and places the reactor in a safe condition by manually tripping the reactor by rotating the "RX TRIP TRN A' and RX TRIP TRN B" handles CCW to the "TRIP" positions and performs the immediate actions of EP/1/A/5000/E-0, Reactor Trip or Safety Injection. STANDARD: Rotates the "RX TRIP TRN A' and RX TRIP TRN B" handles CCW to the "TRIP" position. ****CUE: Reactor Trip breaker handles 1A and 1B have been rotated CCW.*** E-0, Step 2: **Verify Reactor Trip:** All rod bottom lights – LIT, All reactor trip and bypass breakers – OPEN, I/R amps - DECREASING. STANDARD: Candidate verifies the reactor trip breaker 1A and 1B GREEN "OPEN" lights are LIT, Intermediate Range amp meter indications are decreasing, ALL rod bottom light displays on the DRPI screens read "RB". ****CUE: All rod bottom displays read – RB, All reactor trip breaker GREEN "OPEN" lights are lit, Intermediate range amps - DECREASING.*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

Step 12: **Verify Turbine Trip:** All turbine stop valves – CLOSED OR Both of the following: All MSIVs – CLOSED and All MSIV bypass valves - CLOSED. STANDARD: Candidate verifies the stop valves – CLOSED or both of the following: ALL MSIVs and MSIV bypass valves –CLOSED. *****CUE: All turbine stop valves – CLOSED OR Both of the following: All MSIVs – CLOSED and All MSIV bypass valves - CLOSED.*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT
STEP 13: Perform EP/1/A/5000/E-0 Immediate steps 4 and 5 STANDARD: Operator proceeds to perform steps 4 and 5. **EXAMINER CUE: The BOP is completing the remaining E-0 Immediate actions, this JPM is complete.** COMMENTS:	___ SAT __ UNSAT
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 is in Mode 1 with temperature and power stable.
- During a control rod bank insertion for testing, Rod D-12 became misaligned with Control Bank D.
- IAE technicians and the Reactor Engineer have recommended that the rod be realigned with its control bank.

INITIATING CUES:

The Rod Control procedure OP/1/A/6150/008, Enclosure 4.6 has been completed through step 2.5. An NLO is standing by on the phone to provide rod control cabinet information. The Control Room SRO instructs you to complete the rod realignment by performing Enclosure 4.6, steps 2.6 through 2.13.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/SIM-2

Increase Cold Leg Accumulator 1D level

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Increase Cold Leg Accumulator 1D Level

Alternate Path: NO

Facility JPM #: New

K/A Rating(s): Safety Function 2 SYSTEM 006 A4.07 (4.4/4.4)

Task Standard:

Cold Leg accumulator 1D level is increased to 90% using Safety Injection pump 1A and the low pressure condition is cleared.

Preferred Evaluation Simulator: Control Room __X__ In-Plant ____

Preferred Evaluation Perform: Perform __X__ Simulate ____

References:

OP/1/A/6200/009 (Cold Leg Accumulator Operation) Enclosure 4.4 Revision 068

Validation Time: 12 min. **Time Critical:** NO

==

Candidate: ______________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ________________________ ________________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

SIMULATOR SETUP SHEET

1. Init to IC #1.

2. Operate the drain system for CLA 1D per Enclosure 4.5 and decrease level to 84%

3. Ensure the low pressure alarm for CLA 1D is also in.

Write to Protected IC.

SNAP No.: 113

SIMULATOR OPERATOR INSTRUCTIONS:

When the NLO is dispatched to open 1NI-363, state:

"Using time compression, 1NI-363 is open.

Tools/Equipment/Procedures Needed:

Copies of OP/1/A/6200/009, Enclosure 4.4 Revision 68

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:

A sample line leak is suspected as the cause of loss of accumulator 1D level.
The low level condition has also caused a low pressure condition.

INITIATING CUES:

The CRSRO has directed you to increase Cold Leg Accumulator 1D level to 90% using OP1/A/6200/009 (Cold Leg Accumulator Operation) Enclosure 4.4. Both Safety Injection pumps are operable and NI pump 1A has been checked out by an NLO. Complete the enclosure beginning at step 2.4.3. During the fill process ensure the low pressure condition is corrected. Independent verification will be waived during this JPM.

START TIME: _______

STEP 1: Step 2.4.3 **IF** a Safety Injection should occur during the performance of Steps 2.4.4 through 2.25, open 1NI-118A (NI Pump 1A C-Leg Inj Isol). Sign below to document understanding of responsibility. Responsible NCO ______________________ Date ________ Responsible SRO ______________________ Date ________ STANDARD: Operator signs the NCO slot for understanding and asks that the SRO sign for his/her understanding of responsibility. **EXAMINER CUE: SRO Joe Cornwell has signed.** COMMENTS:	___ SAT __ UNSAT
STEP 2: 2.4.4 Close 1NI-118A (NI Pump 1A C-Leg Inj Isol). STANDARD: Candidate depresses the GREEN "CLOSE" button for 1NI-118A on MC-11 and verifies the RED "OPEN" light is DARK and the GREEN "CLOSE" light is LIT. *****CUE: The GREEN "CLOSE" button for 1NI-118A on MC-11has been depressed, the RED "OPEN" light is DARK and the GREEN "CLOSE" light is LIT.*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT
STEP 3: 2.4.5 Use NI Pump 1A for CLA makeup. STANDARD: Candidate understands that based on step 2.4, he/she is to use NI pump 1A. COMMENTS:	___ SAT __ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 4: 2.5 **IF** NI Pump 1B is **NOT** operable **AND NOT** available, use NI Pump 1A for CLA makeup. 2.6 **IF** either of the following conditions exist, use NI Pump 1B for CLA makeup. • NI Pump 1A is **NOT** operable **AND NOT** available • NI Pump 1B is **NOT** operable but is available 2.7 Log one NI Pump in TSAIL due to opening 1NI-120B (NI Pmps To C-Leg Accum Fill) and 1NI-363 (NI To Cold Leg Accum Fill). STANDARD: Per the initial cues, step 2.5 and 2.6 do not apply. The SRO should be directed to Log the pump in TSAIL due to opening NI-120. **EXAMINER CUE: SRO Joe Cornwell has logged NI pump 1A in TSAIL.** COMMENTS:	___ SAT __ UNSAT
STEP 5: 2.8 Open 1NI-363 (NI To Cold Leg Accum Fill) STANDARD: Candidate contacts NLO (through the simulator booth) and directs that 1NI-363 be locally opened. **EXAMINER NOTE: The booth operator will state:** **"Using time compression, 1NI-363 is open."** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 6: 2.9 Open 1NI-120B (NI Pmps To C-Leg Accum Fill). STANDARD: Candidate depresses the RED "OPEN" button for 1NI-120B on MC-11 and verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK. *****CUE: The RED "OPEN" button for 1NI-120B on MC-11 has been depressed and the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK..*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 7: 2.10 Start the desired NI pump: NI PMP 1A STANDARD: Candidate depresses the RED "ON" button for NI pump 1A on MC-11 and verifies the RED "ON" light is LIT and the GREEN "OFF" light is DARK. *****CUE: The RED "ON" button for NI pump 1A on MC-11 has been depressed and the RED "ON" light is LIT and the GREEN "OFF" light is DARK..*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 8: 2.11 Open 1NI-95A (C-Leg Accum Chk Vlv Tst Isol). STANDARD: Candidate depresses the RED "OPEN" button for 1NI-95A on MC-11 and verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK. *****CUE: The RED "OPEN" button for 1NI-95A on MC-11 has been depressed and the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK..*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 9: 2.12 Position 1CB-1 (located behind control panel 1MC6, BB-56) to "ON" STANDARD: Candidate enters the main control boards to position 1CB-1 breaker to the ON position. ****CUE: 1MC6 has been accessed and 1CB-1 has been positioned to ON.*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT
STEP 10: 2.13 Record the initial level of accumulator(s) to be filled. CLA: 1D_________% STANDARD: Candidate records initial level from meters on MC-11 or OAC for 1D CLA. ****CUE: 1D CLA level is 84%.*** COMMENTS:	___ SAT __ UNSAT
STEP 11: 2.14 Open the corresponding valve for the accumulator to be filled: • 1NI-90 (C-Leg Accum D Fill Isol) STANDARD: Candidate depresses the RED "OPEN" button for 1NI-90 on MC-11 and verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK. ****CUE: The RED "OPEN" button for 1NI-90 on MC-11 has been depressed and the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK..*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT
STEP 12: 2.16 Monitor level continuously during the fill process. STANDARD: Candidate monitors CLA 1D level on MC-11 and or on OAC graphics. ****CUE: 1D CLA level is increasing and is now 90% on MC-11 level instrument.*** COMMENTS:	___ SAT __ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 13: 2.16 **WHEN** the accumulator is at the desired level, close the corresponding valve: • 1NI-90 (C-Leg Accum D Fill Isol) STANDARD: Candidate depresses the GREEN "CLOSE" button for 1NI-90 on MC-11 and verifies the GREEN "CLOSE" light is LIT and the " RED "OPEN" light is DARK. *****CUE: The GREEN "CLOSE" button for 1NI-90 on MC-11 has been depressed and the RED "OPEN" light is DARK and the GREEN "CLOSE" light is LIT.*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT
STEP 14: 2.18 Record the final level of accumulator(s) to be filled. CLA: 1D_________% STANDARD: Candidate records final level from meters on MC-11 or OAC for 1D CLA. *****CUE: 1D CLA level is 90%.*** COMMENTS:	___ SAT __ UNSAT
STEP 15: 2.19 Position 1CB-1 (located behind control panel 1MC6, BB-56) to "OFF" STANDARD: Candidate enters the main control boards either at 1MC6 or at the end of the horseshoe to position 1CB-1 breaker to the OFF position. *****CUE: 1MC6 has been accessed and 1CB-1 has been positioned to OFF.*** COMMENTS:	___ SAT __ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 16: 2.20 Stop the pump started in Step 2.10: NI PMP 1A STANDARD: Candidate depresses the GREEN "OFF" button for NI pump 1A on MC-11 and verifies the RED "ON" light is DARK and the GREEN "OFF" light is LIT. ****CUE: The GREEN "OFF" button for NI pump 1A on MC-11 has been depressed and the RED "ON" light is DARK and the GREEN "OFF" light is LIT.*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT
STEP 17: 2.21 Perform the following to reduce 1A NI Pump header pressure to less than 100 psig as indicated by 1NIP5440: STANDARD: Candidate prepares to direct local operator actions to reduce header pressure. **EXAMINER CUE: Using time compression, step 2.21 has been completed and header pressure reduced to less than 100 psig.** COMMENTS:	___ SAT __ UNSAT
STEP 18: 2.22 Close 1NI-95A (C-Leg Accum Chk Vlv Tst Isol). STANDARD: Candidate depresses the GREEN "CLOSE" button for 1NI-195A on MC-11 and verifies the RED "OPEN" light is DARK and the GREEN "CLOSE" light is LIT. ****CUE: The GREEN "CLOSE" button for 1NI-195A on MC-11 has been depressed and the RED "ON" light is DARK and the GREEN "OFF" light is LIT.*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 19: 2.23 Close 1NI-120B (NI Pmps To C-Leg Accum Fill). STANDARD: Candidate depresses the GREEN "CLOSE" button for 1NI-120B on MC-11 and verifies the RED "OPEN" light is DARK and the GREEN "CLOSE" light is LIT. *****CUE: The GREEN "CLOSE" button for 1NI-120B on MC-11 has been depressed and the RED "ON" light is DARK and the GREEN "OFF" light is LIT.*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT
STEP 20: 2.24 Close 1NI-363 (NI To Cold Leg Accum Fill). STANDARD: Candidate directs NLO to locally close 1NI-363. **EXAMINER CUE: Using time compression: the NLO has closed 1NI-363.** COMMENTS:	___ SAT __ UNSAT
STEP 21: 2.25 Ensure 1NI-118A (NI Pump 1A C-Leg Inj Isol) is open. STANDARD: Candidate depresses the RED "OPEN" button for 1NI-118A on MC-11 and verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK. *****CUE: The RED "OPEN" button for 1NI-118A on MC-11 has been depressed and the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK..*** COMMENTS:	**CRITICAL STEP** ___ SAT __ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 22: 2.26 Clear the TSAIL entry(s) made in Step 2.4 (if one was required) and Step 2.7. STANDARD: Operator directs SRO to clear TSAIL entry for 1A NI pump. **EXAMINER CUE: TSAIL entry has been cleared.** COMMENTS: 2.27 Record the following in Autolog: • ☐Affected Accumulator • ☐Initial level (from Step 2.13) • ☐Final level (from Step 2.18) STANDARD: Candidate discusses need to make autolog entries. **EXAMINER CUE: Another operator will complete needed AutoLog entries.** COMMENTS:	___ SAT __ UNSAT
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:

A sample line leak is suspected as the cause of loss of accumulator 1D level.
The low level condition has also caused a low pressure condition.

INITIATING CUES:

The CRSRO has directed you to increase Cold Leg Accumulator 1D level to 90% using OP1/A/6200/009 (Cold Leg Accumulator Operation) Enclosure 4.4. Both Safety Injection pumps are operable and NI pump 1A has been checked out by an NLO. Complete the enclosure beginning at step 2.4.3. During the fill process ensure the low pressure condition is corrected. Independent verification will be waived during this JPM.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/SIM-3

Perform Enclosure 6 of ES-3.2 (SGTR Cooldown Using Blowdown)

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Perform Enclosure 6 of ES-3.2 (SGTR Cooldown Using Blowdown).

Alternate Path: NO

Facility JPM #: OP-CN-EP-EP4-002

K/A Rating(s): Safety Function 3 EPE 038 EA1.18 (4.0/3.9)

Task Standard:

Blowdown flow is established from steam generator 1C at less than or equal to 100 gpm.

Preferred Evaluation Simulator:

Control Room __X__ In-Plant ____

Preferred Evaluation Perform

Perform __X__ Simulate ______

References:

EP/1/A/5000/ES-3.2 (Post – SGTR Cooldown Using Blowdown) Enclosure 6 Revision 13

Validation Time: 12 min. **Time Critical:** NO

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Candidate: ____________________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ____________________________ __________________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

SIMULATOR SET-UP SHEET

1. Reset to a 100% MOL IC.
2. Insert **MAL-SG001C**, Value = **400** gpm.
3. Complete actions of E-0 and E-3.
4. Ensure BB tank Level Lo Alarm (D1880) clear.
5. Ensure BB pump 1A is off.
6. Freeze simulator.

Write to a protected snap _115____

SIMULATOR OPERATOR INSTRUCTIONS:

Reset to snap _____

Tools/Equipment/Procedures Needed:

Copy of EP/1/A/5000/ES-3.2 Enclosure 6

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.

INITIATING CUES:

EP/1/A/5000/ES-3.2 (Post-SGTR Cooldown Using Blowdown) has been implemented following a tube rupture on S/G 1C. As BOP you are directed to establish blowdown at 100 gpm from the ruptured S/G using Enclosure 6 of EP/ES-3.2.

START TIME: _______

STEP 1: Ensure CA system valve control reset. STANDARD: Operator ensures "CA SYS VLV CTRL TRN A(B) YELLOW reset lights are LIT on MC-10. ****CUE: "CA System Valve Control Train A and B" YELLOW reset lights are LIT.******* COMMENTS:	___ SAT ___ UNSAT
EXAMINER NOTE: The flow controllers for the blowdown system are tripped close at the beginning of the tube rupture. This step only positions the controller function to zero flow. Actual flow, the BLACK needle, is already at bottom of scale. STEP 2: Close the following controllers: "S/G A BLDWN FLOW CTRL" "S/G B BLDWN FLOW CTRL" "S/G C BLDWN FLOW CTRL" "S/G D BLDWN FLOW CTRL" STANDARD: Operator positions "S/G A (B,C,D) BLDWN FLOW CTRL" to close by rotating the positioners counter-clockwise until the RED needle is at the bottom of scale. (MC-04) ****CUE: Flow controller "S/G A (B,C,D) BLDWN FLOW CTRL" positioner is rotated counter-clockwise and the RED needle is reading zero.******* COMMENTS:	___ SAT ___ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 3: Ensure 1BB-178 (BB Demin To Cond Drn Hdr Isol) – OPEN STANDARD: Operator ensures 1BB-178 RED "OPEN" light is LIT and GREEN "CLSD" light is DARK on MC-04. *****CUE: Valve 1BB-178 RED "OPEN" light is LIT and GREEN "CLOSED" light is DARK on MC-04.******* COMMENTS:	___ SAT ___ UNSAT
STEP 4: Ensure 1BB-48 (BB Pumps Disch To TB Smp) – CLOSED STANDARD: Operator ensures 1BB-48 RED "OPEN" light is DARK and GREEN "CLSD" light is LIT on MC-04. *****CUE: Valve 1BB-48 RED "OPEN" light is DARK and GREEN "CLOSED" light is LIT on MC-04.******* COMMENTS:	___ SAT ___ UNSAT
STEP 5: Ensure Override 1EMF-33 by depressing "OVRIDE" on the RAD MON OVERRIDE Pushbutton (1MC-4). STANDARD: Operator depresses "OVRIDE" on the RAD MON OVERRIDE pushbutton for 1EMF-33(1MC-4). *****CUE: "OVERRIDE" pushbutton for 1EMF-33 "RAD MON OVERRIDE" has been depressed on MC-04.******* ***If operator uses the WHITE light to verify the override status, state that the WHITE "OVERRIDE" light is LIT*** COMMENTS:	***CRITICAL STEP** ___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 6: Notify station management to determine the maximum blowdown flowrate from ruptured S/G(s). (step 6) STANDARD: Operator asked that a management decision be sought for the maximum flowrate. **EXAMINER NOTE: 100 gpm per initiating cue.** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 7: Align blowdown from ruptured S/G(s) as follows: STANDARD: Operator performs the following for S/G 1C: a. Ensure 1BB-82 (1C S/G Blowdown Penetration Valve Test Isol) - OPEN **EXAMINER CUE: 1BB-82 is OPEN** *b. Open 1BB-60A (S/G 1C Bldwn Cont Isol Insd) STANDARD: Operator depresses "OPEN" pushbutton for 1BB-60A on MC-10 and verifies RED "OPEN" light is LIT and GREEN "CLSD" light is DARK. *****CUE: Valve 1BB-60A RED pushbutton is depressed, RED "OPEN" light is LIT and GREEN "CLOSED" light is DARK on MC-10.***** COMMENTS: *c. Open 1BB-149B (S/G 1C Bldwn Cont Isol Byp) STANDARD: Operator depresses "OPEN" pushbutton for 1BB-149B on MC-10 and verifies RED "OPEN" light is LIT and GREEN "CLSD" light is DARK. *****CUE: Valve 1BB-149B RED pushbutton is depressed, RED "OPEN" light is LIT and GREEN "CLOSED" light is DARK on MC-10.***** COMMENTS: d. Do not continue until 5 minutes has elapsed. STANDARD: Operator checks time and waits for 5 minutes before continuing. **EXAMINER CUE: Using time compression 5 minutes have elapsed.** COMMENTS:	***CRITICAL STEP** ___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 7: (step 7 continued) Align blowdown from ruptured S/G(s) as follows: STANDARD: Operator performs the following for S/G 1C: *e. Open 1BB-61B (S/G 1C Bldwn Cont Isol Otsd) STANDARD: Operator depresses "OPEN" pushbutton for 1BB-61B on MC-10 and verifies RED "OPEN" light is LIT and GREEN "CLSD" light is DARK. *****CUE: Valve 1BB-61B RED pushbutton is depressed, RED "OPEN" light is LIT and GREEN "CLOSED" light is DARK on MC-10.******* COMMENTS: *f. Close 1BB-149B (S/G 1C Bldwn Cont Isol Byp) STANDARD: Operator depresses "CLSD" pushbutton for 1BB-149B on MC-10 and verifies RED "OPEN" light is DARK and GREEN "CLSD" light is LIT. *****CUE: Valve 1BB-149B GREEN pushbutton is depressed, RED "OPEN" light is DARK and GREEN "CLOSED" light is LIT on MC-10.******* COMMENTS: *g. Slowly open "S/G C BLDWN FLOW CTRL" until flow is indicated. STANDARD: On MC-04, operator rotates controller positioner clockwise and looks for BLACK needle to increase above zero GPM flow. **EXAMINER NOTE: The flow is indicated on the BLACK needle and "demanded" position is the RED needle.** *****CUE: "S/G C BLDWN FLOW CTRL" positioner has been rotated clockwise. The BLACK needle reads 10 gpm.******* COMMENTS: h. Do not continue until 10 minutes has elapsed. STANDARD: Operator checks time and waits for 10 minutes before continuing. **EXAMINER CUE: Using time compression 10 minutes have elapsed.** COMMENTS:	***CRITICAL STEP** ____ SAT ____ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 7: (step 7 continued) Step 7 i Verify blowdown system – PREVIOUSLY ALIGNED FOR COLD WATER INJECTION STANDARD: Operator asked for history of Blowdown system alignment. When noted, operator goes to RNO for actions. **EXAMINER CUE: The blowdown system was not aligned for Cold Water Injection.** COMMENTS: *I RNO. WHEN "S/G BLOWDOWN TANK LEVEL LO" alarm (OAC POINT D1880) (28% level on local gauge) clears, THEN restart the BB pump. STANDARD: Operator locates OAC POINT D1880 to determine that "S/G BLOWDOWN TANK LEVEL LO" is not in alarm. Restarts 1A BB pump by depressing the RED "ON" pushbutton verifying the RED "ON" light is LIT and GREEN "OFF" light is DARK on MC-04 *****CUE: OAC POINT D1880 "S/G BLOWDOWN TANK LEVEL LO" is not in alarm. On MC-04, 1A Blowdown pump RED "ON pushbutton has been depressed, the RED "ON" light is LIT and GREEN "OFF" light is DARK.***** COMMENTS: *j. Throttle "S/G C BLDWN FLOW CTRL" to maintain flow as required from Step 6. STANDARD: On MC-04, operator rotates controller positioner clockwise and looks for RED needle to no more than 100 GPM flow. **EXAMINER NOTE: The flow is indicated on the BLACK needle and "demanded" position is the RED needle. The OAC displays a flowrate also.** *****CUE: "S/G C BLDWN FLOW CTRL" positioner has been rotated clockwise. The BLACK needle reads 100 gpm.***** COMMENTS:	***CRITICAL STEP** ___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 8: IF required, THEN shift blowdown operating modes. STANDARD: No change is made to the operating modes. **EXAMINER CUE: No change will be made to the operating mode.** COMMENTS:	___ SAT ___ UNSAT
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)

INITIATING CUES:

EP/1/A/5000/ES-3.2 (Post-SGTR Cooldown Using Blowdown) has been implemented following a tube rupture on S/G 1C. As BOP you are directed to establish blowdown at 100 gpm from the ruptured S/G using Enclosure 6 of EP/ES-3.2.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/SIM-4

Respond to a loss of UST level

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Respond to a loss of UST level.

Alternate Path: YES

Facility JPM #: NEW

K/A Rating(s): Safety Function 4(Secondary) SYSTEM 061 K4.01 (4.1/4.2)

Task Standard:

Candidate uses AP-06 Case II, Loss of Normal CA Supply to isolate CA pumps from an empty UST, reduces CA flow to less than 600 gpm and shifts CA Pump suctions to RN.

Preferred Evaluation Simulator:

Control Room __X__ In-Plant ____

Preferred Evaluation Perform

Perform __X__ Simulate ______

References:

AP/1/A/5500/006 (Loss of S/G Feedwater) Revision 034

Validation Time: 12 min. **Time Critical:** NO

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Candidate: ____ Time Start: ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ____________________________ ________________________________/________
NAME SIGNATURE DATE

===

COMMENTS

____

____

____

Simulator Setup

1. Reset to 100% IC
2. Manually trip the reactor
3. Secure all Condensate and Feedwater Pumps
4. Insert XMT-CM004 (UST level), value = 0.
5. Insert OVR-CM001C (COND VAC BKR VLVS), value = 0
6. Turn off the CST makeup pumps then push the AUTO buttons. Both pumps should stay off.
7. Fail the automatic actions for the 6 RN valves: RN-250A, CA-116A, CA-15A, RN-310B, CA-85B, and CA-18B
8. Stabilize snap and write to IC set ____187________

SIMULATOR OPERATOR ACTIONS

1. NONE.

Tools/Equipment/Procedures Needed:

AP/1/A/5500/006 (Loss of S/G Feedwater) Revision 034

READ TO CANDIDATE

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 has tripped from a loss of condensate and feed system.
- A CM header rupture has required that the condensate system be shutdown.
- The Motor Driven CA pumps are feeding the steam generators.
- Annunciator 1AD-08 B/1 "UST LO LEVEL" has alarmed.

INITIATING CUES:

The SRO has directed you to respond to the UST lo level alarm using AP/1/A/5500/06, Loss of S/G Feedwater, Case II, Loss of Normal CA Supply.

START TIME: _______

NOTE • If the CA pumps are taking a suction on the hotwell with the UST and CACST depleted and the CA auto start circuitry actuated, then the CA pump suction will automatically align to the RN assured makeup source. • If CA has been reset and CA pump suction is aligned to the hotwell with the UST and CACST depleted, then the CA pumps will trip on low suction pressure.	
STEP 1: Step 1: **IF AT ANY TIME 1AD-5, H/4 "CACST LO LEVEL" is LIT, THEN verify 1CA-6 (CA Pmps Suct From CA CST) - CLOSED.** STANDARD: Candidate determines that 1AD-5, H/4 "CACST LO LEVEL" is DARK *****CUE: 1AD-5, H/4 "CACST LO LEVEL" is DARK*** COMMENTS:	___ SAT ___ UNSAT
STEP 2: Step 2. **Initiate makeup to UST as follows:** • Ensure CST pumps - ON. • Throttle open 1YM-100 (UST M/U CTRL) as required to make up to UST. STANDARD: Candidate locates CST pumps on MC-13 and depresses ON pushbutton to start the pumps. *****CUE: CST pumps 1A and 1B "ON" pushbuttons depressed. CST pumps 1A and 1B RED "ON" lights lit. ***** STANDARD: Candidate locates and throttles open 1YM-100 as required to makeup to the UST. *****CUE: 1YM-100 has been throttled open as required to makeup to the UST. ***** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 3: Step 3. Verify UST, Hotwell and CACST level indication as follows: a. Indication available to 1CSP5030 (CA Cond Stor Tnk Level) (1MC10). b. Indication available to 1CSCR5840 (UST Level) (1MC13). c. Indication available to 1CSCR5840 (Hotwell Level) (1MC13). d. IF AT ANY TIME UST, Hotwell or CACST level indication is lost, THEN perform Steps 3.a through 3.c. STANDARD: Candidate locates and determines that level indication available on 1CSP5030 (CA Cond Stor Tnk Level) (1MC10). ****CUE: Level indication available on 1CSP5030 (CA Cond Stor Tnk Level) (1MC10). ***** STANDARD: Candidate locates and determines that level indication available on 1CSCR5840 (UST Level) (1MC13). **EXAMINER NOTE: If candidate decides that the UST level indication is not available, provide the following cue:** **EXAMINER CUE: Using time compression, the operator cannot enter the turbine building.** ****CUE: Level indication available on 1CSCR5840 (UST Level) (1MC13). ***** STANDARD: Candidate locates and determines that level indication available on 1CSCR5840 (Hotwell Level) (1MC13). ****CUE: Level indication available on 1CSCR5840 (Hotwell Level) (1MC13). ***** COMMENTS:	___ SAT ___ UNSAT
NOTE For the remainder of this procedure, level values in parenthesis are local indications, intended for use when control room indications are not available.	

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 4: Step 4: Verify UST level - GREATER THAN 25% (18,000 gal). STANDARD: Candidate locates and determines that UST level on recorder on MC-13 is less than 25%. Goes to STEP 7 from RNO. ****CUE: UST level reads 0%. ***** COMMENTS:	___ SAT ___ UNSAT
STEP 5: Step 7: IF AT ANY TIME UST level is less than 10% (5,000 gal), THEN perform the following: a. Close 1CA-4 (CA Pmps Suct From UST). STANDARD: Candidate determines from step 4 that UST level is less than 10%. COMMENTS: STANDARD: Candidate depresses the closed pushbutton for 1CA-4 and verifies the GREEN "CLSD" light is LIT and the RED "OPEN" light is DARK. ****CUE: The GREEN "CLOSED" pushbutton for 1CA-4 has been depressed. The GREEN "CLSD" light is LIT and the RED "OPEN" light is DARK. ***** COMMENTS:	**CRITICAL** ___ SAT ___ UNSAT
STEP 6: Step 8: IF operators were previously dispatched to close 1CS-69 (U1 CACST To U1 & U2 CA Supplies), THEN GO TO Step 12. STANDARD: Step does not apply. COMMENTS:	___ SAT ___ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 7: Step 9: Verify the following: • CACST level - GREATER THAN 35% • 1CA-6 (CA Pmps Suct From CACST) - OPEN. STANDARD: Candidate verifies that CACST level – LESS THAN 35% and GOES TO STEP 12 from RNO action. ****CUE: CACST level is 23%. ***** COMMENTS:	___ SAT ___ UNSAT
STEP 8: Step 12: Maintain total CA flow less than 600 GPM in subsequent steps. STANDARD: Candidate reads step and continues in procedure. COMMENTS:	___ SAT ___ UNSAT
STEP 9: Step 13: Monitor Enclosure 1 (Foldout Page). STANDARD: Candidate locates Enclosure 1 and monitors criteria. COMMENTS: **EXAMINER NOTE: It is expected that Candidate will go to this Enclosure 1 and perform any needed actions. IF candidate attempts to pass off enclosure to another operator, provide cue:** **EXAMINER CUE: No one else is available to Monitor Enclosure 1 at this time.**	**CRITICAL** ___ SAT ___ UNSAT
ENCLOSURE 1 STEP 10: Step 1: IF AT ANY TIME CA pumps are no longer required, THEN GO TO Case II (Loss of Normal CA Supply), Step 23. STANDARD: Candidate continues in procedure. COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

ENCLOSURE 1	
STEP 11: Step 2: IF AT ANY TIME hotwell level less than 0.5 ft (6 in), THEN GO TO Step 5 of this enclosure. STANDARD: Candidate locates hotwell level on MC-13, determines level is greater than 0.5 ft and continues to Step 3. *****CUE: Hotwell level is 6.6 ft.***** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

ENCLOSURE 1

STEP 12: Step 3: IF AT ANY TIME the following conditions exist:
- CA suction - ALIGNED TO CONDENSATE GRADE SOURCE (CACST, UST, HOTWELL)
- Total CA Flow - GREATER THAN 600 GPM.

THEN perform the following:

a. Immediately reduce total CA flow to less than 600 GPM.

CRITICAL

___ SAT

___ UNSAT

STANDARD: Candidate determines that CA is aligned to the CACST and Hotwell, then locates CA flow meters on MC-10 and determines TOTAL CA FLOW is greater than 600 gpm.

*****CUE: CA Flow to S/G 1A (1CAP5090) reads 250 gpm.***
CA Flow to S/G 1B (1CAP5100) reads 250 gpm.
CA Flow to S/G 1C (1CAP5110) reads 250 gpm.
CA Flow to S/G 1D (1CAP5120) reads 250 gpm.

STANDARD: Candidate resets "CA SYS VLV CTRL TRN A" and CA SYS VLV CTRL TRN B" by depressing the reset pushbuttons for 2 seconds on MC-10 and verifies the Yellow "RESET" light LIT.

*****CUE: "CA SYS VLV CTRL TRN A" and CA SYS VLV CTRL TRN B" reset pushbuttons have been depressed. "CA SYS VLV CTRL TRN A" and CA SYS VLV CTRL TRN B" Yellow "RESET" lights LIT.***

STANDARD: Candidate positions the following valve controllers in the counter-clockwise direction:
"1CA-60 CA PMP 1A FLOW TO S/G 1A"
"1CA-56 CA PMP 1A FLOW TO S/G 1B"
"1CA-44 CA PMP 1B FLOW TO SG 1C"
"1CA-40 CA PMP 1B FLOW TO SG 1D"

*****CUE: The valve controller has been rotated in the counter-clockwise direction (for each valve positioned).*****

STANDARD: Candidate locates CA flow meters on MC-10 and verifies TOTAL CA FLOW is less than 600 gpm.
CA Flow to S/G 1A (1CAP5090)
CA Flow to S/G 1B (1CAP5100)
CA Flow to S/G 1C (1CAP5110)
CA Flow to S/G 1D (1CAP5120)

*****CUE: CA Flow to S/G 1A (1CAP5090) reads 120 gpm.***
CA Flow to S/G 1B (1CAP5100) reads 120 gpm.
CA Flow to S/G 1C (1CAP5110) reads 120 gpm.
CA Flow to S/G 1D (1CAP5120) reads 120 gpm.

COMMENTS:

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

ENCLOSURE 1 STEP 13: Step 4: Do not continue in this enclosure until directed by steps above. STANDARD: Candidate stops Enclosure 1 here and returns to Case II of AP-06 at step 14. COMMENTS:	___ SAT ___ UNSAT
STEP 14: Step 14: Break condenser vacuum as follows: a. Open "COND A-B-C VAC BKR VLVS" STANDARD: Candidate depresses the RED "OPEN" pushbutton for "COND A-B-C VAC BKR VLVS" on 1MC-1. Verifies GREEN "CLSD" light LIT and RED "OPEN" light DARK. *****CUE: The RED "OPEN" pushbutton for "COND A-B-C VAC BKR VLVS" on 1MC-1 has been depressed. The GREEN "CLSD" light is LIT and RED "OPEN" light is DARK.*** STANDARD: Candidate determines that the vacuum breakers did not open goes to step 14a RNO. Step 14a RNO: Dispatch two (2) operators to break vacuum. REFER TO Enclosure 2 (Local Actions to Break Condenser Vacuum) STANDARD: Candidate reads RNO and contacts two operators to perform Enclosure 2 **EXAMINER CUE: Using time compression, the operator cannot enter the turbine building.** COMMENTS:	___ SAT ___ UNSAT
STEP 15: Step 14.b: Verify condenser vacuum broken as follows: 1) Verify condenser vacuum indication - AVAILABLE STANDARD: Candidate locates condenser vacuum meter on MC-1 and determines that indication is available. *****CUE: Condenser vacuum is available. ***** COMMENTS:	___ SAT ___ UNSAT
NOTE: It may take up to 10 minutes for condenser vacuum to reach 0 in HG.	

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

	CRITICAL
STEP 16: Step 14.b.2: Verify one of the following • "CONDENSER VACUUM" (1MC13) - 0 IN HG OR • Dispatched operator reports no air flow into condenser. STANDARD: Candidate locates vacuum meter on MC-1 and determines that condenser vacuum is greater than 0 IN HG and has not heard back from the operators. Continues to step 14.b.2 RNO. *****CUE: Condenser vacuum is 28 in. HG. ***** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 17: Step 14.b.2 RNO: Shift CA pump suction to RN as follows:	**CRITICAL**

STEP 17: Step 14.b.2 RNO: Shift CA pump suction to RN as follows:

____ SAT

____ UNSAT

NOTE: Extreme high temperature in the Auxiliary Building may cause 1RN-250A to lose indication or indicate intermediate when full open.

a) IF Train A RN essential header is available, **THEN** open the following valves:

- 1RN-250A (RN Hdr A To CA Pmp Suct Isol)
- 1CA-116A (CA Pump #1 Suct Frm RN Hdr A)
- 1CA-15A (CA Pump 1A Suct Frm RN Isol).

STANDARD: Candidate locates RN Essential Hdr A pressure meter 1RNP5020 on MC-9F and determines Train A RN essential header is available.

*****CUE: Train A RN essential header pressure is 59 psig. *****

COMMENTS:

STANDARD: Candidate rotates the switch for 1RN-250A on 1MC-10 clockwise to the "OPEN" position. Verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.

*****CUE: The switch for 1RN-250A*** **has been rotated to the "OPEN" position.** ***1RN-250A RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.***

COMMENTS:

STANDARD: Candidate rotates the switch for CA-116A on 1MC-10 clockwise to the "OPEN" position. Verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.

*****CUE: The switch for 1CA-116A has been rotated to the "OPEN" position. 1CA-116A RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.***

COMMENTS:

STANDARD: Candidate rotates the switch for 1CA-15A on 1MC-10 clockwise to the "OPEN" position. Verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.

*****CUE: The switch for 1CA-15A has been rotated to the "OPEN" position. 1CA-15A RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.***

COMMENTS:

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

NOTE: Extreme high temperature in the Auxiliary Building may cause 1RN-310B to lose indication or indicate intermediate when full open.

b) **IF** Train B RN essential header is available, **THEN** open the following valves:

- 1RN-310B (RN Hdr B To CA Pmp Suct Isol)
- 1CA-85B (CA Pump #1 Suct Frm RN Hdr B)
- 1CA-18B (CA Pump 1B Suct Frm RN Isol).

STANDARD: Candidate locates RN Essential Hdr B pressure meter 1RNP5030 on MC-9F and determines Train B RN essential header is available.

*****CUE: Train B RN essential header pressure is 59 psig. *****

COMMENTS:

STANDARD: Candidate rotates the switch for 1RN-310B on 1MC-10 clockwise to the "OPEN" position. Verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.

*****CUE: The switch for 1RN-310B has been rotated to the "OPEN" position. 1RN-250A RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.***

COMMENTS:

STANDARD: Candidate rotates the switch for 1CA-85B on 1MC-10 clockwise to the "OPEN" position. Verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.

*****CUE: The switch for 1CA-85B* has been rotated to the "OPEN" position. *1CA-116A RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.***

COMMENTS:

STANDARD: Candidate rotates the switch for 1CA-18B on 1MC-10 clockwise to the "OPEN" position. Verifies the RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.

*****CUE: The switch for CA-18B* has been rotated to the "OPEN" position. *1CA-18B RED "OPEN" light is LIT and the GREEN "CLOSE" light is DARK.***

COMMENTS:

STEP 18: Step 14.b.2.c RNO: Ensure 1CA-6 (CA Pmps Suct From CA CST) - CLOSED. STANDARD: Candidate rotates the switch for 1CA-6 to the "CLOSE" position. Verifies GREEN "CLOSE" light LIT and RED "OPEN" light DARK. ***CUE: The switch for 1CA-6 has been rotated to the "CLOSE" position. The GREEN "CLOSE" light is LIT and RED "OPEN" light is DARK.***** COMMENTS:	___ SAT ___ UNSAT
STEP 19: Step 14.b.2.e RNO: Ensure 1CA-4 (CA Pmps Suct From UST) - CLOSED. STANDARD: Candidate ensures GREEN "CLOSE" light LIT and RED "OPEN" light DARK for 1CA-4. ***CUE: The 1CA-4 GREEN "CLOSE" light is LIT and the RED "OPEN" light is DARK.***** COMMENTS:	___ SAT ___ UNSAT
STEP 20: Step 14.b.2.g RNO: Maintain S/G N/R levels between 11% - 50%. STANDARD: S/G NR levels are monitored and flow controllers are adjusted as required. ***CUE: All S/G NR levels are 39%.***** COMMENTS:	___ SAT ___ UNSAT
STEP 21: Step 14.b.2.h RNO: **GO TO** Step 22. STANDARD: Candidate transitions to step 22. COMMENTS:	___ SAT ___ UNSAT
STEP 22: Step 22: Do not continue in this procedure until CA is no longer required. STANDARD: Candidate determines that CA is presently required and the procedure should not be continued. COMMENTS:	___ SAT ___ UNSAT
This JPM is complete.	

Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.

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 has tripped from a loss of condensate and feed system.
- A CM header rupture has required that the condensate system be shutdown.
- The Motor Driven CA pumps are feeding the steam generators.
- Annunciator 1AD-8 B/1 "UST LO LEVEL" has alarmed.

INITIATING CUES:

The SRO has directed you to respond to the UST lo level alarm using AP/1/A/5500/06, Loss of S/G Feedwater, Case II, Loss of Normal CA Supply.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM/SIM-5

Align the NS System to Cold Leg Recirculation

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Align the NS System to Cold Leg Recirculation

Alternate Path: YES

Facility JPM #: **2003 NRC Repeat (OP-CN-ECCS-NS-101)**

K/A Rating(s): Safety Function 5 SYSTEM 026 A2.04 (3.9/4.2)

Task Standard:

NS Pump1B is in operation with its suction aligned to the containment sump and proper RN flow established to the 1B NS heat exchanger.

Preferred Evaluation Location:

Simulator __X__ In-Plant ______

Preferred Evaluation Method:

Perform __X__ Simulate ______

References:

EP/1/A/5000/ES-1.3 (transfer to Cold Leg Recirculation) Enclosure 2; Revision 15

Validation Time: 6 min. **Time Critical:** No

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Candidate: ______________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: ____________________ ____________________/________
NAME SIGNATURE DATE

===

COMMENTS

____

____

____

SIMULATOR SET-UP SHEET

1. Reset to any power IC set.
2. Ensure RN Pump 1A is NOT in service.
3. Insert the following:
   - **MAL-NC013B** (Cold Leg Leak) set malfunction value = **27.0**.
   - **MAL-RN003A** (Nuclear Service Water Pump 1A Failure) Value = **BOTH**.
   - **MAL-NS001B** (Containment Spray Pump 1B Failure) Value = **AUTO**
   - **VLV-NI038F** (NI-185A CNMT Sump Line 1A ISO (Stem) Fail To Position) Value = **0**.
4. Run the simulator until the "FWST LO-LO LEVEL" alarm is received while performing all required actions of EP/E-0, EP/E-1 and EP/ES-1.3 up through step 7a by stopping NS pumps.
5. Freeze the simulator and write snap.

Selected IC _114__

SIMULATOR OPERATOR INSTRUCTIONS:

None required.

Tools/Equipment/Procedures Needed:

Have enough copies of EP/1/A/5000/ES-1.3 Revision 15 Enclosure 2 for each candidate.

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.

INITIATING CUE:

EP/1/A/5000/ES-1.3, Transfer to Cold Leg Recirculation has been implemented following a LOCA. With containment pressure previously reaching 6 psig and currently above the shutdown criteria, containment spray is still required. "FWST Lo-Lo Level" alarm has been received and the NS pumps have been stopped per ES-1.3 step 7. The SRO instructs you to align NS to Cold Leg Recirculation per Enclosure 2 of EP/ES-1.3.

START TIME: _______

STEP 1: 1. Align NS as follows. (Enclosure 2, Step 1) 1a. Close the following valves: • Close 1NS-20A (NS Pump 1A Suct From FWST) • Close 1NS-3B (ND Pump 1B Suct From FWST). STANDARD: Candidate depresses the GREEN "CLOSE" pushbutton for 1NS-20A (1MC-11). Verifies GREEN "CLSD" light LIT and RED "OPEN" light DARK. Candidate depresses the GREEN "CLOSE" pushbutton for 1NS-3B (1MC-11). Verifies GREEN "CLSD" light lit and RED "OPEN" light dark.	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2: 1b. Verify 1NI-185A (ND Pump 1A Cont Sump Suct) open. STANDARD: Candidate verifies RED "OPEN" light DARK and GREEN "CLSD" light LIT for 1NI-185A (1MC-11). Transitions to Step 1.b. RNO.	**CRITICAL STEP** ___ SAT ___ UNSAT
EXMAINER NOTE: NS pump 1B will not automatically start in the next step. The candidate may attempt to start the pump at this point or may wait until directed by step JPM Step 5 (Enclosure 2, step 4).	

***Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.**

STEP 3: b.1) RNO: Open 1NS-1B (NS PMP 1B Suct From Cont Sump). STANDARD: Candidate depresses the RED "OPEN" pushbutton for 1NS-1B (1MC-11). Verifies RED "OPEN" light LIT, GREEN "CLSD" light DARK, Continues to Step 2. *****CUE: The RED "OPEN" pushbutton for 1NS-1B has been depressed. The RED "OPEN" light is LIT and the GREEN "CLSD" light is DARK.******* COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 4: 2. Verify containment pressure has exceeded 3 psig. STANDARD: Candidate verifies containment pressure is greater than 3 psig on 1NSCR5040/5390 (pen 1) (1MC-9) or 1MICR5340/5350 (pen 3) (1MC-7). **EXAMINER CUE: Provide cue IF pressure is less than 3 psig. Containment Pressure has exceeded 3 psig** *****CUE: Containment pressure is greater than 3 psig.******* COMMENTS:	___ SAT ___ UNSAT
STEP 5: 3. Verify containment pressure greater than 1 psig. STANDARD: Candidate verifies containment pressure is greater than 1 psig 1NSP5040/5050/5060/5070 (1MC-11) or 1NSCR5040/5390 (pen 1) (1MC-7) or 1MICR5340/5350 (pen 3) (1MC-9). *****CUE: Containment pressure is greater than 1 psig.******* COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 6: 4. Ensure NS pump (s) aligned to an open containment suction valve-ON. STANDARD: Candidate determines NS Pump 1B is not running, NS Pump 1B RED "ON" light DARK and 1NI-184B RED "OPEN" light LIT and GREEN "CLSD" light DARK. Candidate depresses the RED "ON" pushbutton for NS pump 1B and verifies the RED "ON" light is LIT and the GREEN "OFF" light is DARK. **EXAMINER NOTE: NS pump 1B may have been started in JPM Step 3 (Enclosure 2, step 1.b. RNO).** *****CUE: The RED "ON" pushbutton for NS pump 1B has been depressed. The RED "ON" light is LIT and the GREEN "OFF" light is DARK.***** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 7: 5. Verify all Unit 1 and Unit 2 RN pumps on. STANDARD: Candidate verifies RN Pump 1A RED "ON" light is DARK and the GREEN "OFF" light is LIT. RN Pump 1B RED "ON" light LIT with pump current at midscale on ammeter, RN Pump 2A RED "ON" light LIT and RN Pump 2B RED "ON" light LIT. Candidate transitions to step 5 RNO and goes to Step 7. *****CUE:*** • ***The RED "ON" light for RN pump 1A is DARK, and the GREEN "OFF" light is LIT*** • ***The RED "ON" light for RN pump 1B is LIT, and the GREEN "OFF" light is DARK.*** • ***The RED "ON" light for RN pump 2A is LIT, and the GREEN "OFF" light is DARK.*** • ***The RED "ON" light for RN pump 2B is LIT, and the GREEN "OFF" light is DARK.*** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 8: 7. Align RN to NS HX(s) based on RN and NS pumps status: a. Verify NS Pump 1A on: STANDARD: Candidate determines that NS pump 1A is not running and transitions to Step 7.a. RNO ****CUE: NS pump 1A RED :ON" light is DARK and the GREEN "OFF" light is LIT.***** COMMENTS: 7a.RNO: Perform the following: 1) IF only one B Train RN pump is on, THEN close 2RN-47A (RN Supply X-Over) STANDARD: Candidate determines that BOTH B Train RN pumps are running. Continues to step 7. RNO a.2) ****CUE. RN pump 1B RED :ON" light is LIT and GREEN "OFF" light is DARK and RN pump 2B RED :ON" light is LIT and the GREEN "OFF" light is DARK .***** COMMENTS: 7a. RNO 2) IF only B train RN pumps are on, THEN STANDARD: Candidate determines that 2A RN pump is running. Continues to step 7 RNO.a.3) ****CUE:. RN pump 2A RED :ON" light is LIT and the GREEN "OFF" light is DARK.***** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 9:	*7a. RNO 3) Open 1RN-225B (NS HX 1B Inlet Isol).	***CRITICAL STEP**
STANDARD:	Candidate depresses the RED "OPEN" pushbutton for 1RN-225B (1MC-11). Verifies RED "OPEN" light is LIT and the GREEN "CLSD" light is DARK.	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 10.: 8. Verify adequate RN heat sink as follows: RN system suction aligned to Lake Wylie	___ SAT ___ UNSAT
STEP 11: 8. RN essential header temperatures at one of the following locations- LESS THAN OR EQUAL TO 82.5°F.: • 1MC-9 OR • RO Logbook STANDARD: Candidate determines from either 1RNP5000 or 1RNP5010 that RN essential header temperature is approximately 69 °F. ****CUE: RN essential header temperature is 69°F.******* COMMENTS:	___ SAT ___ UNSAT
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)

INITIATING CUE:

EP/1/A/5000/ES-1.3, Transfer to Cold Leg Recirculation has been implemented following a LOCA. With containment pressure previously reaching 6 psig and currently above the shutdown criteria, containment spray is still required. "FWST Lo-Lo Level" alarm has been received and the NS pumps have been stopped per ES-1.3 step 7. The SRO instructs you to align NS to Cold Leg Recirculation per Enclosure 2 of EP/ES-1.3.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/SIM-6

Restore power to Blackout Buss 1FTA from 1ETA

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Restore power to Blackout Busses 1FTA from 1ETA.

Alternate Path: YES

Facility JPM #: NEW

K/A Rating(s): Safety Function 6 APE: 056 AA1.28 (3.1/3.1)

Task Standard:

Restart both trains of ND pumps, select the "THROT" position to establish manual control of temperature through 1NI-173A and 1NI-178B, and restore power to 1FTA from 1ETA.

Preferred Evaluation Simulator:

Control Room __X__ In-Plant ____

Preferred Evaluation Perform

Perform __X__ Simulate ______

References:

AP/1/A/5500/007 Loss of Normal Power Case I, Loss of Normal Power to an Essential Train Revision 38

Validation Time: 15 min. **Time Critical:** NO

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Candidate: ________________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT _____ UNSAT ____ Performance Time ______

Examiner: ___________________________
_______________________________/________
NAME SIGNATURE
DATE

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COMMENTS

____

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SIMULATOR SETUP SHEET

1. Init to IC #36
2. Setup the power failure as follows:
   a. Start the temporary VI compressor, **LOA-VI011,** Value = **ON**
   b. Insert **LOA-EP075** (Rackout FTA B/O ALT FDR from ETA) Value = **Rackout**
   c. Then Insert **MAL-EP01C** (Loss of Red and Yellow Switchyard busses) Value = **0**
   d. Set utility video to ND graphic on MC-2
3. When both diesels have re-energized ETA and ETB and Incore CETs read 190 °F then go to freeze.

   Both trains of ND have shutdown with the power loss. AP-07 Case 1 will reset the sequencer and have the operator restart both trains
4. Write to Protected IC.

SNAP No.: 117

SIMULATOR OPERATOR INSTRUCTIONS:

1. **WHEN** the 1A and 1B D/G load sequencers are reset in STEP 8c, **THEN** insert **LOA-EP075** Value = **RACKIN.**
2. **WHEN** an NLO is tasked to open the 1LXI-4B breaker, insert **LOA-EP077,** Value = OPEN.
3. **WHEN** an NLO is tasked to close the 1LXI-4B breaker, insert **LOA-EP077**, Value = CLOSE

Tools/Equipment/Procedures Needed:

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 shutdown in Mode 5.
- Both trains of ND were in service maintaining a slight 18°F/hr cooldown rate.
- Core Exit thermocouples were 157 °F

INITIATING CUES:

A station blackout has occurred and the ND systems have shutdown on the power loss. Both diesels have started and are carrying their respective essential busses. The Control Room SRO instructs you to use AP1/A/5500/007 (Loss of Normal Power) Case 1 steps 1 through step 9 to restore the electrical systems.

START TIME: _______

STEP 1: 1: Monitor Enclosure STANDARD: Candidate reads step 1. **EXAMINER CUE: The extra BOP will monitor Enclosure 1.** COMMENTS:	___ SAT ___ UNSAT
EXAMINER NOTE: ETA and ETB undervoltage status lights are no longer the sole method to verify buss status. The operators may use them but also can use a valve powered from the affected buss. STEP 2: 2: Verify affected busses energized. STANDARD: Candidate locates valves and other components powered by respective ETA and ETB to verify the lights are lit. *****CUE:* "A" and "B" train powered component lights are lit.** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 3: 3: Verify proper diesel generator operation as follows: a. Dispatch operator to affected D/G rooms to monitor operation. Refer to OP/1/A/6350/002. STANDARD: Candidate dispatches one operator to each D/G in operation to monitor per the operating procedure. **EXAMINER CUE: Two NLO's have been dispatched to monitor diesel generator operation per the OP.** 3b: Verify RN cooling flow to the affected D/G. STANDARD: Candidate locates 1A and 1B D/G HX Outlet Flow on MC-9 (1RNP5930 and 1RNP5980) and verifies flow is indicated. (Normal is about 1300 GPM) *****CUE: 1A and 1B D/G HX Outlet Flows on MC-9, 1RNP5930 and 1RNP5980, read 1250 GPM each.*** COMMENTS:	___ SAT ___ UNSAT
STEP 4: 4: Stop any dilutions in progress. STANDARD: At MC-10, charging and makeup controls, candidate verifies no makeup's are in progress. M/U pumps are off. *****CUE: Makeup system is not in operation.*** COMMENTS:	___ SAT ___ UNSAT
STEP 5: 5: Verify CA Pump #1 is ON. STANDARD: Candidate may request actual plant status of the CA system. For Mode 5, CA pump #1 is not aligned for standby readiness. Candidate should continue in AER column of AP-07. COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 6: 6: Maintain reactor power less than or equal to 100%. STANDARD: Candidate knows from initial conditions, unit is in Mode 5. COMMENTS:	___ SAT ___ UNSAT
STEP 7: 7: Verify S/I has Actuated STANDARD: Candidate locates "SAFETY INJECTION ACTUATED" status light on SI-13 is dark and goes to Step 8. *****CUE: "SAFETY INJECTION ACTUATED" status light on SI-13 is dark.*** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 8:	8 Verify ND System status as follows:	**CRITICAL STEP**
	8a Verify ND on affected train previously operating in RHR mode.	___ SAT
STANDARD:	Candidate acknowledges both trains of ND previously in RHR mode per initial cue.	
	8b Verify AP/1/A/5500/019, Loss of Residual Heat Removal System NOT Implemented.	___ UNSAT

EXAMINER CUE: AP/19 has not been implemented.

STANDARD: Candidate acknowledges that AP-19 has not been implemented per SRO instructions to use AP-07 for the Loss of Normal power.

8c Reset affected D/G load sequencer.

STANDARD: Candidate locates 1A and 1B D/G Load Sequencer RESET pushbutton and depresses and verifies the YELLOW "RESET" lights are lit on MC-11 under the plexiglass covers.

*****CUE: 1A and 1B D/G Load Sequencer RESET pushbuttons have been depressed and the RESET lights are LIT on MC-11***

8d Restart previously operating ND pump.

STANDARD: Candidate locates 1A and 1B ND pushbuttons and depresses the RED ON button for each. Verifies the RED ON lights are lit and amps indicated on ND pump meters. May also verify flow is indicated on ND FLOW TO C-LEGS: 1NDP5190 and 1NDP5180.

*****CUE: ND pump 1A and 1B ON pushbuttons have been depressed, the RED ON lights are lit and ND FLOW to C-LEGs indicate flow.***

COMMENTS:

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 9: 9: Verify B/O busses are energized as follows: 9a: 1AD-11 K/3 "4KV B/O BUS FTA VOLTAGE LO" - DARK STANDARD: Candidate determines that 1AD-11 K/3 is LIT. And enters Step 9 RNO column. *****CUE: 1AD-11 K/3 "4KV B/O BUS FTA VOLTAGE LO" is LIT.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 9 continued: *9a1) RNO: IF ND pump 1A is operating in RHR mode then: a): Place the "PWR DISCON FOR 1NI173A" in "THROT" STANDARD: Candidate determines the previous lineup on MC-11 rotates the power disconnect switch for 1NI-173A to the "THROT" position *****CUE: On MC-11switch "PWR DISCON FOR 1NI173A" is rotated to the "THROT" position.*** COMMENTS: *B): Throttle 1NI-173A to stabilize NC temperature. STANDARD: Temperature is monitored and 1NI-173A adjusted as needed. **EXAMINER NOTE: The temperatures available to the operator are OAC points for Wide range Tcold, Thots, ND heat exchanger Inlet and Outlet temperatures, and RVLIS incore thermocouples. ND heat exchanger inlet is normally used.** **EXAMINER CUE: WHEN candidate selects "THROT" and begins to monitor temperature, after several adjustments provide cue: "Temperature increase has stopped and is stabilizing"** *****CUE: On MC-11 pushbutton for 1NI-173A has been adjusted to establish flow. NC temperature has stabilized.*** COMMENTS:	***CRITICAL STEP** ___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

	*CRITICAL STEP
STEP 9 continued: *9a2) RNO: IF ND pump 1B is operating in RHR mode then: a): Place the "PWR DISCON FOR 1NI178B" in "THROT" STANDARD: Candidate determines the previous lineup and on MC-11 rotates the power disconnect switch for 1NI-178B to the "THROT" position ****CUE: On MC-11switch "PWR DISCON FOR 1NI178B" is rotated to the "THROT" position.*** COMMENTS: *B): Throttle 1NI-178B to stabilize NC temperature. STANDARD: Temperature is monitored and 1NI-178B adjusted as needed. **EXAMINER NOTE: The temperatures available to the operator are OAC points for Wide range Tcold, Thots, ND heat exchanger Inlet and Outlet temperatures, and RVLIS incore thermocouples. ND heat exchanger inlet is normally used.** **EXAMINER CUE: WHEN candidate selects "THROT" and begins to monitor temperature, after several adjustments provide cue: "Temperature increase has stopped and is stabilizing".** ****CUE: On MC-11 pushbutton for 1NI-178B has been adjusted to establish flow. NC temperature has stabilized.*** COMMENTS:	___ SAT ___ UNSAT
STEP 9 continued: 9a3 RNO: Ensure breaker "FTA B/O NORM FDR FRM ATC" OPEN. STANDARD: On MC-11 candidate locates "FTA B/O NORM FDR FRM ATC" and verifies the green OPEN light is LIT. ****CUE: On MC-11, "FTA Blackout Normal Feeder From ATC" green OPEN light is LIT.*** COMMENTS:	___ SAT ___ UNSAT

****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 9 continued: 9a4 RNO: Dispatch operator to open 1LXI-4B (SB-594 U-V, 29-30). STANDARD: Candidate contacts an NLO to locally open 1LXI-4B in the service building location. **EXAMINER CUE: I understand to locally open the 1LXI-4B breaker.** COMMENTS:	___ SAT ___ UNSAT
STEP 9 continued: 9a5 RNO: IF S/I has actuated....... STANDARD: On SI-13, candidate notes that the Safety Injection Actuated status light is dark. *****CUE: On SI-13, "SAFETY INJECTION ACUTATED" light is dark.*** COMMENTS:	___ SAT ___ UNSAT
STEP 9 continued: 9a6 RNO: Reset "D/G 1A LOAD SEQ RESET". STANDARD: From step 8c, candidate determines that the 1A sequencer is already reset. COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 9 continued: 9a7 RNO: When notified by the dispatched operator that 1LXI-4B is open, Then perform the following: **EXAMINER CUE: Using time compression, the dispatched NLO has opened the 1LXI-4B breaker.** *a): Close breaker "FTA B/O ALT FDR FRM ETA" STANDARD: On MC-11 candidate locates and depressed the red CLOSE button for FTA B/O ALT FDR FRM ETA and verifies the red CLOSE light is lit. *****CUE: On MC-11 "FTA B/O ALT FDR FRM ETA" red CLOSE button has been depressed and the red CLOSE light is lit.*** COMMENTS: *b): Close breaker "ETA ALT FDR TO FTA" STANDARD: On MC-11 candidate locates and depressed the red CLOSE button for "ETA ALT FDR TO FTA" and verifies the red CLOSE light is lit. *****CUE: On MC-11 "ETA Alternate Feeder to FTA" red CLOSE button has been depressed and the red CLOSE light is lit.*** COMMENTS: *c): Dispatch operator to close 1LXI-4B (SB-594 U-V, 29-30). STANDARD: Candidate contacts an NLO to locally close 1LXI-4B in the service building location. **EXAMINER CUE: Time Compression, the NLO has closed the 1LXI-4B breaker.** COMMENTS:	***CRITICAL STEP** ___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 17: 9b: 1AD-11 K/4 "4KV B/O BUS FTB VOLTAGE LO" - DARK STANDARD: Candidate determines that 1AD-11 K/4 is DARK. *****CUE: 1AD-11 K/4 "4KV B/O BUS FTB VOLTAGE LO" Is DARK.*** COMMENTS:	___ SAT ___ UNSAT
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 is shutdown in Mode 5.
- Both trains of ND were in service maintaining a slight 18°F/hr cooldown rate.
- Core Exit thermocouples were 157 °F

INITIATING CUES:

A station blackout has occurred and the ND systems have shutdown on the power loss. Both diesels have started and are carrying their respective essential busses. The Control Room SRO instructs you to use AP1/A/5500/007 (Loss of Normal Power) Case 1 steps 1 through step 9 to restore the electrical systems.

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/SIM-7

Restore Adequate Nuclear Service Water Flow

CANDIDATE ____

EXAMINER ____

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Restore adequate Nuclear Service Water flow

Alternate Path: NO

Facility JPM #: OP-CN-PSS-RN-004

K/A Rating(s): Safety Function 4(Primary) APE: 062 AK 3.03 (4.0/4.2)

Task Standard: RN pump 1A is shutdown with RN pump 1B running between 8000 and 23000 gpm.

Preferred Evaluation Simulator:

Control Room __X__ In-Plant ____

Preferred Evaluation Perform

Perform __X__ Simulate ______

References:

AP/0/A/5500/020 (Loss of Nuclear Service Water) Case I Revision 032

Validation Time: 5 min. **Time Critical:** NO

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Candidate: ____________________________________
NAME

Time Start : ________
Time Finish: ________

Performance Rating: SAT ______ UNSAT ______ Performance Time ______

Examiner: __________________________ __________________________/________
NAME SIGNATURE DATE

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COMMENTS

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SIMULATOR SETUP SHEET

1. Init to any IC set.
2. Ensure RN pump 1A is on.
3. Stop all other operating RN pumps.
4. Insert **MAL-RN002A** (RN pump 1A strainer HI Delta P) Set Value = **100**.
5. Acknowledge alarms freeze and write a protected snap.

Write to Protected IC.

SNAP No.: 199

SIMULATOR OPERATOR INSTRUCTIONS:

None.

Tools/Equipment/Procedures Needed:

Copy of AP/0/A/5500/020 Case I

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.

INITIATING CUE:

Both units are at 100% power. RN Pump 1A is in service. "RN PMP A FLOW HI/LO" and RN PMP 1A STRAINER HI D/P" annunciators have alarmed. The SRO instructs you to respond and take appropriate actions per Case I of AP/0/A/5500/020 (Loss of Nuclear Service Water).

START TIME: ________

STEP 1: 1. Start idle RN pump(s) as required. STANDARD: Candidate depresses ON pushbutton for RN Pump 1B and verifies red "ON" light is lit, pump current indicating on meter. *****CUE: RN pump 1B "ON" pushbutton is depressed, RED "ON" light is LIT, amps are indicated on meter.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2: 2. Monitor enclosure 1. STANDARD: Candidate reads step. **EXAMINER CUE: An extra RO will monitor Enclosure 1.**	___ SAT ___ UNSAT
STEP 3: 3. Verify each operating RN pump discharge flow- Greater Than 8600 gpm. STANDARD: Candidate locates RN pump flow transmitters on 1MC-9: RN pump 1A (1RNP7520) reads less than 8600 gpm. RN Pump 1B (1RNP7510) reads greater than 8600 gpm. Based on meter readings, candidate continues in Step 3 RNO column. *****CUE: On MC-9, RN pump 1A discharge flow on 1RNP7520 reads 0 gpm and RN pump 1B discharge flow on 1RNP7510 reads greater than 8600 gpm.*** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 4: 3aRNO: Stop any RN pumps not required to support system operation. STANDARD: On MC-11, candidate depresses OFF pushbutton for RN pump 1A and verifies OFF light is LIT and no amps on meter. *****CUE: RN pump 1A OFF pushbutton depressed, GREEN OFF light LIT, zero amps indicated.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 5: 3bRNO: Ensure the following suction valves to lake open: • 1RN-1A (RN P/H Pit A Isol From Lake) • 1RN-2B (RN P/H Pit A Isol From Lake) • 1RN-5A (RN P/H Pit B Isol From Lake) • 1RN-6B (RN P/H Pit B Isol From Lake) STANDARD: Candidate locates 1RN-1A,1RN-2B,1RN-5A, 1RN-6B on MC-11 and verifies RED OPEN lights are LIT. *****CUE: On MC-11 1RN-1A,1RN-2B,1RN-5A, 1RN-6B RED OPEN lights are LIT*** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 6: 3cRNO: Ensure the following essential header isolation valves for required trains open: • 1RN-67A (RN Hdr 1A Supply Isol) • 1RN-69B (RN Hdr 1B Supply Isol) • 2RN-67A (RN Hdr 2A Supply Isol) • 2RN-69B (RN Hdr 2B Supply Isol) STANDARD: Candidate locates 1RN-69A and 1RN-69B on 1MC-11 and verifies the RED OPEN lights are LIT. For 2RN-67A and 2RN-69B, candidate request valve position from Unit 2 BOP. *****CUE:1RN-69A and 1RN-69B RED OPEN lights are LIT on 1MC-11.*** **EXAMINER CUE: This is the Unit 2 BOP, 2RN-67A and 2RN-69B RED OPEN lights are LIT on 2MC-11.** COMMENTS:	___ SAT ___ UNSAT
STEP 7: 3dRNO: Ensure the following RN to RL discharge valves open: • 1RN-57A (Station RN Disch To RL Syst) • 1RN-843B (Station RN Disch To RL Syst) STANDARD: Candidate locates 1RN-57A and 1RN-843B on 1MC-11 and verifies RED OPEN lights are LIT. *****CUE: On MC-11 1RN-57A and 1RN-843B RED OPEN lights are LIT*** COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

EXAMINER NOTE: These valves are open with power removed. Red collar covers state their condition. STEP 8: 3eRNO: Ensure the following RL discharge valves - OPEN: • 1RL-54 (RN Sys Disch To RL Hdr A) • 1RL-62 (RN Sys Disch To RL Hdr B) STANDARD: Candidate locates 1RL-54 and 1RL-62 on 1MC-13 and notes the valve indicator lights are dark. Red collar is covering switch control and states breaker open by procedure. *****CUE: On MC-13, 1RL-54 and 1RL-62 lights are dark, red collar covering switch states breakers are open by procedure.*** COMMENTS:	___ SAT ___ UNSAT
STEP 9: 3fRNO: Ensure the following station RN discharge header crossover valves open: • 1RN-54A (Station RN Disch Hdr X-Over) • 1RN-53B (Station RN Disch Hdr X-Over) STANDARD: Candidate locates 1RN-54A and 1RN-53B on 1MC-11 and verifies RED OPEN lights are LIT. *****CUE: On MC-11 1RN-54A and 1RN-53B RED OPEN lights are LIT*** COMMENTS:	___ SAT ___ UNSAT
STEP 10: 3gRNO: If either of the following conditions is met: RN cannot be aligned to the lake OR No flow indicated on operating RN pump(s). STANDARD: Candidate determines neither condition applies and continues to step 3hRNO. COMMENTS:	___ SAT ___ UNSAT

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

STEP 11: 3hRNO: Verify the following alarms dark: • 1AD-12, C/2 "RN PMP A STRAINER HI D/P" • 1AD-12, C/5 "RN PMP B STRAINER HI D/P" • 2AD-12, C/2 "RN PMP A STRAINER HI D/P" • 2AD-12, C/5 "RN PMP B STRAINER HI D/P" STANDARD: Candidate locates annunciators on 1AD-12 and verifies C/2 and C/5 light is dark. For 2AD-13 C/2 and C/5, candidate requests Unit 2 BOP verify dark status. *****CUE: On 1AD-12, C/2 and C/5 lights are DARK. When Unit 2 is addressed:*** **EXAMINER CUE: This is the Unit 2 BOP, 2AD-12 C/2 and C/5 lights are DARK.** COMMENTS:	___ SAT ___ UNSAT
STEP 12: 3iRNO: IF any of the previous alarms lit, THEN manually backflush affected strainer. Refer to OP/0/A/6400/006C. STANDARD: Candidate determines annunciator 1AD-12 C/2 was lit and 1A strainer must be backflushed. **EXAMINER CUE: This will be performed after completion of AP/20.** COMMENTS:	___ SAT ___ UNSAT
STEP 13: 4. Verify each operating RN pump discharge flow- less than 23000 gpm. STANDARD: Candidate locates RN pump flow transmitter on 1MC-9: RN Pump 1B (1RNP7510) reads less than 23000 gpm. Based on meter readings, candidate continues in Step 3 RNO column. *****CUE: On MC-9, RN pump 1B discharge flow on 1RNP7510 reads less than 23000gpm.*** **EXAMINER CUE: The control Room SRO and Unit 2 BOP will complete the remaining AP/20 actions.** COMMENTS:	___ SAT ___ UNSAT
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)

INITIATING CUE:

Both units are at 100% power. RN Pump 1A is in service. "RN PMP A FLOW HI/LO" and RN PMP 1A STRAINER HI D/P" annunciators have alarmed. The SRO instructs you to respond and take appropriate actions per Case I of AP/0/A/5500/020 (Loss of Nuclear Service Water).

*****Italicized Cues Are To Be Used Only If JPM Performance Is Being Simulated.***

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM NRC/SIM-8

Place Standby Component Cooling Train In Service

CANDIDATE ______________________________

EXAMINER ______________________________

CATAWBA 2004 NRC
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

Task: Place Standby Component Cooling Train In Service.

Alternate Path: NO

Facility JPM #: Modified (OP-CN-PSS-KC-082)

K/A Rating(s): Safety Function 8: SYSTEM 008 A4.01 (3.3/3.1)

Task Standard:

"B" Train KC header cross-connected to "A" train KC with "1B1" Component Cooling Pump and "B" KC heat exchanger outlet valve is selected to "KC TEMP'. "1A2" KC pump is shutdown with the "A" KC heat exchanger outlet valve selected to "MINI FLOW"

Preferred Evaluation Simulator: **Preferred Evaluation Perform**

Control Room __X____ In-Plant ____ ________ Perform __X___ Simulate

References: OP/1/A/6400/005 (Component Cooling System) Enclosure 4.3 Revision 100

Validation Time: 15 min. **Time Critical:** NO

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Candidate: ______________________________ Time Start : ________
NAME Time Finish: ________

Performance Rating: SAT _______ UNSAT _______ Performance Time _______

Examiner: ______________________________ ______________________________/__________
NAME SIGNATURE DATE

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COMMENTS

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____

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SIMULATOR SETUP SHEET

1. Init to IC #11
2. Ensure 1A2 KC pump in service.
3. Close all the following valves: 1KC-2B, 1KC-18B, 1KC-53B, 1KC-228B

Write to Protected IC.

SNAP No.: 116

SIMULATOR OPERATOR INSTRUCTIONS:

None.

Tools/Equipment/Procedures Needed:

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%.
- Component Cooling Train "A" is in service with "1A2" KC Pump in operation and not cross-connected to "B" train which has been under repairs.
- Maintenance on Train "B" is now complete and is ready to be placed in service.

INITIATING CUES:

The Control Room SRO instructs you to shift trains of KC with 1B1 KC Pump in service per enclosure 4.3 of OP/1/A/6400/005. The initial conditions are complete and the 1B1 KC pump has been "checked out" satisfactorily by an NLO. Independent verification will be waived during the performance of this JPM.

START TIME: _______

STEP 1: To shift from KC Train 1A to KC Train 1B with the trains **NOT** cross-connected, complete the following steps: STANDARD: Operator uses enclosure 4.3 and begins with step 2.2. COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2: 2.2.1 Complete the following steps to ensure the RN System has minimum flow protection: 2.2.1.1 IF a Unit 2 KC Hx discharge valve is in the "MINIFLOW" position, ensure the associated inlet valve is open: • 2RN-287A (KC Hx 2A Inlet Isol) • 2RN-347B (KC Hx 2B Inlet Isol) STANDARD: Operator must inquire about the status of Unit 2 KC heat exchanger discharge valve operating mode then ensure its associated inlet valve is open. **EXAMINER CUE: Unit 2B KC heat Exchanger is in miniflow and 2RN-347B is open.** 2.2.1.2 If no Unit 2 KC Hxs are available for RN Miniflow....... STANDARD: Operator N/A's step 2.1.1.2 based on cue. COMMENTS:	___ SAT ___ UNSAT
STEP 3: 2.2.2 Ensure 1RN-347B (KC Hx 1B Inlet Isol) is open. STANDARD: Candidate ensures 1RN-347B RED OPEN light is LIT on MC-11. *****CUE: 1RN-347B red OPEN light is lit on MC-11.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

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STEP 4: 2.2.3 Ensure "KC HX 1B OTLT MODE" is in "KC TEMP". STANDARD: Candidate selects "KC HX 1B OTLT MODE" switch on MC-11 to the "KC TEMP" mode. *****CUE: "KC HX 1B OTLT MODE" switch on MC-11 is in the "KC TEMP" position.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
Step 5: 2.2.4 Ensure 1KC-81B (KC To ND Hx 1B Sup Isol) is closed. STANDARD: Candidate locates 1KC-81B and verifies that the GREEN "CLOSE" light is lit. *****CUE: 1KC-81B GREEN "CLOSE" light is LIT.*** COMMENTS:	___ SAT ___ UNSAT
Step 6: 2.2.5 Start either KC Train 1B pump: "KC PMP B1" or "KC PMP B2" STANDARD: Candidate depresses ON pushbutton for the 1B1 KC pump and verifies pump "ON" light is lit on MC-11. *****CUE: "ON" pushbutton has been depressed and the "ON" light is lit for 1B1 KC pump.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
Step 7: 2.2.6 Ensure 1KC-C40B (Train B Miniflow Isol) opens. STANDARD: Candidate notes that 1KC-C40B RED "OPEN" light is LIT *****CUE: 1KC-C40B RED "OPEN" light is LIT.*** COMMENTS:	___ SAT ___ UNSAT

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STEP 8: 2.2.7 Adjust the following flow controllers on 1MC11 to zero gpm flow: • 1KC-149 (KF Hx 1A Cool Wtr Otlt) • 1KC-156 (KF Hx 1B Cool Wtr Otlt) STANDARD: Candidate determines KF 1A train is in service and reduces flow to zero gpm by rotating the control knob counter clockwise using 1KC-149 and verifying the red demand needle is reading zero on MC-11. *****CUE: 1KC-149 control knob has been rotated counter clockwise and the red needle is set at 0 gpm.*** COMMENTS:	___ SAT ___ UNSAT
STEP 9: 2.2.8 IF letdown is in service per OP/1/A/6200/001 (Chemical and Volume Control System), stabilize letdown hx outlet temp by placing 1KC-132 (Letdn Hx Otlt Temp Ctrl) in manual. STANDARD: Candidate depresses manual pushbutton for 1KC-132 and verifies the red manual light is lit on MC-10. *****CUE: 1KC-132 manual pushbutton has been depressed; the manual light is lit on MC-10.*** COMMENTS:	___ SAT ___ UNSAT

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Step 10: 2.2.9: Open the following valves: 2.2.9.1 1KC-2B (Aux Bldg Non-Ess Ret Hdr Isol) 2.2.9.2 1KC-18B (Rx Bldg Non-Ess Ret Hdr Isol) 2.2.9.3 1KC-53B (Aux Bldg Non-Ess Hdr Isol) 2.2.9.4 1KC-228B (Rx Bldg Non-Ess Hdr Isol) STANDARD: Candidate depresses the RED OPEN pushbutton for 1KC-2B and verifies the RED "OPEN" light is lit and the GREEN "CLOSE" light is dark. *****CUE: The RED OPEN pushbutton for 1KC-2B has been depressed and the RED "OPEN" light is lit and the GREEN "CLOSE" light is dark.*** Candidate depresses the RED OPEN pushbutton for 1KC-18B and verifies the RED "OPEN" light is lit and the GREEN "CLOSE" light is dark. *****CUE: The RED OPEN pushbutton for 1KC-18B has been depressed and the RED "OPEN" light is lit and the GREEN "CLOSE" light is dark.*** Candidate depresses the RED OPEN pushbutton for 1KC-53B and verifies the RED "OPEN" light is lit and the GREEN "CLOSE" light is dark. *****CUE: The RED OPEN pushbutton for 1KC-53B has been depressed and the RED "OPEN" light is lit and the GREEN "CLOSE" light is dark.*** Candidate depresses the RED OPEN pushbutton for 1KC-228B and verifies the RED "OPEN" light is lit and the GREEN "CLOSE" light is dark. *****CUE: The RED OPEN pushbutton for 1KC-228B has been depressed and the RED "OPEN" light is lit and the GREEN "CLOSE" light is dark.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 11: 2.2.10 Stop all KC Train 1A pumps: "KC PMP A1" or "KC PMP A2" STANDARD: Candidate depresses OFF pushbutton for 1A2 KC pump and verifies pump "OFF" light is lit on MC-11. *****CUE: "OFF" pushbutton has been depressed and the "OFF" light is lit for 1A2 KC pump.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

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STEP 12: 2.2.11 Place "KC HX 1A OTLT MODE" in "MINIFLOW" position. STANDARD: Candidate selects "KC HX 1A OTLT MODE" switch on MC-11 to the "MINIFLOW" position. *****CUE: "KC HX 1A OTLT MODE" switch on MC-11 is in the "MINIFLOW" position.*** COMMENTS:	___ SAT ___ UNSAT
EXAMINER NOTE: Operator will most likely reset 1KC-149 to the initial value of about 1500 gpm. But may set also set it to the procedure step value. STEP 13: 2.2.12 Perform the following for the KF cooling loops that are in service: Adjust 1KC-149 (KF Hx 1A Cool Wtr Otlt) flow controller on 1MC-11 to 3000 gpm or as necessary to maintain Spent Fuel Pool temperature <125°F. STANDARD: Candidate determines KF 1A train is in service and restores KC flow to original the value or as directed to maintain temperature by rotating 1KC-149 control knob clockwise verifying the red demand needle is reading the desired value. *****CUE: 1KC-149 control knob has been rotated clockwise and the red needle is set at 3000 gpm.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 14: 2.2.13 IF KC flow requirements is > 5700 gpm, perform the following: 2.1.13.1 Ensure 1KC-C40B (Train B Miniflow Isol) is closed. 2.1.13.2 If KC flow is > 5700 gpm, start the remaining KC Train 1B pump. STANDARD: Based on JPM step 10, candidate should not have to add a second by verifying "KC HX 1B Inlet Flow" on MC-11 reading less than 5700 gpm. *****CUE: "KC HX 1B Inlet Flow" on MC-11 is reading 5000 gpm.*** COMMENTS:	___ SAT ___ UNSAT

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STEP 15: 2.2.14 IF letdown is in service per OP/1/A/6200/001 (Chemical and Volume Control System), WHEN KC flow and temperature have stabilized, return 1KC-132 (Letdn Hx Otlt Temp Ctrl) to automatic. STANDARD: Candidate verifies KC system flow and temperature parameters on MC-11 and depresses automatic pushbutton for 1KC-132 and verifies the red auto light is lit on MC-10. *****CUE: KC flow and temperature have stabilized. (WHEN Identified; then CUE: 1KC-132 auto pushbutton has been depressed; the auto light is lit on MC-10.*** COMMENTS:	___ SAT ___ UNSAT
STEP 16: 2.2.15 Secure any NS Hx that was aligned for RN miniflow in step 2.2.1.2. STANDARD: Candidate determines this step was N/A'd and requires no action. COMMENTS:	___ SAT ___ UNSAT
This JPM is complete.	

TIME STOP: ________

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has been checked out satisfactorily by an NLO. Independent verification will be waived during the performance of this JPM.

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