Facility: **Watts Bar** Date of Examination: October 2011

Examination Level: RO ☐ SRO ☒ Operating Test Number: 2

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	M,R	**A.1-1 Determine License Status** *2.1.4 Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.*
Conduct of Operations	M,R	**A.1-2 RCS Deboration Calculation.** *2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc. 3.9 / 4.2 41.10 / 45.12 / 43.5*
Equipment Control	N,R	**A.2 Independent Verification of 1-SI-68-32 Calculation.** *2.2.12 Knowledge of surveillance procedures. 3.7/4.1 41.10 / 45.13*
Radiation Control	M,R	**A.3 Determine Potential Dose During Valve Alignment.** *2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. 3.2/3.7 41.12 / 43.4 / 45.10*
Emergency Procedures / Plan	M,R	**A.4 Evaluate Changing Plant Conditions and Determine if REP Classification Upgrade is Required.** *2.4.40 Knowledge of SRO responsibilities in emergency plan implementation. 2.7/4.5 41.10 / 43.5 / 45.11*

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.

* Type Codes & Criteria:
(C)ontrol room, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

SRO Admin JPM Summary

A.1-1 The applicant determines that Operator C is the only RO with an ACTIVE license available for call-in, and that the SRO is eligible to assume the RO position. The applicant indicates that the replacement operator must report for work no later than 0225, to meet the two hour requirement of Technical Specification Section 5.5.2, "Unit Staffing."

A.1-2 Applicant determines that it will take 229.5 minutes to reduce RCS boron concentration from 52 ppm to 38 ppm after performing SOI-62.04, "CVCS Purification System," Appendix B, "RCS Deboration Calculation."

A.2 The applicant performs an Independent Verification of 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," Appendix A, "Manual Performance of RCS Water Inventory Balance," using the data provided. The applicant evaluates results of the calculation and enters Technical Specification LCO 3.4.13, RCS Operational LEAKAGE, Condition A.

A.3 The applicant determines total dose which an individual would receive while aligning 1-FCV-63-11 to be 360 - 367 mrem. When added to the total dose received for the year, the applicant determines that the administrative dose limit (1000 mrem) will be exceeded.

A.4 The applicant determines that an upgrade from an ALERT to a GENERAL EMERGENCY is required. The applicant prepares forms for emergency notification. The applicant evaluates conditions and initiates Protective Action Recommendations, Recommendation 2.

Facility: **Watts Bar** Date of Examination: October 2011

Examination Level: RO ☒ SRO ☐ Operating Test Number: 2

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	M,R	**A.1-1 Determine License Status.** 2.1.4 *Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.*
Conduct of Operations	M,R	**A.1-2 RCS Deboration Calculation.** 2.1.25 *Ability to interpret reference materials, such as graphs, curves, tables, etc. 3.9 / 4.2 41.10 / 45.12 /43.5*
Equipment Control	M,R	**A.2 Hand Calculation of Reactor Coolant System Water Inventory Balance.** 2.2.12 *Knowledge of surveillance procedures. 3.7/4.1 41.10/45.13*
Radiation Control	M,R	**A.3 Determine Potential Dose During Valve Alignment.** 2.3.4 *Knowledge of radiation exposure limits under normal or emergency conditions. 3.2/3.7 41.12 / 43.4 / 45.10*
Emergency Procedures / Plan	N/A	*N/A*

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.

* Type Codes & Criteria:
(C)ontrol room, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

RO Admin JPM Summary

A.1-1 The applicant is provided with historical data for four operators and must determine each operator's license status. The applicant determines that Operator A, B and D do NOT meet the criteria for assuming shift.

A.1-2 Applicant determines that it will take 229.5 minutes to reduce RCS boron concentration from 52 ppm to 38 ppm after performing SOI-62.04, "CVCS Purification System," Appendix B, "RCS Deboration Calculation."

A.2 The applicant performs 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," Appendix A, "Manual Performance of RCS Water Inventory Balance," using the data provided in the Applicant Data Sheets. Based on the results of the calculation, the applicant determines that the UNIDENTIFIED leakage limits have been exceeded.

A.3 The applicant determines total dose which an individual would receive while aligning 1-FCV-63-11 to be 360 - 367 mrem. When added to the total dose received for the year, the applicant determines that the administrative dose limit (1000 mrem) will be exceeded.

A.4 N/A

A.1-1 SRO
Determine License Status

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-1 SRO
2011-10 NRC Exam

EVALUATION SHEET

Task: Determine License Status.

Alternate Path: n/a

Facility JPM #: New

Safety Function: 2.1 **Title:** Conduct of Operations

K/A 2.1.4 Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.

Rating(s): 3.3/3.8 **CFR:** 41.10 / 43.2

Evaluation Method: Simulator _____ In-Plant _____ **Classroom** **X**

References: OPDP-1, "Conduct of Operations," Rev. 19.
OPDP-10, "License Status Maintenance, Reactivation and Proficiency for Non-Licensed Positions ," Rev. 3
WBN Technical Specifications Section 5.2.2, Unit Staff.

Task Number: SRO-119-SPP-10.0-001 **Title:** Authorize the call-in of personnel.

Task Standard: The applicant:
1) Determines that Operator C is the only RO with an ACTIVE license available for call-in, and that the SRO is eligible to assume the RO position.
2) States that, per Technical Specification Section 5.5.2, replacement must report for work no later than 0225, to meet the two hour requirement of Tech Spec 5.2.2.b.

Validation Time: 15 minutes **Time Critical:** Yes _____ No **X**

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Applicant: _____ _____ Time Start: _____
NAME Docket No. Time Finish: _____

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: _____ _____/_____
NAME SIGNATURE DATE

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COMMENTS

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WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-1 SRO
2011-10 NRC Exam

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

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 cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit 1 is operating at 100% power with the following 1900-0700 shift positions manned on January, 31, 2012:**

   Shift Manager, SM
   Unit Supervisor, US
   Shift Technical Advisor, STA (non-licensed)
   Operator at the Controls, OAC
   Control Room Operator, CRO
   Outside Nuclear Assistant Unit Operator, OS NAUO
   Auxiliary Building Nuclear Assistant Unit Operator, AB NAUO
   Turbine Building Nuclear Assistant Unit Operator, TB NAUO
   Control Building/Ice Nuclear Assistant Unit Operator, CB/ICE NAUO
   Condensate Demineralizer Nuclear Assistant Unit Operator, COND DI

2. **At 0025, the Operator at the Controls (OAC) becomes violently ill, requiring medical assistance and immediate transport to a hospital.**

INITIATING CUE:

You are the US, and are to determine:

1. **Which, if any, of the following available operators is eligible to call in to replace the OAC?**

   a. **Three Reactor Operators with the following history:**

      1.) **The three obtained a license in 2009, have off-shift assignments at the plant, are current in License Operator Requalification Training, and have had a medical examination in the past 2 years.**

      2.) **None of the ROs have worked any shift since December 1, 2011.**

      3.) **The Active/Inactive status and time on shift since October 1, 2011 for each of the Reactor Operators is provided in the table on the next page.**

   b. **An SRO (Instant) who was issued his license on January 29, 2012.**

2. **If a replacement operator was called in to meet minimum shift staffing, what is the latest time allowed by procedure for the replacement to assume shift?**

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-1 SRO
2011-10 NRC Exam

OPERATOR A	
License was active on October 1, 2011.	
10/02/11	Worked 0700-1900 shift as Unit 1 OAC.
10/03/11	Worked 0700-1900 shift as Unit 1 OAC.
10/04/11	Worked 0700-1900 shift in the Tagging Office.
10/05/11	Worked 0700-1900 shift as Unit 1 OAC.
10/06/11	Worked 0700-1900 shift as Unit 1 OAC. Called for Fitness for Duty Random Test., and was absent from the Control Room for 2.0 hours.
11/14/11	Worked 1900-0700 shift as Unit 1 OAC.

OPERATOR B	
License was active on October 1, 2011.	
10/01/11	Worked 0700-1900 shift as Unit 1 OAC.
10/02/11	Worked 0700-1900 shift in the Tagging Office.
10/03/11	Worked 0700-1900 shift as Unit 1 CRO.
10/05/11	Worked 0700-1900 shift as Unit 1 OAC.
10/14/11	Worked 1900-0700 shift as Unit 1 OAC.
11/02/11	Worked 0700-1900 shift in the Tagging Office.

OPERATOR C	
License was inactive on October 1, 2011	
10/05/11 thru 10/09/11 worked 40 hours under the direction of the Unit 1 OAC and completed all requirements for license reactivation.	
11/12/11	Worked 0700-1900 shift as Unit 1 OAC.
11/13/11	Worked 0700-1900 shift as Unit 1 OAC.
11/15/11	Worked 0700-1900 shift as Unit 1 OAC.
11/21/11	Worked 1900-0700 shift as Unit 1 OAC.

STEP/STANDARD	SAT/UNSAT
START TIME: _____	
STEP 1: Determine the Active / Inactive status of Operator A license. STANDARD: Applicant determines the license is Inactive because the operator did not work the required qualified 5 twelve hour shifts in a license position during the previous quarter. The shift on 10/06/11 DOES NOT count due to the 2.0 hour absence. OPDP-10, Section 3.2.4.B states "Absences from the Control Room for extended periods (i.e., Fitness-for-Duty testing) will not count towards shift functions." **Step is critical to ensure an operator with an inactive license does not perform license duties.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2: Determine the Active / Inactive status of Operator B license. STANDARD: Applicant determines the license is Inactive because the operator did not work the required 5 twelve hour shifts in a license position during the previous quarter. **Step is critical to ensure an operator with an inactive license does not perform license duties.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: Determine the Active / Inactive status of Operator C license. STANDARD: Applicant determines the license is Active because the license was reactivated in the previous quarter, including working 40 hours under the direction of the Unit 1 OAC. The operator has also worked 4 twelve hour shifts in a license position during the quarter. **Step is critical to ensure an operator with an active license is called in to replace the ill OAC to perform license duties.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 4: Determine the status of the newly licensed SRO. STANDARD: Applicant determines the license is active, and that the SRO may fill either an RO or SRO position. **Step is critical to ensure an operator with an active license is called in to replace the ill OAC to perform license duties.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: Determine the latest time that the replacement operator may assume the shift. STANDARD: Applicant determines the operator selected as the replacement (either RO "C" or the SRO) must report for work no later than 0225, to meet the two hour requirement of Tech Spec 5.2.2.b. **Step is critical to ensure an operator with an active license reports for work within 2 hours.** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME _____

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit 1 is operating at 100% power with the following 1900-0700 shift positions manned on January, 31, 2012:

   Shift Manager, SM
   Unit Supervisor, US
   Shift Technical Advisor, STA (non-licensed)
   Operator at the Controls, OAC
   Control Room Operator, CRO
   Outside Nuclear Assistant Unit Operator, OS NAUO
   Auxiliary Building Nuclear Assistant Unit Operator, AB NAUO
   Turbine Building Nuclear Assistant Unit Operator, TB NAUO
   Control Building/Ice Nuclear Assistant Unit Operator, CB/ICE NAUO
   Condensate Demineralizer Nuclear Assistant Unit Operator, COND DI

2. At 0025, the Operator at the Controls (OAC) becomes violently ill, requiring medical assistance and immediate transport to a hospital.

INITIATING CUE:

You are the US, and are to determine:

1. Which, if any, of the following available operators is eligible to call in to replace the OAC?

   a. Three Reactor Operators with the following history:

      1.) The three obtained a license in 2009, have off-shift assignments at the plant, are current in License Operator Requalification Training, and have had a medical examination in the past 2 years.

      2.) None of the ROs have worked any shift since December 1, 2011.

      3.) The Active/Inactive status and time on shift since October 1, 2011 for each of the Reactor Operators is provided in the table on the next page.

   b. An SRO (Instant) who was issued his license on January 29, 2012.

2. If a replacement operator was called in to meet minimum shift staffing, what is the latest time allowed by procedure for the replacement to assume shift?

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

OPERATOR A	
License was active on October 1, 2011.	
10/02/11	Worked 0700-1900 shift as Unit 1 OAC.
10/03/11	Worked 0700-1900 shift as Unit 1 OAC.
10/04/11	Worked 0700-1900 shift in the Tagging Office.
10/05/11	Worked 0700-1900 shift as Unit 1 OAC.
10/06/11	Worked 0700-1900 shift as Unit 1 OAC. Called for Fitness for Duty Random Test., and was absent from the Control Room for 2.0 hours.
11/14/11	Worked 1900-0700 shift as Unit 1 OAC.

OPERATOR B	
License was active on October 1, 2011.	
10/01/11	Worked 0700-1900 shift as Unit 1 OAC.
10/02/11	Worked 0700-1900 shift in the Tagging Office.
10/03/11	Worked 0700-1900 shift as Unit 1 CRO.
10/05/11	Worked 0700-1900 shift as Unit 1 OAC.
10/14/11	Worked 1900-0700 shift as Unit 1 OAC.
11/02/11	Worked 0700-1900 shift in the Tagging Office.

OPERATOR C	
License was inactive on October 1, 2011	
10/05/11 thru 10/09/11 worked 40 hours under the direction of the Unit 1 OAC and completed all requirements for license reactivation.	
11/12/11	Worked 0700-1900 shift as Unit 1 OAC.
11/13/11	Worked 0700-1900 shift as Unit 1 OAC.
11/15/11	Worked 0700-1900 shift as Unit 1 OAC.
11/21/11	Worked 1900-0700 shift as Unit 1 OAC.

A.1-1 RO
Determine License Status

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-1 RO
2011-10 NRC Exam

Task: Determine License Status Active / Inactive

Alternate Path: N/A

Facility JPM #: None

Safety Function: 2.1 **Title:** Conduct of Operations

K/A 2.1.4 Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.

Rating(s): 3.3/3.8 **CFR:** 41.10 / 43.2

Evaluation Method: Simulator _____ In-Plant _____ **Classroom** X

References: OPDP-10, "License Status Maintenance, Reactivation and Proficiency for Non-Licensed Positions ," Rev. 3

Task Number: RO-119-PAI-2.07-001 **Title:** Maintain active NRC License

Task Standard: Applicant determines that Reactor Operators A, B, and D are Inactive and are NOT able to assume shift.

Validation Time: 10 minutes **Time Critical:** Yes _____ No X

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Applicant: _____ _____ Time Start: _____
NAME Docket No. Time Finish: _____

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: _____ _____/_____
NAME SIGNATURE DATE

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COMMENTS

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WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-1 RO
2011-10 NRC Exam

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

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:

Four Reactor Operators have the following history:

1. All four obtained a license in 2009, have off-shift assignments at the plant, are current in License Operator Requalification Training, and have had a medical examination in the past 2 years.
2. None of the 4 has worked any shift since December 1, 2011.
3. Active/Inactive status and time on shift since October 1, 2011 is as follows for each of the Reactor Operators:

Operator A	**License was active on October 1, 2011.**	
	10/02/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/03/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/04/11	Worked 0700-1900 shift in the Tagging Office.
	10/05/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/06/11	Worked 0700-1900 shift as Unit 1 OAC. Called for Fitness for Duty Random Test., and was absent from the Control Room for 2.0 hours.
	11/14/11	Worked 1900-0700 shift as Unit 1 OAC.
Operator B	**License was active on October 1, 2011.**	
	10/01/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/02/11	Worked 0700-1900 shift in the Tagging Office.
	10/03/11	Worked 0700-1900 shift as Unit 1 CRO.
	10/05/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/14/11	Worked 1900-0700 shift as Unit 1 OAC.
	11/02/11	Worked 0700-1900 shift in the Tagging Office.
Operator C	**License was inactive on October 1, 2011**	
	10/05/11 thru 10/09/11 worked 40 hours under the direction of the Unit 1 OAC and completed all requirements for license reactivation.	
	11/12/11	Worked 0700-1900 shift as Unit 1 OAC.
	11/13/11	Worked 0700-1900 shift as Unit 1 OAC.
	11/15/11	Worked 0700-1900 shift as Unit 1 OAC.
	11/21/11	Worked 1900-0700 shift as Unit 1 OAC.

Table continued on next page.

Operator D	**License was active on October 1, 2011.**	
	10/07/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/08/11	Worked 0700-1900 shift as Unit 1 OAC. Absent from the Control Room for 1 hour to attend a pre-job brief for a sensitive evolution.
	10/09/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/10/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/11/11	Worked 0700-1900 shift as Unit 1 OAC. Absent from MCR for 2.5 hours to complete required General Employee Training.

INITIATING CUES:

1. You are to determine if each of the Reactor Operators is eligible to work the Unit 1 OAC position on the 0700 - 1900 shift on January, 31, 2012.

STEP/STANDARD	SAT/UNSAT

START TIME: _____

STEP 1.: Determine the Active / Inactive status of Operator A license. STANDARD: Applicant determines the license is Inactive because the operator did not work the required qualified 5 twelve hour shifts in a license position during the previous quarter. The shift on 10/06/11 DOES NOT count due to the 2.0 hour absence. OPDP-10, Section 3.2.4.B states "Absences from the Control Room for extended periods (i.e., Fitness-for-Duty testing) will not count towards shift functions." **Step is critical to ensure an operator with an inactive license does not perform license duties.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2.: Determine the Active / Inactive status of Operator B license. STANDARD: Applicant determines the license is Inactive because the operator did not work the required 5 twelve hour shifts in a license position during the previous quarter. **Step is critical to ensure an operator with an inactive license does not perform license duties.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3.: Determine the Active / Inactive status of Operator C license. STANDARD: Applicant determines the license is Active because the license was reactivated in the previous quarter, including working 40 hours under the direction of the Unit 1 OAC. The operator has also worked 4 twelve hour shifts in a license position during the quarter. COMMENTS:	___ SAT ___ UNSAT
STEP 4.: Determine the Active / Inactive status of Operator D license. STANDARD: Applicant determines the license is Inactive because the operator did not work the required qualified 5 twelve hour shifts in a license position during the previous quarter. The 1 hour time to attend the pre-job brief on 10/08/11 does count as "actively performing the functions of an operator." Howerver, the 2.5 hours spent completing required general employee training on 10/11/11 does **NOT** count as "actively performing the functions of an operator." **Step is critical to ensure an operator with an inactive license does not perform license duties.** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME _____

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

Four Reactor Operators have the following history:

1. All four obtainted a license in 2009, have off-shift assignments at the plant, are current in License Operator Requalification Training, and have had a medical examination in the past 2 years.
2. None of the 4 has worked any shift since December 1, 2011.
3. Active/Inactive status and time on shift since October 1, 2011 is as follows for each of the Reactor Operators:

Operator A	**License was active on October 1, 2011.**	
	10/02/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/03/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/04/11	Worked 0700-1900 shift in the Tagging Office.
	10/05/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/06/11	Worked 0700-1900 shift as Unit 1 OAC. Called for Fitness for Duty Random Test., and was absent from the Control Room for 2.0 hours.
	11/14/11	Worked 1900-0700 shift as Unit 1 OAC.
Operator B	**License was active on October 1, 2011.**	
	10/01/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/02/11	Worked 0700-1900 shift in the Tagging Office.
	10/03/11	Worked 0700-1900 shift as Unit 1 CRO.
	10/05/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/14/11	Worked 1900-0700 shift as Unit 1 OAC.
	11/02/11	Worked 0700-1900 shift in the Tagging Office.
Operator C	**License was inactive on October 1, 2011**	
	10/05/11 thru 10/09/11 worked 40 hours under the direction of the Unit 1 OAC and completed all requirements for license reactivation.	
	11/12/11	Worked 0700-1900 shift as Unit 1 OAC.
	11/13/11	Worked 0700-1900 shift as Unit 1 OAC.
	11/15/11	Worked 0700-1900 shift as Unit 1 OAC.
	11/21/11	Worked 1900-0700 shift as Unit 1 OAC.

Table continued on next page.

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

Operator D	License was active on October 1, 2011.	
	10/07/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/08/11	Worked 0700-1900 shift as Unit 1 OAC. Absent from the Control Room for 1 hour to attend a pre-job brief for a sensitive evolution.
	10/09/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/10/11	Worked 0700-1900 shift as Unit 1 OAC.
	10/11/11	Worked 0700-1900 shift as Unit 1 OAC. Absent from MCR for 2.5 hours to complete required General Employee Training.

INITIATING CUE:

1. You are to determine which if any of the Reactor Operators is NOT eligible to work the Unit 1 OAC position on the 0700 - 1900 shift on January, 31, 2012.

A.1-2
Perform RCS Deboration Calculation

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-2
2011-10 NRC Exam

EVALUATION SHEET

Task: Perform RCS Deboration Calculation.

Alternate Path: n/a

Facility JPM #:

Safety Function: n/a **Title:**

K/A 2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc.

Rating(s): 3.9 / 4.2 **CFR:** 41.10 / 43.5 / 45.12

Evaluation Method: Simulator _____ In-Plant _____ **Classroom** **X**

References: SOI-62.04, "CVCS Purification System," Rev. 57
TI-59, "Boron Tables," Rev. 7

Task Number: RO-062-TI-59-001 **Title:** Perform boron concentration change calculations.

Task Standard: Applicant determines that it will take 229.5 (acceptable range 229-230) minutes to reduce RCS boron concentration from 52 ppm to 38 ppm after performing SOI-62.04, "CVCS Purification System," Appendix B, "RCS Deboration Calculation."

Validation Time: 10 minutes **Time Critical:** Yes _____ No **X**

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Applicant: _____ (NAME) _____ (Docket No.) Time Start: _____ Time Finish: _____

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: _____ (NAME) _____ (SIGNATURE) /_____ (DATE)

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COMMENTS

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WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-2
2011-10 NRC Exam

Tools/Equipment/Procedures Needed:

- SOI-62.04, "CVCS Purification System," Rev. 57
- TI-59, "Boron Tables," Rev. 7
- Calculator

NOTE: This JPM is designed to be performed in a classroom with procedures available to the applicant via a laptop computer loaded with the NRC Reference Disk.

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

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 cue sheet I provided you.

INITIAL CONDITIONS:

1. **The unit is in Mode 1, coasting down prior to refueling.**
2. **Current RCS C_B is 52 ppm.**
3. **Current RCS temperature is 575°F.**
4. **Mixed Bed A contains fresh, unborated resin.**
5. **Maximum Mixed Bed (MB) flow per SOI-62.04, "CVCS Purification System," will be used during this evolution.**
6. **You are an extra operator.**

INITIATING CUES:

1. **The Unit SRO has directed you to perform SOI-62.04, "CVCS Purification System," Appendix B,"RCS Deboration Calculation," to estimate the time that CVCS Mixed Bed Demineralizer 'A' must be in service in order to reduce RCS boron concentration to 38 ppm.**
2. **Report the results of your calculation to the Unit SRO.**

STEP/STANDARD	SAT/UNSAT

START TIME: _____

STEP 1: [1] **INDICATE** Mixed Bed for which this calculation is being performed (CHECK ONLY ONE.) Mixed Bed A _____ **OR** Mixed Bed B _____ STANDARD: From INITIAL CONDITIONS, the applicant checks Mixed Bed A. COMMENTS:	___ SAT ___ UNSAT

NOTE

This calculation is based on the Mixed Bed being a fresh unborated bed, all letdown flow being directed through the mixed bed being placed in service, and the following:

$$Cf = Co\, e^{-\frac{QT}{V}}$$

Where: Cf = Final Boron Concentration
Co = Initial Boron Concentration
Q = Mixed Bed Flow Rate (Letdown Flow in gpm)
V = RCS Volume at operating temperature (gals)
T = Time (minutes)

STEP 2: [2] **RECORD** current RCS Temperature: STANDARD: From INITIAL CONDITIONS, applicant records 575°F as the current RCS temperature. COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [3] **RECORD** RCS Volume (*V*) based on current RCS Temp using TI-59 (first page of App D through App N, as appropriate.) STANDARD: Applicant locates TI-59, and selects Appendix L, and records 87813.5 as the RCS volume. (Acceptable Range 87813 - 87814 gallons) COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 4: [4] **PERFORM** the following calculation to estimate time in service: STANDARD: Applicant enters letdown flow of 120 gpm, since the INITIAL CONDITIONS requires letdown flow to be at maximum, and RCS volume of 87813.5 gallons. Applicant calculates time of **229.5 minutes.** (Acceptable range 229 - 230 minutes) Applicant reports the results of the calculation to the Unit Supervisor. **EVALUATOR'S CUE:** ***When the applicant reports the result of the calculation to the Unit Supervisor, acknowledge using repeat back. State that "another operator will complete Step 5 of Appendix B."*** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME _____

Appendix B
(Page 1 of 1)

RCS Deboration Calculation

[1] **INDICATE** Mixed Bed for which this Calculation is being performed (CHECK ONLY ONE.)

Mixed Bed A __X__ **OR** Mixed Bed B _____

NOTE

This calculation is based on the Mixed Bed being a fresh unborated bed, all letdown flow being directed through the mixed bed being placed in service, and the following:

$$Cf = Co\, e^{-\frac{Q\,T}{V}}$$

Where:
- *Cf* = Final Boron Concentration
- *Co* = Initial Boron Concentration
- *Q* = Mixed Bed Flow Rate (Letdown Flow in gpm)
- *V* = RCS Volume at operating temperature (gals)
- *T* = Time (minutes)

[2] **RECORD** current RCS Temperature:

575 RCS Temp

[3] **RECORD** RCS Volume (*V*) based on current RCS Temp using TI-59 (first page of App D through App N, as appropriate.)

87813.5 RCS Volume

[4] **PERFORM** the following calculation to estimate time in service:

$$\text{Time} = \frac{-\ln (C_f/C_o)\, V}{Q} = \frac{-\ln (\underline{38}\ \text{ppm}/\underline{52}\ \text{ppm})\ \underline{87813.5}\ \text{gals}}{\underline{120}\ \text{gpm}}$$

Time = 229.5 *minutes*

[5] **RECORD** Mixed Bed Run times for which this Calculation is being performed (Times can be obtained from Attachment 1 for the associated demin).

	1	2	3	4	5	6	7	8
Run time								
Total time								
Initials								

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. The unit is in Mode 1 coasting down prior to refueling.
2. Current RCS C_B is 52 ppm.
3. Current RCS temperature is 575°F.
4. Mixed Bed A contains fresh, unborated resin.
5. Maximum Mixed Bed (MB) flow per SOI-62.04, "CVCS Purification System," will be used during this evolution.
6. You are an extra operator.

INITIATING CUES:

1. The Unit SRO has directed you to perform SOI-62.04, "CVCS Purification System," Appendix B "RCS Deboration Calculation," to estimate the time that CVCS Mixed Bed Demineralizer 'A' must be in service in order to reduce RCS boron concentration to 38 ppm.
2. Report the results of your calculation to the Unit SRO.

A.2 SRO
Independent Verification of 1-SI-68-32 Calculation

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.2 SRO
2011-10 NRC Exam

EVALUATION SHEET

Task: Independent Verification of 1-SI-68-32 Calculation.

Alternate Path: n/a

Facility JPM #: Modified

Safety Function: n/a **Title:** Equipment Control

K/A 2.2.12 Knowledge of surveillance procedures.

Rating(s): 3.7/4.1 **CFR:** 41.10/45.13

Evaluation Method: Simulator _____ In-Plant _____ **Classroom** X

References: 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," Rev. 14.

Task Number: RO-068-SI-68-32-001 **Title:** Perform a Reactor Coolant System Inventory Balance.

Task Standard: The applicant:

1.) Performs an Independent Verification of 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," Appendix A, "Manual Performance of RCS Water Inventory Balance," using the data provided and identifies that the RCDT Leakage was incorrectly calculated.

2.) Evaluates results of the calculation and enters Technical Specification LCO 3.4.13, RCS Operational LEAKAGE, Condition A.

Validation Time: 45 minutes **Time Critical:** Yes _____ No X

==========

Applicant: _____ _____ Time Start: _____
NAME Docket No. Time Finish: _____

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: _____ _____/_____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

_____

_____

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.2 SRO
2011-10 NRC Exam

Tools/Equipment/Procedures Needed:

- Marked-up copy of 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," Rev. 14.
- Calculator
- Steam Tables

NOTE: This JPM is designed to be performed in a classroom with procedures available to the applicant via a laptop computer loaded with the NRC Reference Disk.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.2 SRO
2011-10 NRC Exam

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

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 cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit 1 is in Mode 1 at 100% power.**
2. **1-SI-68-32, "Reactor Coolant System Water Inventory Balance," performance is required.**
3. **The ICS Computer program RCSWIB is unreliable.**
4. **1-SI-68-32 Appendix A, "Manual Performance of RCS Water Inventory Balance," has been completed through step 5.**
5. **An initial data set was entered at 1800 and a second data set was entered at 1900 on 1-SI-68-32 Appendix B, "RCS Water Inventory Balance Data Sheet."**
6. **Appendix C, "RCS Water Inventory Balance Calculations," has been performed by an extra operator assigned to the shift.**

INITIATING CUES:

1. **As the Unit SRO, you are to complete an independent verification of the manual calculation of RCS inventory balance using the data provided.**
2. **Evaluate the results of your calculation and determine which, if any, Technical Specification ACTIONS are applicable.**

STEP/STANDARD	SAT/UNSAT

START TIME: _____

NOTE

Throughout this Appendix, INITIAL indicates the data is to be taken from first data set recorded in Appendix B and FINAL indicates data is to be taken from the last data set recorded in Appendix B. A copy of this Appendix is required to be completed each time RCS leakage is calculated.

STEP 1: **[1] CALCULATE** elapsed time (ΔT) as follows: STANDARD: Applicant determines the elapsed time to be 60 minutes by performing the appropriate calculation. **Step is critical since an incorrect calculation of the elapsed time will result in an incorrect calculation of leak rates.**	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2: **[2] CONVERT** INITIAL and FINAL PZR PRESSURE units of measure to psia as follows: STANDARD: Applicant determines the Initial and Final PZR pressures to be 2250 psia. **Step is critical since an incorrect calculation of the initial and final pressures will result in an incorrect calculation PZR water inventory.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: **[3] CALCULATE** VCT Leakage as follows: STANDARD: Applicant determines VCT leakage to be 1.03 gpm. (Acceptable range 1.0-1.3 gpm) **Step is critical since an incorrect calculation of the VCT leakage will result in an incorrect calculation of overall leakage rates.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 4: **[4] CALCULATE** Pressurizer (PZR) Leakage as follows: **[4.1] RECORD** INITIAL and FINAL PZR PRESSURE in table below using values calculated in Step [2]. **[4.2] RECORD** INITIAL and FINAL PZR LEVEL in table below using values recorded in Appendix B. **[4.3] DETERMINE and RECORD** INITIAL and FINAL PZR Vf (volume of water) and Vg (volume of steam) at INITIAL and FINAL PZR PRESS (Step [2]) using ASME Steam Tables (Table 2, Properties of Saturated Steam and Saturated Water). STANDARD: Applicant enters the appropriate data from the Steam Tables into the table. **Step is critical since an incorrect calculation of the VCT leakage will result in an incorrect calculation of overall leakage rates.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: **[4] CALCULATE** Pressurizer (PZR) Leakage as follows: (Continued) **[4.4] CALCULATE** INITIAL PZR VOLUME as follows: STANDARD: Applicant performs the calculation and determines Initial PZR volume to be 4972.5 gallons. (Acceptable range 4944.2 - 5003.4 gallons) **Step is critical since an incorrect calculation of the PZR initial volume will result in an incorrect calculation of PZR and overall leakage rates.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 6: **[4] CALCULATE** Pressurizer (PZR) Leakage as follows: (Continued) **[4.5] CALCULATE** FINAL PZR VOLUME as follows: STANDARD: Applicant performs the calculation and determines Final PZR volume to be 4834.4 gallons. (Acceptable range 4808.9 - 4862.5 gallons) **Step is critical since an incorrect calculation of the PZR final volume will result in an incorrect calculation of PZR and overall leakage rates.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 7: **[4] CALCULATE** Pressurizer (PZR) Leakage as follows: (Continued) **[4.6] CALCULATE** PZR Leakage as follows: STANDARD: Applicant performs calculation and determines PZR leakage to be 2.3 gpm. (Acceptable range 2.25 - 2.35 gpm) **Step is critical since an incorrect calculation of the PZR leakage rate will result in an incorrect calculation of the overall leakage rate.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 8: **[5] IF** RCS TEMP FINAL is NOT equal to RCS TEMP INITIAL, **THEN** STANDARD: Applicant determines RCS temperature did not change so this step and its sub steps are not applicable. Applicant marks Step 5 and its sub-steps as N/A. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: **[6] CALCULATE** Total RCS Leakage as follows: STANDARD: Applicant adds VCT Leakage of 1.03 gpm to PZR Leakage of 2.3 gpm and determines Total RCS Leakage to be 3.33 gpm. (Acceptable range 3.25 - 3.4 gpm) **Step is critical since an incorrect calculation of Total RCS Leakage will result in an incorrect evaluation of RCS Leakage.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 10: **[7] CALCULATE** Leakage to Pressurizer Relief Tank (PRT) as follows: STANDARD: Applicant determines there is no change in the PRT level and leakage to the PRT is 0 gpm. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 11: **[8] CALCULATE** Leakage to Reactor Coolant Drain Tank (RCDT) as follows: STANDARD: Applicant determines from TI-4 Part II that initial RCDT volume is equal to 80 gallons, and that final RCDT volume is 140 gallons. The leakage to the RCDT is calculated at 1.0 gpm. Applicant determines that the RO entered the incorrect value for the initial RCDT level (21gallons), resulting in a value of 2 gpm. **Step is critical since an incorrect calculation will result in an incorrect evaluation of RCS leakage.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 12: **[9] CALCULATE** Identified Leakage as follows: STANDARD: Applicant performs adds Leakage to PRT of 0 gpm to the Leakage to RCDT of 1 gpm and Total SG Leakage of 0 gpm and determines that Identified Leakage is 1.0 gpm. Applicant determines that the RO entered the incorrect value for the Leakage to RCDT of 2 gpm. **Step is critical since an incorrect calculation will result in an incorrect evaluation of RCS leakage.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 13: **[10] CALCULATE** Unidentified Leakage as follows: STANDARD: Applicant subtracts the Identified leakage of 1.0 gpm from the Total RCS Leakage of 3.33 gpm determines that Unidentified Leakage is 2.33 gpm. (Acceptable range 2.25 - 2.4 gpm) Applicant determines that the previous error made by the RO resulted in an Unidentified Leakage of 1.33 gpm. **Step is critical since an incorrect calculation will result in an incorrect evaluation of RCS leakage.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 14: **[11] RECORD** Total RCS Leakage (Step [6]), Identified Leakage (Step [9]) and Unidentified Leakage (Step [10]) on Appendix B in the last column that data is recorded. STANDARD: Applicant records values in the appropriate column on Appendix B. Applicant determines that the Unidentified Leakage Rate does not meet Acceptance Criteria, and determines that Technical Specification 3.4.13, Action A is applicable and leakage rate must be reduced to within limits within 4 hours. **Step is critical to ensure that the proper Technical Specification is entered and the appropriate Action is performed.** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME _____

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
Rev 9	08/12/04	2, 8-11, 18	Non-intent change. Incorporated Operations comments related to PER 64091 and other enhancements. Required 1-LCV-62-118 (1-HS-62-118A) to be in VCT position during test. 50.59 review is **NOT** required.
Rev 10	07/25/06	2, 23	Corrected UNID for Pressurizer Cold Cal instrument 1-LI-68-321. 50.59 review is **NOT** required.
Rev 11	11/24/06	2, 4, 13, 29	Updated RCS volume in temperature correction calculation based on DCN 51754.
Rev 12	12/12/06	2, 8, 11	Added notes relative to zinc addition (DCN 52122).
Rev 13	03/05/10	All	This procedure has been converted from Word 95 to Word XP using Rev 12 by the conversion team. A line by line verification, including minor editorial and formatting corrections, was performed by the preparer. Clarifications related to procedure revisions were made to the Precautions and Limitations . A 10CFR50.59 screening review is not required for this revision.
Rev 14	01/24/11	2, 31	Added Note to Appendix C allowing Total RCS Leakage to conservatively be set equal to Unidentified Leakage under certain unusual conditions. A 10CFR50.59 screening review or evaluation is not required for this revision since it implements requirements of the Technical Specifications.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

This Instruction provides detailed steps to perform a Reactor Coolant System (RCS) water inventory balance.

1.2 Scope

1.2.1 Operability Test to be Performed

Operations that could affect RCS water inventory (makeup and sampling) are terminated and the RCS is stabilized. With the RCS stable, parameters such as temperature, pressure, and associated tank levels are measured at one hour or greater intervals. When at least two sets of data have been collected, identified and unidentified leakages are calculated using the rate of change between the data sets. Then, the calculated leakage rates are compared to values in Technical Specification Limiting Condition for Operation (LCO) 3.4.13 to determine RCS operability.[4]

1.2.2 Surveillance Requirements Fulfilled and Modes

NOTES

1) TSR 3.4.13.1 is applicable in Modes 3 and 4 after 12 hours of steady state operation have been achieved.
2) Steady state operation is defined as RCS temperature stable within ± 0.3°F.[4]

Performance of this SI fully implements Technical Specifications Requirements 3.4.13.1.

TECHNICAL SPECIFICATION SECTION	APPLICABLE MODES	PERFORMANCE MODES
3.4.13.1	1, 2, 3, 4 (See Notes)	1, 2, 3, 4
LCO 3.4.15, ACTION-A.1	1, 2, 3, 4	1, 2, 3, 4
LCO 3.4.15, ACTION-B.1.2	1, 2, 3, 4	1, 2, 3, 4

1.3 Frequency and Conditions

A. This Instruction is required to be performed at least once every 72 hours when the unit is in Mode 1 or 2 during steady state operation and in Mode 3 or 4 after 12 hours of steady state operation has been achieved.

1.3 Frequency and Conditions (continued)

B. This Instruction is required to be performed within one hour of receiving an alarm and confirming leakage in a flow path with no indicators.[2]

Leakage by any of the following will be indicated by an alarm in the control room: Leakage across the SIS cold-leg and hot-leg check valves is detected by pressure transmitters, leakage across the cold-leg accumulators check valves is detected by increase in accumulator inventory, steam generator tube leakage is indicated by radiation monitors, leakage past RHR injection check valves is detected by pressure transmitters, RCS leakage into CCS is detected by radiation monitors.[2]

C. This Instruction is required to be performed once per 24 hours for LCO 3.4.15 Action-A.1 or LCO 3.4.15 Action-B.1.2

2.0 REFERENCES

2.1 Performance References

A. ASME Steam Tables.

B. SOI-77.01, Waste Disposal System.

C. TI-4, Part II, Plant Curve Book, Tank Curves, Turbine Curves.

2.2 Developmental References

2.2.1 TVA Procedures

A. SPP-2.6, Computer Software Control.

2.2.2 TVA Drawings

A. 1-47W809-1

B. 1-47W809-2

C. 1-47W813-1

D. 1-47W830-1

2.2.3 Other

A. N3-68-4001, Reactor Coolant System.

B. Regulatory Guide 1.45, Reactor Coolant Pressure Boundary Leakage Detection System.

C. Unit 1 Technical Specification Section 3.4.13.

3.0 PRECAUTIONS AND LIMITATIONS

A. The final RCS temperature must be within ± 0.3°F of the initial RCS temperature or the final data is VOID and must be retaken.

B. The final RCS power level must be within ± 1.0% of the initial RCS power level or the final data is VOID and must be retaken.

C. Makeup to the Volume Control Tank (VCT) is isolated and VCT level is expected to decrease during this SI. If VCT level falls to 20% or low VCT level alarm annunciates before final data is recorded, makeup to the VCT will be required and the test will have to be voided and reperformed.

D. The Reactor Coolant Drain Tank (RCDT) pumps are placed in PULL-TO-LOCK with 1-FCV-68-310, PRT DRAIN, closed. At the same time, RCDT and Pressurizer Relief Tank (PRT) levels are expected to increase. If PRT or RCDT high level alarm annunciates before final data is recorded, pump-down of the PRT or RCDT will be required and the test will have to be voided and reperformed.

E. Instruments such as PZR pressure and level or any other instruments used by the RCS Inventory Program that are removed from service during the performance of this SI will cause the quality to be bad on the final data sheet.

F. Any revisions to this SI will require coordination with the Computer Engineering Group to change the SI revision level displayed on the ICS Water Inventory Balance screen.

G. Any revisions or modifications to this procedure that affect the water inventory balance calculation or that could affect the ICS software will require a Computer Software Service Request (SSR) per SPP-2.6 to make the applicable software changes to the ICS Water Inventory Balance.

H. If any of the following events occur during performance of Section 6.0 the data is VOID and the test must be restarted after initial conditions are reestablished:

1. Any instrument or computer data point used to obtain initial data is **NOT** available for final data.
2. Emergency boration.
3. Diversion of letdown to the hold up tanks.
4. Makeup from any source.
5. Change in primary side purification demineralizers or filter lineup.
6. Failure to accumulate data for at least 1 hour.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

7. Restarting the primary water pumps if they were stopped before the initial data was collected.

8. Sampling the RCS or making chemical additions to the RCS (with the exception of RCS Zinc Injection).

9. PRT or RCDT operations that affect tank levels.

I. Operating with VCT level near the divert setpoint of 63% may cause erratic readings due to diversion of letdown to the HUT (which is **NOT** accounted for in the calculations). Reducing VCT level to less than 60% before initiating performance will minimize the possibility of errors in the calculations.

J. To ensure that test results are as accurate as possible, the test should **NOT** begin until at least 30 minutes following evolutions such as dilution, boration, or rod movement.

K. Zinc injection, as implemented by DCN 52122, is limited to a maximum of 8 ml per minute (about 0.002 gpm). This amount of inventory increase is **NOT** detectable within the methodology of this procedure.

Data Package: Page ____ **Date** TODAY

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

[1] **RECORD** start date and time on Surveillance Task Sheet. LRM

[2] **IF** required, **THEN**

OBTAIN an RWP. LRM

[3] **IF** in Mode 3 or 4, **THEN**

[3.1] **SETUP** trend block on the Plant computer to monitor T_{hot} approximately every 30 minutes. N/A

[3.2] **IF** steady state conditions are maintained for any continuous 12 hours, **THEN**

PERFORM this instruction. N/A

[3.3] **MAKE** log entry at end of each 12 hour period if **NOT** at steady state (± 0.3°F). N/A

[4] **RECORD** present plant operating mode: 1

[5] **OBTAIN** the most recent Steam Generator (SG) Leakage from Chemistry. LRM

[6] **RECORD** the most recent Steam Generator Leakage obtained from Chemistry in the appropriate column below, **AND**

CALCULATE Total SG Leakage (in gpm) as follows:

SG Leakage Reported as TOTAL	SG Leakage Reported as INDIVIDUAL				
Total SG Leakage = 0 gpd	Total SG Leakage =	SG1 Leakage +	SG2 Leakage +	SG3 Leakage +	SG4 Leakage
	Total SG Leakage =	0 gpd +	0 gpd +	0 gpd+	0 gpd
	Total SG Leakage =	0 gpd	(sum of above)		
Total SG Leakage (gpm) =	Total SG Leakage (gpd) / 1440 min/day	= 0 gpd / 1440 min/day =	0 gpm		
Total SG Leakage = 0 gpm		LRM Performed		DAH CV	

Data Package: Page ____ **Date** TODAY

4.2 Approvals and Notifications

[1] **OBTAIN** Operations approval on Surveillance Task Sheet to perform this Instruction. LRM

4.3 Field Preparations

[1] **ENSURE** VCT level is such that neither makeup **NOR** diversion to the HUT is anticipated during performance of this Instruction. LRM

[2] **IF** Reactor Coolant Drain Tank (RCDT) level is such that an automatic pump-down may occur during the performance of this procedure, **THEN**

PERFORM SOI-77.01 as required to reduce RCDT level to the LO-level cutoff. LRM

[3] **RECORD** as-found position of the following handswitches, **AND**

PLACE the following handswitches in their required position:

HANDSWITCH	DESCRIPTION	AS-FOUND POSITION	REQUIRED POSITION	INITIALS
1-HS-77-4A	REACTOR COOLANT DR TK PUMP A	PULL TO LOCK	PULL TO LOCK	LRM
1-HS-77-6A	RCDT PUMP B	PULL TO LOCK	PULL TO LOCK	LRM

[4] **NOTIFY** Chemistry Lab that RCS water inventory balance is being performed and they are **NOT** to make any chemical additions to the RCS (with the exception of RCS Zinc Injection) **OR** take any samples from the RCS. LRM

Data Package: Page ____ **Date** TODAY

4.3 Field Preparations (continued)

[5] **RECORD** as-found position of the following valves and handswitches, **AND**

PLACE the following valves and handswitches in their required position.

VALVE	DESCRIPTION	AS-FOUND POSITION	REQUIRED POSITION	INITIALS
1-LCV-77-415	RCDT DRAIN LEVEL CONTROL	CLOSED	CLOSED	LRM
1-HS-62-118A	LETDOWN DIVERT TO HUT	VCT	VCT	LRM
1-FCV-62-128	BA BLENDER TO VCT INLET	P-AUTO CLOSED	CLOSED	LRM
1-FCV-62-144	MAKEUP INJECTION VLV FLOW CONTROL	P-AUTO CLOSED	CLOSED	LRM
1-FCV-62-138	EMERGENCY BORATION FLOW CONTROL VALVE	CLOSED	CLOSED	LRM

[6] **ESTABLISH** communications between test performer in the Main Control Room and test performer stationed at 1-LI-77-1 [0-PNL-276-L2, EL 692, COL A8-S]. LRM

Data Package: Page ____ **Date _____**

5.0 ACCEPTANCE CRITERIA

A. Technical Specification acceptance criteria for RCS leakage is shown below:

1. No pressure boundary leakage.

NOTE

Negative unidentified leakage may be considered acceptable if at least one hour of additional data is collected and unidentified leakage is more positive than -0.10 gpm OR total leakage is less than or equal to 1.0 gpm.[3]

2. 1 gpm unidentified leakage.

3. 10 gpm identified leakage.

B. If Acceptance Criteria stated above is **NOT** met, the SRO is to be notified as soon as possible that LCO 3.4.13 may be applicable and an investigation into the source of leakage is to be initiated.

Data Package: Page ____ **Date** TODAY

6.0 PERFORMANCE

[1] **ENSURE** precautions and limitations in Section 3.0 have been reviewed. LRM

[2] **ENSURE** prerequisite actions in Section 4.0 have been met. LRM

[3] **ENSURE** reactor power and RCS temperature are stable and have varied less than the limits shown below during the last 30 minutes:

	PARAMETER	VARIATION LIMITS
Mode 1 & 2	Reactor power T_{avg}	± 1.0% ± 0.3°F
Mode 3 & 4	T_{hot}	± 0.3°F

LRM

NOTE

RCS parameters must remain stable during performance of remaining steps in this Section.

[4] **IF** Plant Computer Program RCSWIB is unavailable, **THEN**

MARK Steps 6.0[5] through 6.0[18] in this Section **N/A**, **AND**

PERFORM Appendix A. LRM

NOTES

1) Values displayed on the computer screen are color coded to indicate QUALITY of the data point. Values that appear BLUE are BAD QUALITY (**NOT** reliable). Final readings will appear BLUE until computed.

2) Step 6.0[11] provides action to be taken when a data point has BAD QUALITY. This action should be taken anytime (during this SI) a data point has BAD QUALITY.

[5] **DISPLAY** Plant Computer Program RCSWIB screen using the RCSWIB TURN ON Code (TOC) **OR** the BOP menu touch screen.[4] N/A

Data Package: Page ____ **Date** TODAY

6.0 PERFORMANCE (continued)

NOTE

Steps 6.0[6]and 6.0[7]will clear the RCSWIB program to allow a new performance to be started with Step 6.0[8]

[6] **IF** RCSWIB prompt says "READY FOR FINAL READINGS? (Y/N)", **THEN**

ENTER Y, **AND**, when prompted,

ENTER RCDT level (%) from 1-LI-77-1 [0-PNL-276-L2]. N/A

[7] **IF** RCSWIB prompt says "PRINT SUMMARY SHEET/DATA PACKAGE? (Y/N)", **THEN**

ENTER N. N/A

[8] **IF** RCSWIB prompt says "START OR CONTINUE CALC.? (S/C)", **THEN**

ENTER S. N/A

[9] **ENTER** Steam Generator leakage (gpm) from Section 4.1[6]. N/A

[10] **ENTER** RCDT level (%) from 1-LI-77-1 [0-PNL-276-L2]. N/A

[11] **IF** any value shown on the computer display is BLUE, **THEN**

[11.1] **MARK** remaining steps in this Section **N/A**, **AND**

PERFORM Appendix A, **OR**

[11.2] **SELECT** another data point associated with the parameter in question, **THEN**

REPLACE the BAD QUALITY data point using the substitute value function on the single point menu screen prior to initiating and finalizing the RCSWIB program, **AND**

EXPLAIN in Remarks Section of Surveillance Task Sheet. N/A

Data Package: Page ____ **Date** TODAY

6.0 PERFORMANCE (continued)

NOTE

The RCSWIB prompt "READY FOR FINAL READINGS? (Y/N)" will display at the top of the screen until Y is entered. Operators may exit the program to perform other tasks and return to this prompt by starting RCSWIB program as described in Step 6.0[5]. All data is retained and the program's clock keeps track of elapsed time

[12] **WAIT** at least one hour (optimum time is 4 hours) N/A

[13] **ENSURE** RCSWIB prompt says "READY FOR FINAL READINGS? (Y/N)", **AND**

ENTER Y. N/A

NOTE

After RCDT level is entered, the RCSWIB program collects values from additional data points and calculates Total Leakage, Identified Leakage, and Unidentified Leakage.

[14] **ENTER** RCDT level (%) from 1-LI-77-1, [0-PNL-276-L2]. N/A

[15] **IF** UNIDENTIFIED LEAKAGE is less than 0 gpm (negative leakage)[3], **THEN**

[15.1] **ENSURE** RCSWIB prompt says "PRINT SUMMARY SHEET/DATA PACKAGE? (Y/N)", **AND**

ENTER N. N/A

[15.2] **WHEN** RCSWIB prompt says "START OR CONTINUE CALC.? (S/C)", **THEN**

ENTER C. N/A

[15.3] **WAIT** at least one hour from the last time data was collected. N/A

[15.4] **ENSURE** RCSWIB prompt says "READY FOR FINAL READINGS?, (Y/N)", **AND**

ENTER Y. N/A

[15.5] **ENTER** RCDT level (%) from 1-LI-77-1, [0-PNL-276-L2]. N/A

Data Package: Page ____ **Date** TODAY

6.0 PERFORMANCE (continued)

[15.6] **REPEAT** Steps 6.0[15.1] through 6.0[15.5] UNTIL one of the following conditions exists:

A. UNIDENTIFIED LEAKAGE is more positive than -0.10 gpm.

B. TOTAL LEAKAGE is less than or equal to 1.0 gpm.

C. SI is aborted because A or B above cannot be met before plant conditions, e.g. makeup to VCT or pump down of RCDT, require action that would invalidate test results. N/A

[15.7] **IF** SI is aborted per Step 6.0[15.6]C, **THEN**

NOTIFY UNIT SRO and/or cognizant System Engineer that an investigation to determine the source of inleakage to the RCS must be initiated.[3] N/A

[16] **ENSURE** RCSWIB prompt says "PRINT SUMMARY SHEET/DATA PACKAGE? (Y/N)", **AND**

ENTER Y. N/A

[17] **PRESS** "ENTER" to obtain printout at default printer. N/A

[18] **ATTACH** printout to the data package of this SI. N/A

[19] **IF** UNIDENTIFIED LEAKAGE is greater than 1 gpm, **THEN**

NOTIFY UNIT SRO and/or cognizant System Engineer that an investigation to determine any miscellaneous identified leakage (i.e., other than leakage to the PRT, RCDT or SG tube leakage) from the RCS must be initiated. _____

[20] **IF** MISCELLANEOUS IDENTIFIED LEAKAGE is found and determined to cause failure of the SI, **THEN**

RECORD the source and amount of MISCELLANEOUS IDENTIFIED LEAKAGE on the computer printout/data sheet. _____

[21] **VERIFY** Acceptance Criteria is met. _____

Data Package: Page ____ **Date _____**

7.0 POST PERFORMANCE ACTIVITIES

[1] **RETURN** the following valves and handswitches to their as-found position listed in Step 4.3[5], **AND**

VERIFY valve and handswitch position:

VALVE	DESCRIPTION	INITIALS	IV
1-LCV-77-415	RCDT DRAIN LEVEL CONTROL		N/A
1-HS-62-118A	LETDOWN DIVERT TO HUT		
1-FCV-62-128	BA BLENDER TO VCT INLET		N/A
1-FCV-62-144	MAKEUP INJECTION VLV FLOW CONTROL		N/A
1-FCV-62-138	EMERGENCY BORATION FLOW CONTROL VALVE		

[2] **PLACE** the following handswitches in their as-found position listed in Section 4.3[3]:

HANDSWITCH	DESCRIPTION	AS-FOUND POSITION	INITIALS
1-HS-77-4A	REACT COOLANT DR TK PUMP A		
1-HS-77-6A	RCDT PUMP B		

[3] **RECORD** completion time and date on Surveillance Task Sheet. _____

[4] **NOTIFY** SM/UNIT SRO that this SI is complete. _____

8.0 RECORDS

8.1 QA Records

The Data Package is a QA record, is handled in accordance with the Document Control and Records Management Program, and contains the following:

A. Completed parts of Sections 4.0, 6.0 and 7.0.

B. Section 5.0.

C. Completed Appendixes A and B.

D. Surveillance Task Sheet.

E. Other sheets added during the performance.

8.2 Non-QA Records

None

Appendix A
(Page 1 of 2)

Manual Performance of RCS Water Inventory Balance

Data Package: Page ____ **Date** TODAY

1.0 MANUAL PERFORMANCE OF RCS WATER INVENTORY BALANCE

[1] **OBTAIN** controlled copy of TI-4, Part II pages that show graphs of volume vs. indicated level for Pressurizer Relief Tank (PRT) and Reactor Coolant Drain Tank (RCDT). LRM

[2] **RECORD** initial RCS data per Appendix B. LRM

[3] **WAIT** at least one hour (optimum is 4 hours). LRM

[4] **RECORD** another set of RCS data per Appendix B. LRM

[5] **CALCULATE** RCS leakage per Appendix C.[4] LRM

NOTE

Additional copies of Appendix C may be used to perform independent verification.

[6] **PERFORM** independent verification of Appendix C. IV

[7] **IF** unidentified leakage is less than 0 gpm (negative leakage)[3], **THEN**

[7.1] **WAIT** at least one hour from the last time data was collected. _____

[7.2] **RECORD** another set of RCS data per Appendix B. _____

[7.3] **CALCULATE** RCS leakage per Appendix C.[4] _____

[7.4] **PERFORM** independent verification of Appendix C. IV

[7.5] **REPEAT** Steps 1.0[7.1] through 1.0[7.5] UNTIL one of the following conditions exists:

A. Unidentified leakage rate is more positive than -0.10 gpm. _____

B. Total RCS leakage is less than or equal to 1.0 gpm. _____

Appendix A
(Page 2 of 2)

Data Package: Page ____ **Date _____**

1.0 MANUAL PERFORMANCE OF RCS WATER INVENTORY BALANCE (continued)

C. SI is aborted because A or B above cannot be met before plant conditions (e.g. makeup to VCT, pump down of RCDT) require action that would invalidate test results. _____

[7.6] **IF** SI is aborted per Step1.0[7.5]C , **THEN**

NOTIFY SM/Unit SRO and /or cognizant System Engineer that an investigation to determine the source of inleakage to the RCS must be initiated.[3] _____

[8] **GO TO** Step 6.0[19]. _____

Appendix B
(Page 1 of 3)

RCS Water Inventory Balance Data Sheet

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE DATA SHEET

NOTES

1) Time for each data set is the time of day when the first instrument is read. Recording each data set as quickly as possible will ensure an accurate relationship between parameters. Additional copies of Appendix A may be used as required.

2) Only one instrument should be used for each parameter and the same instrument must be used for each data set. Instruments **NOT** used should be marked **N/A** for each data set.

PARAMETER	INSTRUMENT [PANEL]	INITIAL DATA SET	2nd DATA SET	3rd DATA SET	4th DATA SET	5th DATA SET
TIME	N/A	1800	1900			
VCT LEVEL	L0112A	40 %	36.8 %	%	%	%
	1-LI-62-129A [1-M-6]	N/A %	N/A %	%	%	%
PRESSURIZER PRESSURE	1-PI-68-342A < 1700 psi	N/A psig	N/A psig	psig	psig	psig
	1-PI-68-340A [1-M-5]	N/A psig	N/A psig	psig	psig	psig
	P0480A	2235.3 psig	2235.3 psig	psig	psig	psig
	1-PR-68-340 [1-M-5]	N/A psig	N/A psig	psig	psig	psig
	P0481A	N/A psig	N/A psig	psig	psig	psig
	1-PI-68-322 [1-M-5]	N/A psig	N/A psig	psig	psig	psig
	P0483A	N/A psig	N/A psig	psig	psig	psig

Appendix B
(Page 2 of 3)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE DATA SHEET (continued)

PARAMETER	INSTRUMENT [PANEL]	INITIAL DATA SET	2nd DATA SET	3rd DATA SET	4th DATA SET	5th DATA SET
PRESSURIZER LEVEL	1-LI-68-321 < 350°F	N/A %	N/A %	%	%	%
	1-LI-68-320 [1-M-4]	N/A %	N/A %	%	%	%
	L0482A	60.25 %	58.0 %	%	%	%
	1-LI-68-335A [1-M-4]	N/A %	N/A %	%	%	%
	L0481A	N/A %	N/A %	%	%	%
	1-LI-68-339A [1-M-4]	N/A %	N/A %	%	%	%
	L0480A	N/A %	N/A %	%	%	%
RCS TEMPERATURE	1-TI-68-2E [1-M-5]	N/A °F	N/A °F	°F	°F	°F
	T0439A T_{hot} < 530°F	N/A °F	N/A °F	°F	°F	°F
	T0460A	586.2 °F	586.2 °F	°F	°F	°F
	T0440A	N/A °F	N/A °F	°F	°F	°F
	T0420A	N/A °F	N/A °F	°F	°F	°F
	T0400A	N/A °F	N/A °F	°F	°F	°F

Appendix B
(Page 3 of 3)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE DATA SHEET (continued)

PARAMETER	INSTRUMENT [PANEL]	INITIAL DATA SET	2nd DATA SET	3rd DATA SET	4th DATA SET	5th DATA SET
REACTOR POWER	1-NI-41 [1-M-4]	99.5 %	99.5 %	%	%	%
	1-NI-42	N/A %	N/A %	%	%	%
	1-NI-43	N/A %	N/A %	%	%	%
	1-NI-44	N/A %	N/A %	%	%	%
PRT LEVEL	1-LI-68-300 [1-M-4]	N/A %	N/A %	%	%	%
	L0485A	59 %	59 %	%	%	%
RCDT LEVEL	1-LI-77-1 [0-PNL-276-L2]	21 %	38 %	%	%	%
DATA SET RECORDED BY		LRM	LRM			
TOTAL RCS LEAKAGE (Appendix C Step 1.0[6])		N/A	3.33			
IDENTIFIED LEAKAGE (**Acc Crit: ≤ 10 gpm**) (Appendix C Step 1.0[9])		N/A	2.0			
UNIDENTIFIED LEAKAGE (**Acc Crit: ≤ 1 gpm**) (Appendix C Step 1.0[10])		N/A	1.33			

SRO determines that the value of 1 gpm should have been entered here.

SRO determines that the value of 2.33 gpm should have been entered here.

Appendix C
(Page 1 of 8)

RCS Water Inventory Balance Calculations

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS

NOTE

Throughout this Appendix, INITIAL indicates the data is to be taken from first data set recorded in Appendix B and FINAL indicates data is to be taken from the last data set recorded in Appendix B. A copy of this Appendix is required to be completed each time RCS leakage is calculated.

[1] **CALCULATE** elapsed time (ΔT) as follows:

ΔT = FINAL TIME - INITIAL TIME

ΔT = 1900 - 1800

ΔT = 60 min

LRM 1st

CV

[2] **CONVERT** INITIAL and FINAL PZR PRESSURE units of measurement to psia as follows:

PARAMETER	INITIAL	FINAL
PZR PRESS	= 2235.3 psig + 14.7 = 2250 psia	= 2235.3 psig + 14.7 = 2250 psia

LRM 1st

CV

Appendix C
(Page 2 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[3] **CALCULATE** VCT Leakage as follows:

VCT Leakage = $\frac{\text{(INITIAL VCT LEVEL - FINAL VCT LEVEL) x 19.27 gal/\%}}{\Delta T \text{ (Step 1.0[1])}}$

VCT Leakage = $\frac{(\ 40\ \%\ -\ 36.8\ \%) \times 19.27 \text{ gal/\%}}{60 \text{ min}}$

VCT Leakage = 1.03 gpm

LRM
1st
CV

[4] **CALCULATE** Pressurizer (PZR) Leakage as follows:[4]

[4.1] **RECORD** INITIAL and FINAL PZR PRESSURE in table below using values calculated in Step 1.0[2]. LRM

[4.2] **RECORD** INITIAL and FINAL PZR LEVEL in table below using values recorded in Appendix B. LRM

[4.3] **DETERMINE and RECORD** INITIAL and FINAL PZR V_f (volume of water) and V_g (volume of steam) at INITIAL and FINAL PZR PRESS (Step 1.0[2]) using ASME Steam Tables (Table 2, Properties of Saturated Steam and Saturated Water).

STEP	PARAMETER	INITIAL		FINAL	
1.0[4.1]	PZR PRESS	2250	psia	2250	psia
1.0[4.2]	PZR LEVEL	60.25	%	58	%
1.0[4.3]	PZR V_f	0.02698	ft^3/lbm	0.02698	ft^3/lbm
	PZR V_g	0.157	ft^3/lbm	0.157	ft^3/lbm

LRM

Appendix C
(Page 3 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[4.4] **CALCULATE** INITIAL PZR VOLUME as follows:[4]

$$\text{INITIAL PZR VOLUME} = \left(\left(\frac{\text{PZR LVL}}{V_f}\right)+\left(\frac{100-\text{PZR LVL}}{V_g}\right)\right) X \left(\frac{16.73\,ft^3}{\%}\right) X \left(\frac{7.4805\,gal}{ft^3}\right) X\, 0.01605$$

$$\text{INITIAL PZR VOLUME} = \left(\left(\frac{60.25\ \%}{0.02698\ ft^3/lbm}\right)+\left(\frac{100-60.25\ \%}{0.157\ ft^3/lbm}\right)\right) X \left(\frac{2\,gal\,ft^3}{\%\,lbm}\right)$$

INITIAL PZR VOLUME = 4972.64 gallons

LRM
1st
CV

[4.5] **CALCULATE** FINAL PZR VOLUME as follows:[5]

$$\text{FINAL PZR VOLUME} = \left(\left(\frac{\text{PZR LVL}}{V_f}\right)+\left(\frac{100-\text{PZR LVL}}{V_g}\right)\right) X \left(\frac{16.73\,ft^3}{\%}\right) X \left(\frac{7.4805\,gal}{ft^3}\right) X\, 0.01605$$

$$\text{FINAL PZR VOLUME} = \left(\left(\frac{58\ \%}{0.02698\ ft^3/lbm}\right)+\left(\frac{100-58\ \%}{0.157\ ft^3/lbm}\right)\right) X \left(\frac{2\,gal\,ft^3}{\%\,lbm}\right)$$

FINAL PZR VOLUME = 4834.51 gallons

LRM
1st
CV

Appendix C
(Page 4 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[4.6] **CALCULATE** PZR Leakage as follows:

$$\text{PZR Leakage} = \frac{\text{INITIAL PZR VOLUME (Step1.0[4.4])} - \text{FINAL PZR VOLUME (Step 1.0[4.5])}}{\Delta T \text{ (Step1.0[1])}}$$

$$\text{PZR Leakage} = \frac{4972.64 \text{ gallons} - 4834.51 \text{ gallons}}{60 \text{ min}}$$

PZR Leakage = 2.3 gpm

LRM
1st

CV

[5] **IF** RCS TEMP FINAL is **NOT** equal to RCS TEMP INITIAL[4], **THEN**

[5.1] **RECORD** INITIAL and FINAL PZR PRESSURE in table below using values calculated in Step 1.0[2] N/A

[5.2] **RECORD** INITIAL and FINAL RCS TEMPERATURE in table below using values recorded in Appendix B. N/A

[5.3] **DETERMINE** and **RECORD** INITIAL and FINAL RCS SPECIFIC VOLUME in table below using PZR PRESSURE, RCS TEMPERATURE and ASME Steam Tables (Table 3, Properties of Superheated Steam and Compressed Water). N/A

Appendix C
(Page 5 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[5.4] **CALCULATE** INITIAL and FINAL RCS DENSITY as follows, **AND**

RECORD in table below:

$$\text{RCS DENSITY} = \frac{1}{\text{RCS SPECIFIC VOLUME}}$$

STEP	PARAM	INITIAL	FINAL
1.0[5.1]	PZR PRESS	psia	psia
1.0[5.2]	RCS TEMP	°F	°F
1.0[5.3]	RCS SPECIFIC VOLUME	ft^3/lbm	ft^3/lbm
1.0[5.4]	RCS DENSITY	lbm/ft^3	lbm/ft^3

N/A
1st

CV

[5.5] **CALCULATE** RCS Temperature Correction as follows:

$$\text{Temp Corr} = \frac{(\text{Initial RCS Density} - \text{Final RCS Density}) \text{ X } 10902 ft^3 \text{ X } 7.4805 \frac{gal}{ft^3} \text{ X } 0.01605 \frac{ft^3}{lbm}}{\Delta T \text{ (Step 1.0[1])}}$$

$$\text{Temp Corr} = \frac{\left(\_\_\_\_ \frac{lbm}{ft^3} - \_\_\_\_ \frac{lbm}{ft^3} \right) \text{ X } 1308.92 \frac{gal\ ft^3}{lbm}}{\_\_\_\_ \text{ min}}$$

Temp Corr = ____ gpm

N/A
1st

CV

Appendix C
(Page 6 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[6] **CALCULATE** Total RCS Leakage as follows:

Total RCS Leakage = VCT Leakage (Step 1.0[3]) + PZR Leakage (Step [1.0[4]) + Temp Corr (Step 1.0[5] or 0)

Total RCS Leakage = 1.03 gpm + 2.3 gpm + 0 gpm

Total RCS Leakage = 3.33 gpm

LRM
1st
CV

[7] **CALCULATE** Leakage to Pressurizer Relief Tank (PRT) as follows:

[7.1] **CONVERT** INITIAL and FINAL PRT LEVEL from percent (%) to gallons using TI-4, Part II, **AND**

RECORD the converted PRT LEVELS in Step 1.0[7.2]. LRM

[7.2] **CALCULATE** Leakage to PRT using the following equation:

$$\text{Leakage to PRT} = \left(\frac{\text{Final PRT LVL} - \text{Initial PRT LVL}}{\Delta T \text{ (Step 1.0[1])}} \right)$$

$$\text{Leakage to PRT} = \left(\frac{8250 \text{ gallons} - 8250 \text{ gallons}}{60 \text{ min}} \right)$$

Leakage to PRT = 0 gpm

LRM
1st
CV

Appendix C
(Page 7 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[8] **CALCULATE** Leakage to Reactor Coolant Drain Tank (RCDT) as follows:

[8.1] **CONVERT** INITIAL and FINAL RCDT LEVEL from percent (%) to gallons using TI-4, Part II, **AND**

RECORD the converted RCDT LEVELS in Step 1.0[8.2]. LRM

[8.2] **CALCULATE** Leakage to RCDT using the following equation:

SRO identifies that 80 gal should have been entered here

$$\text{Leakage to RCDT} = \frac{\text{Final RCDT LVL} - \text{Initial RCDT LVL}}{\Delta T \text{ (Step 1.0[1])}}$$

$$\text{Leakage to RCDT} = \frac{140 \text{ gal} - (21) \text{ gal}}{60 \text{ min}}$$

Leakage to RCDT = (2.0) gpm

LRM
1st
CV

SRO identifies that 1 gpm should have been entered here

[9] **CALCULATE** Identified Leakage as follows:

Identified Leakage = Leakage to PRT (Step 1.0[7]) +
Leakage to RCDT (Step 1.0[8]) +
Total SG Leakage (Step 4.1[6]

Identified Leakage = 0 gpm + (1.0) gpm + 0 gpm

Identified Leakage = 1.0 gpm

LRM
1st
CV

Appendix C
(Page 8 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[10] **CALCULATE** Unidentified Leakage as follows:

Unidentified Leakage = Total RCS Leakage (Step 1.0[6]) - Identified Leakage (Step 1.0[9])

Unidentified Leakage = 3.33 gpm - 2.0 gpm

Unidentified Leakage = 1.33 gpm

SRO identifies that 2.33 gpm should have been entered here

SRO identifies that 1 gpm should have been entered here

LRM
1st
CV

NOTE

The value of Total RCS Leakage recorded in Appendix B by the following step should conservatively be set equal to the value of Unidentified Leakage **IF** the value of Identified Leakage is negative **AND** there is a well-understood reason for the negative value of Identified Leakage. Such a situation could arise if there is known external leakage from the PRT and/or the RCDT which is causing a corresponding decrease in tank level (i.e., tank out-leakage). A notation should be added to Appendix B if the value of Total RCS Leakage is set equal to Unidentified Leakage based on the reasoning in this NOTE.

[11] **RECORD** Total RCS Leakage (Step 1.0[6]), Identified Leakage (Step 1.0[9]) and Unidentified Leakage (Step1.0[10]) on Appendix B in the last column that data is recorded.

LRM

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Primary to Secondary leakage is limited to 1 gpm. [Reference to this source note on page 13 is deleted by Revision 8, which incorporates Tech Spec Change WBN-TS-99-014.]	NCO 850404138 Watts Bar SER (NUREG-0847) Pages 15-18	1
A water inventory balance must be performed within one hour of receiving an alarm and confirming leakage in a flow path with no indicators.	NCO 850404025 Watts Bar SER (NUREG-0847) Pages 5-7	2
Steps to take when negative unidentified leakage is calculated.	NRC Inspection Report 50-327 NOV 50-327, 328/89-16-02	3
RCS leakage should NOT be measured using the reactor sump. Correction factors for PZR level need to be traceable. RCS temperature correction factor must be calculated for any change in initial and final RCS temperature.	NRC Inspection Report 50-390IFI 390/85-22-01	4
The pressurizer (PZR) mass volume (initial and final) should be obtained by adding the vapor space volume and the liquid space volume together.	WBPER960017	5

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS Operational LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE;

b. 1 gpm unidentified LEAKAGE;

c. 10 gpm identified LEAKAGE; and

d. 150 gallons per day primary-to-secondary LEAKAGE through any one steam generator (SG).

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

ACTIONS

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

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.13.1	----------NOTE---------- 1. Not required to be performed until 12 hours after establishment of steady state operation. 2. Not applicable to primary-to-secondary LEAKAGE. --- Verify RCS operational LEAKAGE is within limits by performance of RCS water inventory balance.	72 hours
SR 3.4.13.2	----------NOTE---------- Not required to be performed until 12 hours after establishment of steady state operation. --- Verify primary-to-secondary LEAKAGE is less than or equal to 150 gallons per day through any one SG.	72 hours

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS Operational LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE;

b. 1 gpm unidentified LEAKAGE;

c. 10 gpm identified LEAKAGE; and

d. 150 gallons per day primary-to-secondary LEAKAGE through any one steam generator (SG).

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

ACTIONS

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

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.13.1	----------NOTE---------- 1. Not required to be performed until 12 hours after establishment of steady state operation. 2. Not applicable to primary-to-secondary LEAKAGE. --- Verify RCS operational LEAKAGE is within limits by performance of RCS water inventory balance.	72 hours
SR 3.4.13.2	----------NOTE---------- Not required to be performed until 12 hours after establishment of steady state operation. --- Verify primary-to-secondary LEAKAGE is less than or equal to 150 gallons per day through any one SG.	72 hours

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit 1 is in Mode 1 at 100% power.
2. 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," performance is required.
3. The ICS Computer program RCSWIB is unreliable.
4. 1-SI-68-32 Appendix A, "Manual Performance of RCS Water Inventory Balance," has been completed through step 5.
5. An initial data set was entered at 1800 and a second data set was entered at 1900 on 1-SI-68-32 Appendix B, "RCS Water Inventory Balance Data Sheet."
6. Appendix C, "RCS Water Inventory Balance Calculations," has been performed by an extra operator assigned to the shift.

INITIATING CUES:

1. As the Unit SRO, you are to complete an independent verification of the manual calculation of RCS inventory balance using the data provided.
2. Evaluate the results of your calculation and determine which, if any, Technical Specification ACTIONS are applicable.

A.2 RO
Hand Calculation of Reactor Coolant System Water Inventory Balance

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.2 RO
2011-10 NRC Exam

EVALUATION SHEET

Task: Hand Calculation of Reactor Coolant System Water Inventory Balance.

Alternate Path: n/a

Facility JPM #: Modified

Safety Function: n/a **Title:** Equipment Control

K/A 2.2.12 Knowledge of surveillance procedures.

Rating(s): 3.7/4.1 **CFR:** 41.10/45.13

Evaluation Method: Simulator _____ In-Plant _____ **Classroom** **X**

References: 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," Rev. 14.

Task Number: RO-068-SI-68-32-001 **Title:** Perform a Reactor Coolant System Inventory Balance.

Task Standard: The applicant:

1.) Performs 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," Appendix A, "Manual Performance of RCS Water Inventory Balance," using the data provided in the Applicant Data Sheets.

2.) Evaluates results of the calculation and determines that the UNIDENTIFIED leakage limits have been exceeded.

Validation Time: 45 minutes **Time Critical:** Yes _____ No **X**

==========

Applicant: _____ _____ Time Start: _____
NAME Docket No. Time Finish: _____

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: _____ _____/_____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

_____

_____

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.2 RO
2011-10 NRC Exam

Tools/Equipment/Procedures Needed:

- Marked-up copy of 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," Rev. 14.
- Calculator
- Steam Tables

NOTE: This JPM is designed to be performed in a classroom with procedures available to the applicant via a laptop computer loaded with the NRC Reference Disk.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.2 RO
2011-10 NRC Exam

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

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 cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit 1 is in Mode 1 at 100% power.**
2. **1-SI-68-32, "Reactor Coolant System Water Inventory Balance," performance is required.**
3. **The ICS Computer program RCSWIB is unreliable.**
4. **1-SI-68-32 Appendix A, "Manual Performance of RCS Water Inventory Balance," has been completed through step 4.**
5. **An initial data set was entered at 1800 and a second data set was entered at 1900 on 1-SI-68-32 Appendix B, "RCS Water Inventory Balance Data Sheet."**
6. **You are an extra operator assigned to the shift.**

INITIATING CUES:

1. **The Unit SRO has directed you to complete 1-SI-68-32, Appendix C, "RCS WATER INVENTORY BALANCE CALCULATIONS," using the data provided.**
2. **After completion of 1-SI-68-32, Appendix C, "RCS WATER INVENTORY BALANCE CALCULATIONS," report your results to the Unit SRO.**

STEP/STANDARD	SAT/UNSAT

START TIME: _____

NOTE

Throughout this Appendix, INITIAL indicates the data is to be taken from first data set recorded in Appendix B and FINAL indicates data is to be taken from the last data set recorded in Appendix B. A copy of this Appendix is required to be completed each time RCS leakage is calculated.

STEP 1: **[1] CALCULATE** elapsed time (ΔT) as follows: STANDARD: Applicant determines the elapsed time to be 60 minutes by performing the appropriate calculation. **Step is critical since an incorrect calculation of the elapsed time will result in an incorrect calculation of leak rates.**	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2: **[2] CONVERT** INITIAL and FINAL PZR PRESSURE units of measure to psia as follows: STANDARD: Applicant determines the Initial and Final PZR pressures to be 2250 psia. **Step is critical since an incorrect calculation of the initial and final pressures will result in an incorrect calculation PZR water inventory.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: **[3] CALCULATE** VCT Leakage as follows: STANDARD: Applicant determines VCT leakage to be 1.03 gpm. (Acceptable range 1.0 - 1.03 gpm) **Step is critical since an incorrect calculation of the VCT leakage will result in an incorrect calculation of overall leakage rates.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 4: **[4] CALCULATE** Pressurizer (PZR) Leakage as follows: **[4.1] RECORD** INITIAL and FINAL PZR PRESSURE in table below using values calculated in Step [2]. **[4.2] RECORD** INITIAL and FINAL PZR LEVEL in table below using values recorded in Appendix B. **[4.3] DETERMINE and RECORD** INITIAL and FINAL PZR Vf (volume of water) and Vg (volume of steam) at INITIAL and FINAL PZR PRESS (Step [2]) using ASME Steam Tables (Table 2, Properties of Saturated Steam and Saturated Water). STANDARD: Applicant enters the appropriate data from the Steam Tables into the table. **Step is critical since an incorrect calculation of the VCT leakage will result in an incorrect calculation of overall leakage rates.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: **[4] CALCULATE** Pressurizer (PZR) Leakage as follows: (Continued) **[4.4] CALCULATE** INITIAL PZR VOLUME as follows: STANDARD: Applicant performs the calculation and determines Initial PZR volume to be 4972.5 gallons. (Acceptable Range 4944.2 - 5003.4 gallons) **Step is critical since an incorrect calculation of the PZR initial volume will result in an incorrect calculation of PZR and overall leakage rates.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 6: **[4] CALCULATE** Pressurizer (PZR) Leakage as follows: (Continued) **[4.5] CALCULATE** FINAL PZR VOLUME as follows: STANDARD: Applicant performs the calculation and determines Final PZR volume to be 4834.4 gallons. (Acceptable range 4808.9 - 4862.5 gallons) **Step is critical since an incorrect calculation of the PZR final volume will result in an incorrect calculation of PZR and overall leakage rates.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 7: **[4] CALCULATE** Pressurizer (PZR) Leakage as follows: (Continued) **[4.6] CALCULATE** PZR Leakage as follows: STANDARD: Applicant performs calculation and determines PZR leakage to be 2.3 gpm. (Acceptable range 2.25 - 2.35 gpm) **Step is critical since an incorrect calculation of the PZR leakage rate will result in an incorrect calculation of the overall leakage rate.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 8: **[5] IF** RCS TEMP FINAL is NOT equal to RCS TEMP INITIAL, **THEN** STANDARD: Applicant determines RCS temperature did not change so this step and its sub steps are not applicable. Applicant marks Step 5 and its sub-steps as N/A. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: **[6] CALCULATE** Total RCS Leakage as follows: STANDARD: Applicant adds VCT Leakage of 1.03 gpm to PZR Leakage of 2.3 gpm and determines Total RCS Leakage to be 3.33 gpm. (Acceptable range 3.25 - 3.4 gpm) **Step is critical since an incorrect calculation of Total RCS Leakage will result in an incorrect evaluation of RCS Leakage.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 10: **[7] CALCULATE** Leakage to Pressurizer Relief Tank (PRT) as follows: STANDARD: Applicant determines there is no change in PRT level and leakage to the PRT is 0 gpm. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 11: **[8] CALCULATE** Leakage to Reactor Coolant Drain Tank (RCDT) as follows: STANDARD: Applicant determines from TI-4 Part II that initial RCDT volume is equal to 80 gallons, and that final RCDT volume is 140 gallons. The leakage to the RCDT is calculated at 1.0 gpm. (Acceptable range 0.9- 1.1 gpm) **Step is critical since an incorrect calculation will result in an incorrect evaluation of RCS leakage.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 12: **[9] CALCULATE** Identified Leakage as follows: STANDARD: Applicant performs adds Leakage to PRT of 0 gpm to the Leakage to RCDT of 1 gpm and Total SG Leakage of 0 gpm and determines that Identified Leakage is 1.0gpm. (Acceptable range 0.9- 1.1 gpm) **Step is critical since an incorrect calculation will result in an incorrect evaluation of RCS leakage.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 13: **[10] CALCULATE** Unidentified Leakage as follows: STANDARD: Applicant subtracts the Identified leakage of 1.0 gpm from the Total RCS Leakage of 3.33 gpm determines that Unidentified Leakage is 2.33 gpm. (Acceptable range 2.25 - 2.4 gpm) **Step is critical since an incorrect calculation will result in an incorrect evaluation of RCS leakage.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 14: **[11] RECORD** Total RCS Leakage (Step [6]), Identified Leakage (Step [9]) and Unidentified Leakage (Step [10]) on Appendix B in the last column that data is recorded. STANDARD: Applicant records values in the appropriate column on Appendix B. Applicant determines that the Unidentified Leakage Rate does not meet Acceptance Criteria, and reports values to the SRO. **Step is critical to ensure that the proper information is provided to the SRO to evaluate Technical Specifications.** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME _____

ADMIN JPM KEY

Watts Bar Nuclear Plant

Unit 1

Surveillance Instruction

1-SI-68-32

Reactor Coolant System Water Inventory Balance

Revision 0014

Quality Related

Level of Use: Continuous Use

Effective Date: 01-24-2011

Responsible Organization: SNE, System Eng - NSSS

Prepared By: Nicholas C. Horning

Approved By: Stephen M. Partch

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
Rev 9	08/12/04	2, 8-11, 18	Non-intent change. Incorporated Operations comments related to PER 64091 and other enhancements. Required 1-LCV-62-118 (1-HS-62-118A) to be in VCT position during test. 50.59 review is **NOT** required.
Rev 10	07/25/06	2, 23	Corrected UNID for Pressurizer Cold Cal instrument 1-LI-68-321. 50.59 review is **NOT** required.
Rev 11	11/24/06	2, 4, 13, 29	Updated RCS volume in temperature correction calculation based on DCN 51754.
Rev 12	12/12/06	2, 8, 11	Added notes relative to zinc addition (DCN 52122).
Rev 13	03/05/10	All	This procedure has been converted from Word 95 to Word XP using Rev 12 by the conversion team. A line by line verification, including minor editorial and formatting corrections, was performed by the preparer. Clarifications related to procedure revisions were made to the Precautions and Limitations . A 10CFR50.59 screening review is not required for this revision.
Rev 14	01/24/11	2, 31	Added Note to Appendix C allowing Total RCS Leakage to conservatively be set equal to Unidentified Leakage under certain unusual conditions. A 10CFR50.59 screening review or evaluation is not required for this revision since it implements requirements of the Technical Specifications.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

This Instruction provides detailed steps to perform a Reactor Coolant System (RCS) water inventory balance.

1.2 Scope

1.2.1 Operability Test to be Performed

Operations that could affect RCS water inventory (makeup and sampling) are terminated and the RCS is stabilized. With the RCS stable, parameters such as temperature, pressure, and associated tank levels are measured at one hour or greater intervals. When at least two sets of data have been collected, identified and unidentified leakages are calculated using the rate of change between the data sets. Then, the calculated leakage rates are compared to values in Technical Specification Limiting Condition for Operation (LCO) 3.4.13 to determine RCS operability.[4]

1.2.2 Surveillance Requirements Fulfilled and Modes

NOTES

1) TSR 3.4.13.1 is applicable in Modes 3 and 4 after 12 hours of steady state operation have been achieved.
2) Steady state operation is defined as RCS temperature stable within ± 0.3°F.[4]

Performance of this SI fully implements Technical Specifications Requirements 3.4.13.1.

TECHNICAL SPECIFICATION SECTION	APPLICABLE MODES	PERFORMANCE MODES
3.4.13.1	1, 2, 3, 4 (See Notes)	1, 2, 3, 4
LCO 3.4.15, ACTION-A.1	1, 2, 3, 4	1, 2, 3, 4
LCO 3.4.15, ACTION-B.1.2	1, 2, 3, 4	1, 2, 3, 4

1.3 Frequency and Conditions

A. This Instruction is required to be performed at least once every 72 hours when the unit is in Mode 1 or 2 during steady state operation and in Mode 3 or 4 after 12 hours of steady state operation has been achieved.

1.3 Frequency and Conditions (continued)

B. This Instruction is required to be performed within one hour of receiving an alarm and confirming leakage in a flow path with no indicators.[2]

Leakage by any of the following will be indicated by an alarm in the control room: Leakage across the SIS cold-leg and hot-leg check valves is detected by pressure transmitters, leakage across the cold-leg accumulators check valves is detected by increase in accumulator inventory, steam generator tube leakage is indicated by radiation monitors, leakage past RHR injection check valves is detected by pressure transmitters, RCS leakage into CCS is detected by radiation monitors.[2]

C. This Instruction is required to be performed once per 24 hours for LCO 3.4.15 Action-A.1 or LCO 3.4.15 Action-B.1.2

2.0 REFERENCES

2.1 Performance References

A. ASME Steam Tables.

B. SOI-77.01, Waste Disposal System.

C. TI-4, Part II, Plant Curve Book, Tank Curves, Turbine Curves.

2.2 Developmental References

2.2.1 TVA Procedures

A. SPP-2.6, Computer Software Control.

2.2.2 TVA Drawings

A. 1-47W809-1

B. 1-47W809-2

C. 1-47W813-1

D. 1-47W830-1

2.2.3 Other

A. N3-68-4001, Reactor Coolant System.

B. Regulatory Guide 1.45, Reactor Coolant Pressure Boundary Leakage Detection System.

C. Unit 1 Technical Specification Section 3.4.13.

3.0 PRECAUTIONS AND LIMITATIONS

A. The final RCS temperature must be within ± 0.3°F of the initial RCS temperature or the final data is VOID and must be retaken.

B. The final RCS power level must be within ± 1.0% of the initial RCS power level or the final data is VOID and must be retaken.

C. Makeup to the Volume Control Tank (VCT) is isolated and VCT level is expected to decrease during this SI. If VCT level falls to 20% or low VCT level alarm annunciates before final data is recorded, makeup to the VCT will be required and the test will have to be voided and reperformed.

D. The Reactor Coolant Drain Tank (RCDT) pumps are placed in PULL-TO-LOCK with 1-FCV-68-310, PRT DRAIN, closed. At the same time, RCDT and Pressurizer Relief Tank (PRT) levels are expected to increase. If PRT or RCDT high level alarm annunciates before final data is recorded, pump-down of the PRT or RCDT will be required and the test will have to be voided and reperformed.

E. Instruments such as PZR pressure and level or any other instruments used by the RCS Inventory Program that are removed from service during the performance of this SI will cause the quality to be bad on the final data sheet.

F. Any revisions to this SI will require coordination with the Computer Engineering Group to change the SI revision level displayed on the ICS Water Inventory Balance screen.

G. Any revisions or modifications to this procedure that affect the water inventory balance calculation or that could affect the ICS software will require a Computer Software Service Request (SSR) per SPP-2.6 to make the applicable software changes to the ICS Water Inventory Balance.

H. If any of the following events occur during performance of Section 6.0 the data is VOID and the test must be restarted after initial conditions are reestablished:

1. Any instrument or computer data point used to obtain initial data is **NOT** available for final data.
2. Emergency boration.
3. Diversion of letdown to the hold up tanks.
4. Makeup from any source.
5. Change in primary side purification demineralizers or filter lineup.
6. Failure to accumulate data for at least 1 hour.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

7. Restarting the primary water pumps if they were stopped before the initial data was collected.

8. Sampling the RCS or making chemical additions to the RCS (with the exception of RCS Zinc Injection).

9. PRT or RCDT operations that affect tank levels.

I. Operating with VCT level near the divert setpoint of 63% may cause erratic readings due to diversion of letdown to the HUT (which is **NOT** accounted for in the calculations). Reducing VCT level to less than 60% before initiating performance will minimize the possibility of errors in the calculations.

J. To ensure that test results are as accurate as possible, the test should **NOT** begin until at least 30 minutes following evolutions such as dilution, boration, or rod movement.

K. Zinc injection, as implemented by DCN 52122, is limited to a maximum of 8 ml per minute (about 0.002 gpm). This amount of inventory increase is **NOT** detectable within the methodology of this procedure.

Data Package: Page ____ **Date** TODAY

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

[1] **RECORD** start date and time on Surveillance Task Sheet. LRM

[2] **IF** required, **THEN**

OBTAIN an RWP. LRM

[3] **IF** in Mode 3 or 4, **THEN**

[3.1] **SETUP** trend block on the Plant computer to monitor T_{hot} approximately every 30 minutes. N/A

[3.2] **IF** steady state conditions are maintained for any continuous 12 hours, **THEN**

PERFORM this instruction. N/A

[3.3] **MAKE** log entry at end of each 12 hour period if **NOT** at steady state (± 0.3°F). N/A

[4] **RECORD** present plant operating mode: 1

[5] **OBTAIN** the most recent Steam Generator (SG) Leakage from Chemistry. LRM

[6] **RECORD** the most recent Steam Generator Leakage obtained from Chemistry in the appropriate column below, **AND**

CALCULATE Total SG Leakage (in gpm) as follows:

SG Leakage Reported as TOTAL	SG Leakage Reported as INDIVIDUAL				
Total SG Leakage = 0 gpd	Total SG Leakage =	SG1 Leakage +	SG2 Leakage +	SG3 Leakage +	SG4 Leakage
	Total SG Leakage =	0 gpd +	0 gpd +	0 gpd+	0 gpd
	Total SG Leakage =	0 gpd	(sum of above)		
Total SG Leakage (gpm) =	Total SG Leakage (gpd) / 1440 min/day	= 0 gpd / 1440 min/day =	0 gpm		
Total SG Leakage = 0 gpm		LRM Performed		DAH CV	

Data Package: Page ____ **Date** TODAY

4.2 Approvals and Notifications

[1] **OBTAIN** Operations approval on Surveillance Task Sheet to perform this Instruction. LRM

4.3 Field Preparations

[1] **ENSURE** VCT level is such that neither makeup **NOR** diversion to the HUT is anticipated during performance of this Instruction. LRM

[2] **IF** Reactor Coolant Drain Tank (RCDT) level is such that an automatic pump-down may occur during the performance of this procedure, **THEN**

PERFORM SOI-77.01 as required to reduce RCDT level to the LO-level cutoff. LRM

[3] **RECORD** as-found position of the following handswitches, **AND**

PLACE the following handswitches in their required position:

HANDSWITCH	DESCRIPTION	AS-FOUND POSITION	REQUIRED POSITION	INITIALS
1-HS-77-4A	REACTOR COOLANT DR TK PUMP A	PULL TO LOCK	PULL TO LOCK	LRM
1-HS-77-6A	RCDT PUMP B	PULL TO LOCK	PULL TO LOCK	LRM

[4] **NOTIFY** Chemistry Lab that RCS water inventory balance is being performed and they are **NOT** to make any chemical additions to the RCS (with the exception of RCS Zinc Injection) **OR** take any samples from the RCS. LRM

Data Package: Page ____ **Date** TODAY

4.3 Field Preparations (continued)

[5] **RECORD** as-found position of the following valves and handswitches, **AND**

PLACE the following valves and handswitches in their required position.

VALVE	DESCRIPTION	AS-FOUND POSITION	REQUIRED POSITION	INITIALS
1-LCV-77-415	RCDT DRAIN LEVEL CONTROL	CLOSED	CLOSED	LRM
1-HS-62-118A	LETDOWN DIVERT TO HUT	VCT	VCT	LRM
1-FCV-62-128	BA BLENDER TO VCT INLET	P-AUTO CLOSED	CLOSED	LRM
1-FCV-62-144	MAKEUP INJECTION VLV FLOW CONTROL	P-AUTO CLOSED	CLOSED	LRM
1-FCV-62-138	EMERGENCY BORATION FLOW CONTROL VALVE	CLOSED	CLOSED	LRM

[6] **ESTABLISH** communications between test performer in the Main Control Room and test performer stationed at 1-LI-77-1 [0-PNL-276-L2, EL 692, COL A8-S]. LRM

Data Package: Page ____ **Date _____**

5.0 ACCEPTANCE CRITERIA

A. Technical Specification acceptance criteria for RCS leakage is shown below:

1. No pressure boundary leakage.

NOTE

Negative unidentified leakage may be considered acceptable if at least one hour of additional data is collected and unidentified leakage is more positive than -0.10 gpm OR total leakage is less than or equal to 1.0 gpm.[3]

2. 1 gpm unidentified leakage.

3. 10 gpm identified leakage.

B. If Acceptance Criteria stated above is **NOT** met, the SRO is to be notified as soon as possible that LCO 3.4.13 may be applicable and an investigation into the source of leakage is to be initiated.

Data Package: Page ____ **Date** TODAY

6.0 PERFORMANCE

[1] **ENSURE** precautions and limitations in Section 3.0 have been reviewed. LRM

[2] **ENSURE** prerequisite actions in Section 4.0 have been met. LRM

[3] **ENSURE** reactor power and RCS temperature are stable and have varied less than the limits shown below during the last 30 minutes:

	PARAMETER	VARIATION LIMITS
Mode 1 & 2	Reactor power T_{avg}	± 1.0% ± 0.3°F
Mode 3 & 4	T_{hot}	± 0.3°F

LRM

NOTE

RCS parameters must remain stable during performance of remaining steps in this Section.

[4] **IF** Plant Computer Program RCSWIB is unavailable, **THEN**

MARK Steps 6.0[5] through 6.0[18] in this Section **N/A**, **AND**

PERFORM Appendix A. LRM

NOTES

1) Values displayed on the computer screen are color coded to indicate QUALITY of the data point. Values that appear BLUE are BAD QUALITY (**NOT** reliable). Final readings will appear BLUE until computed.

2) Step 6.0[11] provides action to be taken when a data point has BAD QUALITY. This action should be taken anytime (during this SI) a data point has BAD QUALITY.

[5] **DISPLAY** Plant Computer Program RCSWIB screen using the RCSWIB TURN ON Code (TOC) **OR** the BOP menu touch screen.[4] N/A

Data Package: Page ____ **Date** TODAY

6.0 PERFORMANCE (continued)

NOTE

Steps 6.0[6]and 6.0[7]will clear the RCSWIB program to allow a new performance to be started with Step 6.0[8]

[6] **IF** RCSWIB prompt says "READY FOR FINAL READINGS? (Y/N)", **THEN**

ENTER Y, **AND**, when prompted,

ENTER RCDT level (%) from 1-LI-77-1 [0-PNL-276-L2]. N/A

[7] **IF** RCSWIB prompt says "PRINT SUMMARY SHEET/DATA PACKAGE? (Y/N)", **THEN**

ENTER N. N/A

[8] **IF** RCSWIB prompt says "START OR CONTINUE CALC.? (S/C)", **THEN**

ENTER S. N/A

[9] **ENTER** Steam Generator leakage (gpm) from Section 4.1[6]. N/A

[10] **ENTER** RCDT level (%) from 1-LI-77-1 [0-PNL-276-L2]. N/A

[11] **IF** any value shown on the computer display is BLUE, **THEN**

[11.1] **MARK** remaining steps in this Section **N/A**, **AND**

PERFORM Appendix A, **OR**

[11.2] **SELECT** another data point associated with the parameter in question, **THEN**

REPLACE the BAD QUALITY data point using the substitute value function on the single point menu screen prior to initiating and finalizing the RCSWIB program, **AND**

EXPLAIN in Remarks Section of Surveillance Task Sheet. N/A

Data Package: Page ____ **Date** TODAY

6.0 PERFORMANCE (continued)

NOTE

The RCSWIB prompt "READY FOR FINAL READINGS? (Y/N)" will display at the top of the screen until Y is entered. Operators may exit the program to perform other tasks and return to this prompt by starting RCSWIB program as described in Step 6.0[5]. All data is retained and the program's clock keeps track of elapsed time

[12] **WAIT** at least one hour (optimum time is 4 hours) N/A

[13] **ENSURE** RCSWIB prompt says "READY FOR FINAL READINGS? (Y/N)", **AND**

ENTER Y. N/A

NOTE

After RCDT level is entered, the RCSWIB program collects values from additional data points and calculates Total Leakage, Identified Leakage, and Unidentified Leakage.

[14] **ENTER** RCDT level (%) from 1-LI-77-1, [0-PNL-276-L2]. N/A

[15] **IF** UNIDENTIFIED LEAKAGE is less than 0 gpm (negative leakage)[3], **THEN**

[15.1] **ENSURE** RCSWIB prompt says "PRINT SUMMARY SHEET/DATA PACKAGE? (Y/N)", **AND**

ENTER N. N/A

[15.2] **WHEN** RCSWIB prompt says "START OR CONTINUE CALC.? (S/C)", **THEN**

ENTER C. N/A

[15.3] **WAIT** at least one hour from the last time data was collected. N/A

[15.4] **ENSURE** RCSWIB prompt says "READY FOR FINAL READINGS?, (Y/N)", **AND**

ENTER Y. N/A

[15.5] **ENTER** RCDT level (%) from 1-LI-77-1, [0-PNL-276-L2]. N/A

Data Package: Page ____ **Date** TODAY

6.0 PERFORMANCE (continued)

[15.6] **REPEAT** Steps 6.0[15.1] through 6.0[15.5] UNTIL one of the following conditions exists:

A. UNIDENTIFIED LEAKAGE is more positive than -0.10 gpm.

B. TOTAL LEAKAGE is less than or equal to 1.0 gpm.

C. SI is aborted because A or B above cannot be met before plant conditions, e.g. makeup to VCT or pump down of RCDT, require action that would invalidate test results. N/A

[15.7] **IF** SI is aborted per Step 6.0[15.6]C, **THEN**

NOTIFY UNIT SRO and/or cognizant System Engineer that an investigation to determine the source of inleakage to the RCS must be initiated.[3] N/A

[16] **ENSURE** RCSWIB prompt says "PRINT SUMMARY SHEET/DATA PACKAGE? (Y/N)", **AND**

ENTER Y. N/A

[17] **PRESS** "ENTER" to obtain printout at default printer. N/A

[18] **ATTACH** printout to the data package of this SI. N/A

[19] **IF** UNIDENTIFIED LEAKAGE is greater than 1 gpm, **THEN**

NOTIFY UNIT SRO and/or cognizant System Engineer that an investigation to determine any miscellaneous identified leakage (i.e., other than leakage to the PRT, RCDT or SG tube leakage) from the RCS must be initiated. _____

[20] **IF** MISCELLANEOUS IDENTIFIED LEAKAGE is found and determined to cause failure of the SI, **THEN**

RECORD the source and amount of MISCELLANEOUS IDENTIFIED LEAKAGE on the computer printout/data sheet. _____

[21] **VERIFY** Acceptance Criteria is met. _____

Data Package: Page ____ **Date _____**

7.0 POST PERFORMANCE ACTIVITIES

[1] **RETURN** the following valves and handswitches to their as-found position listed in Step 4.3[5], **AND**

VERIFY valve and handswitch position:

VALVE	DESCRIPTION	INITIALS	IV
1-LCV-77-415	RCDT DRAIN LEVEL CONTROL		N/A
1-HS-62-118A	LETDOWN DIVERT TO HUT		
1-FCV-62-128	BA BLENDER TO VCT INLET		N/A
1-FCV-62-144	MAKEUP INJECTION VLV FLOW CONTROL		N/A
1-FCV-62-138	EMERGENCY BORATION FLOW CONTROL VALVE		

[2] **PLACE** the following handswitches in their as-found position listed in Section 4.3[3]:

HANDSWITCH	DESCRIPTION	AS-FOUND POSITION	INITIALS
1-HS-77-4A	REACT COOLANT DR TK PUMP A		
1-HS-77-6A	RCDT PUMP B		

[3] **RECORD** completion time and date on Surveillance Task Sheet. _____

[4] **NOTIFY** SM/UNIT SRO that this SI is complete. _____

8.0 RECORDS

8.1 QA Records

The Data Package is a QA record, is handled in accordance with the Document Control and Records Management Program, and contains the following:

A. Completed parts of Sections 4.0, 6.0 and 7.0.

B. Section 5.0.

C. Completed Appendixes A and B.

D. Surveillance Task Sheet.

E. Other sheets added during the performance.

8.2 Non-QA Records

None

Appendix A
(Page 1 of 2)

Manual Performance of RCS Water Inventory Balance

Data Package: Page ____ **Date** TODAY

1.0 MANUAL PERFORMANCE OF RCS WATER INVENTORY BALANCE

[1] **OBTAIN** controlled copy of TI-4, Part II pages that show graphs of volume vs. indicated level for Pressurizer Relief Tank (PRT) and Reactor Coolant Drain Tank (RCDT). LRM

[2] **RECORD** initial RCS data per Appendix B. LRM

[3] **WAIT** at least one hour (optimum is 4 hours). LRM

[4] **RECORD** another set of RCS data per Appendix B. LRM

[5] **CALCULATE** RCS leakage per Appendix C.[4] _____

NOTE

Additional copies of Appendix C may be used to perform independent verification.

[6] **PERFORM** independent verification of Appendix C. _____ IV

[7] **IF** unidentified leakage is less than 0 gpm (negative leakage)[3], **THEN**

[7.1] **WAIT** at least one hour from the last time data was collected. _____

[7.2] **RECORD** another set of RCS data per Appendix B. _____

[7.3] **CALCULATE** RCS leakage per Appendix C.[4] _____

[7.4] **PERFORM** independent verification of Appendix C. _____ IV

[7.5] **REPEAT** Steps 1.0[7.1] through 1.0[7.5] UNTIL one of the following conditions exists:

A. Unidentified leakage rate is more positive than -0.10 gpm. _____

B. Total RCS leakage is less than or equal to 1.0 gpm. _____

Appendix A
(Page 2 of 2)

Data Package: Page ____ **Date _____**

1.0 MANUAL PERFORMANCE OF RCS WATER INVENTORY BALANCE (continued)

C. SI is aborted because A or B above cannot be met before plant conditions (e.g. makeup to VCT, pump down of RCDT) require action that would invalidate test results. _____

[7.6] **IF** SI is aborted per Step1.0[7.5]C , **THEN**

NOTIFY SM/Unit SRO and /or cognizant System Engineer that an investigation to determine the source of inleakage to the RCS must be initiated.[3] _____

[8] **GO TO** Step 6.0[19]. _____

Appendix B
(Page 1 of 3)

RCS Water Inventory Balance Data Sheet

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE DATA SHEET

NOTES

1) Time for each data set is the time of day when the first instrument is read. Recording each data set as quickly as possible will ensure an accurate relationship between parameters. Additional copies of Appendix A may be used as required.

2) Only one instrument should be used for each parameter and the same instrument must be used for each data set. Instruments **NOT** used should be marked **N/A** for each data set.

PARAMETER	INSTRUMENT [PANEL]	INITIAL DATA SET	2nd DATA SET	3rd DATA SET	4th DATA SET	5th DATA SET
TIME	N/A	1800	1900			
VCT LEVEL	L0112A	40 %	36.8 %	%	%	%
	1-LI-62-129A [1-M-6]	N/A %	N/A %	%	%	%
PRESSURIZER PRESSURE	1-PI-68-342A < 1700 psi	N/A psig	N/A psig	psig	psig	psig
	1-PI-68-340A [1-M-5]	N/A psig	N/A psig	psig	psig	psig
	P0480A	2235.3 psig	2235.3 psig	psig	psig	psig
	1-PR-68-340 [1-M-5]	N/A psig	N/A psig	psig	psig	psig
	P0481A	N/A psig	N/A psig	psig	psig	psig
	1-PI-68-322 [1-M-5]	N/A psig	N/A psig	psig	psig	psig
	P0483A	N/A psig	N/A psig	psig	psig	psig

Appendix B
(Page 2 of 3)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE DATA SHEET (continued)

PARAMETER	INSTRUMENT [PANEL]	INITIAL DATA SET	2nd DATA SET	3rd DATA SET	4th DATA SET	5th DATA SET
PRESSURIZER LEVEL	1-LI-68-321 < 350°F	N/A %	N/A %	%	%	%
	1-LI-68-320 [1-M-4]	N/A %	N/A %	%	%	%
	L0482A	60.25 %	58.0 %	%	%	%
	1-LI-68-335A [1-M-4]	N/A %	N/A %	%	%	%
	L0481A	N/A %	N/A %	%	%	%
	1-LI-68-339A [1-M-4]	N/A %	N/A %	%	%	%
	L0480A	N/A %	N/A %	%	%	%
RCS TEMPERATURE	1-TI-68-2E [1-M-5]	N/A °F	N/A °F	°F	°F	°F
	T0439A T_{hot} < 530°F	N/A °F	N/A °F	°F	°F	°F
	T0460A	586.2 °F	586.2 °F	°F	°F	°F
	T0440A	N/A °F	N/A °F	°F	°F	°F
	T0420A	N/A °F	N/A °F	°F	°F	°F
	T0400A	N/A °F	N/A °F	°F	°F	°F

Appendix B
(Page 3 of 3)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE DATA SHEET (continued)

PARAMETER	INSTRUMENT [PANEL]	INITIAL DATA SET	2nd DATA SET	3rd DATA SET	4th DATA SET	5th DATA SET
REACTOR POWER	1-NI-41 [1-M-4]	99.5 %	99.5 %	%	%	%
	1-NI-42	N/A %	N/A %	%	%	%
	1-NI-43	N/A %	N/A %	%	%	%
	1-NI-44	N/A %	N/A %	%	%	%
PRT LEVEL	1-LI-68-300 [1-M-4]	N/A %	N/A %	%	%	%
	L0485A	59 %	59 %	%	%	%
RCDT LEVEL	1-LI-77-1 [0-PNL-276-L2]	21 %	38 %	%	%	%
DATA SET RECORDED BY		LRM	LRM			
TOTAL RCS LEAKAGE (Appendix C Step 1.0[6])		N/A	3.33			
IDENTIFIED LEAKAGE (**Acc Crit: ≤ 10 gpm**) (Appendix C Step 1.0[9])		N/A	1.0			
UNIDENTIFIED LEAKAGE (**Acc Crit: ≤ 1 gpm**) (Appendix C Step 1.0[10])		N/A	2.33			

Appendix C
(Page 1 of 8)

RCS Water Inventory Balance Calculations

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS

NOTE

Throughout this Appendix, INITIAL indicates the data is to be taken from first data set recorded in Appendix B and FINAL indicates data is to be taken from the last data set recorded in Appendix B. A copy of this Appendix is required to be completed each time RCS leakage is calculated.

[1] **CALCULATE** elapsed time (ΔT) as follows:

ΔT = FINAL TIME - INITIAL TIME

ΔT = 1900 - 1800

ΔT = 60 min

LRM
1st
CV

[2] **CONVERT** INITIAL and FINAL PZR PRESSURE units of measurement to psia as follows:

PARAMETER	INITIAL	FINAL
PZR PRESS	= 2235.3 psig + 14.7 = 2250 psia	= 2235.3 psig + 14.7 = 2250 psia

LRM
1st
CV

Appendix C
(Page 2 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[3] **CALCULATE** VCT Leakage as follows:

$$\text{VCT Leakage} = \frac{(\text{INITIAL VCT LEVEL} - \text{FINAL VCT LEVEL}) \times 19.27\ \text{gal/\%}}{\Delta T\ (\text{Step 1.0[1]})}$$

$$\text{VCT Leakage} = \frac{(40\ \% - 36.8\ \%) \times 19.27\ \text{gal/\%}}{60\ \text{min}}$$

VCT Leakage = 1.03 gpm

LRM
1st
CV

[4] **CALCULATE** Pressurizer (PZR) Leakage as follows:[4]

[4.1] **RECORD** INITIAL and FINAL PZR PRESSURE in table below using values calculated in Step 1.0[2]. LRM

[4.2] **RECORD** INITIAL and FINAL PZR LEVEL in table below using values recorded in Appendix B. LRM

[4.3] **DETERMINE and RECORD** INITIAL and FINAL PZR V_f (volume of water) and V_g (volume of steam) at INITIAL and FINAL PZR PRESS (Step 1.0[2]) using ASME Steam Tables (Table 2, Properties of Saturated Steam and Saturated Water).

STEP	PARAMETER	INITIAL		FINAL	
1.0[4.1]	PZR PRESS	2250	psia	2250	psia
1.0[4.2]	PZR LEVEL	60.25	%	58	%
1.0[4.3]	PZR V_f	0.02698	ft^3/lbm	0.02698	ft^3/lbm
	PZR V_g	0.157	ft^3/lbm	0.157	ft^3/lbm

LRM

Appendix C
(Page 3 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[4.4] **CALCULATE** INITIAL PZR VOLUME as follows:[4]

$$\text{INITIAL PZR VOLUME} = \left(\left(\frac{\text{PZR LVL}}{V_f}\right)+\left(\frac{100-\text{PZR LVL}}{V_g}\right)\right) X \left(\frac{16.73\,ft^3}{\%}\right) X \left(\frac{7.4805\,gal}{ft^3}\right) X\, 0.01605$$

$$\text{INITIAL PZR VOLUME} = \left(\left(\frac{60.25\ \%}{0.02698\ ft^3/lbm}\right)+\left(\frac{100-60.25\ \%}{0.157\ ft^3/lbm}\right)\right) X \left(\frac{2\,gal\,ft^3}{\%\,lbm}\right)$$

INITIAL PZR VOLUME = 4972.64 gallons

LRM
1st
CV

[4.5] **CALCULATE** FINAL PZR VOLUME as follows:[5]

$$\text{FINAL PZR VOLUME} = \left(\left(\frac{\text{PZR LVL}}{V_f}\right)+\left(\frac{100-\text{PZR LVL}}{V_g}\right)\right) X \left(\frac{16.73\,ft^3}{\%}\right) X \left(\frac{7.4805\,gal}{ft^3}\right) X\, 0.01605$$

$$\text{FINAL PZR VOLUME} = \left(\left(\frac{58\ \%}{0.02698\ ft^3/lbm}\right)+\left(\frac{100-58\ \%}{0.157\ ft^3/lbm}\right)\right) X \left(\frac{2\,gal\,ft^3}{\%\,lbm}\right)$$

FINAL PZR VOLUME = 4834.51 gallons

LRM
1st
CV

Appendix C
(Page 4 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[4.6] **CALCULATE** PZR Leakage as follows:

$$\text{PZR Leakage} = \frac{\text{INITIAL PZR VOLUME (Step1.0[4.4])} - \text{FINAL PZR VOLUME (Step 1.0[4.5])}}{\Delta T \text{ (Step1.0[1])}}$$

$$\text{PZR Leakage} = \frac{4972.64 \text{ gallons} - 4834.51 \text{ gallons}}{60 \text{ min}}$$

PZR Leakage = 2.3 gpm

LRM
1st

CV

[5] **IF** RCS TEMP FINAL is **NOT** equal to RCS TEMP INITIAL[4], **THEN**

[5.1] **RECORD** INITIAL and FINAL PZR PRESSURE in table below using values calculated in Step 1.0[2] — N/A

[5.2] **RECORD** INITIAL and FINAL RCS TEMPERATURE in table below using values recorded in Appendix B. — N/A

[5.3] **DETERMINE** and **RECORD** INITIAL and FINAL RCS SPECIFIC VOLUME in table below using PZR PRESSURE, RCS TEMPERATURE and ASME Steam Tables (Table 3, Properties of Superheated Steam and Compressed Water). — N/A

Appendix C
(Page 5 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[5.4] **CALCULATE** INITIAL and FINAL RCS DENSITY as follows, **AND**

RECORD in table below:

$$\text{RCS DENSITY} = \frac{1}{\text{RCS SPECIFIC VOLUME}}$$

STEP	PARAM	INITIAL	FINAL
1.0[5.1]	PZR PRESS	psia	psia
1.0[5.2]	RCS TEMP	°F	°F
1.0[5.3]	RCS SPECIFIC VOLUME	ft^3/lbm	ft^3/lbm
1.0[5.4]	RCS DENSITY	lbm/ft^3	lbm/ft^3

N/A
1st
CV

[5.5] **CALCULATE** RCS Temperature Correction as follows:

$$\text{Temp Corr} = \frac{(\text{Initial RCS Density} - \text{Final RCS Density}) \text{X } 10902 ft^3 \text{ X } 7.4805 \frac{gal}{ft^3} \text{ X } 0.01605 \frac{ft^3}{lbm}}{\Delta T \text{ (Step 1.0[1])}}$$

$$\text{Temp Corr} = \frac{\left(\_\_\_\_ \frac{lbm}{ft^3} - \_\_\_\_ \frac{lbm}{ft^3}\right) \text{X } 1308.92 \frac{gal\ ft^3}{lbm}}{\_\_\_\_ \text{ min}}$$

Temp Corr = _____ gpm

N/A
1st
CV

Appendix C
(Page 6 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[6] **CALCULATE** Total RCS Leakage as follows:

Total RCS Leakage = VCT Leakage (Step 1.0[3]) + PZR Leakage (Step [1.0[4]) + Temp Corr (Step 1.0[5] or 0)

Total RCS Leakage = 1.03 gpm + 2.3 gpm + 0 gpm

Total RCS Leakage = 3.33 gpm

LRM
1st
CV

[7] **CALCULATE** Leakage to Pressurizer Relief Tank (PRT) as follows:

[7.1] **CONVERT** INITIAL and FINAL PRT LEVEL from percent (%) to gallons using TI-4, Part II, **AND**

RECORD the converted PRT LEVELS in Step 1.0[7.2]. LRM

[7.2] **CALCULATE** Leakage to PRT using the following equation:

$$\text{Leakage to PRT} = \left(\frac{\text{Final PRT LVL} - \text{Initial PRT LVL}}{\Delta T \text{ (Step 1.0[1])}} \right)$$

$$\text{Leakage to PRT} = \left(\frac{8250 \text{ gallons} - 8250 \text{ gallons}}{60 \text{ min}} \right)$$

Leakage to PRT = 0 gpm

LRM
1st
CV

Appendix C
(Page 7 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[8] **CALCULATE** Leakage to Reactor Coolant Drain Tank (RCDT) as follows:

[8.1] **CONVERT** INITIAL and FINAL RCDT LEVEL from percent (%) to gallons using TI-4, Part II, **AND**

RECORD the converted RCDT LEVELS in Step 1.0[8.2]. LRM

[8.2] **CALCULATE** Leakage to RCDT using the following equation:

$$\text{Leakage to RCDT} = \frac{\text{Final RCDT LVL} - \text{Initial RCDT LVL}}{\Delta T \text{ (Step 1.0[1])}}$$

$$\text{Leakage to RCDT} = \frac{140 \text{ gal} - 80 \text{ gal}}{60 \text{ min}}$$

Leakage to RCDT = 1.0 gpm LRM 1st CV

[9] **CALCULATE** Identified Leakage as follows:

Identified Leakage = Leakage to PRT (Step 1.0[7]) +
Leakage to RCDT (Step 1.0[8]) +
Total SG Leakage (Step 4.1[6]

Identified Leakage = 0 gpm + 1.0 gpm + 0 gpm

Identified Leakage = 1.0 gpm LRM 1st CV

Appendix C
(Page 8 of 8)

Data Package: Page ____ **Date** TODAY

1.0 RCS WATER INVENTORY BALANCE CALCULATIONS (continued)

[10] **CALCULATE** Unidentified Leakage as follows:

Unidentified Leakage = Total RCS Leakage (Step 1.0[6]) - Identified Leakage (Step 1.0[9])

Unidentified Leakage = 3.33 gpm - 1.0 gpm

Unidentified Leakage = 2.33 gpm

LRM
1st

CV

NOTE

The value of Total RCS Leakage recorded in Appendix B by the following step should conservatively be set equal to the value of Unidentified Leakage **IF** the value of Identified Leakage is negative **AND** there is a well-understood reason for the negative value of Identified Leakage. Such a situation could arise if there is known external leakage from the PRT and/or the RCDT which is causing a corresponding decrease in tank level (i.e., tank out-leakage). A notation should be added to Appendix B if the value of Total RCS Leakage is set equal to Unidentified Leakage based on the reasoning in this NOTE.

[11] **RECORD** Total RCS Leakage (Step 1.0[6]), Identified Leakage (Step 1.0[9]) and Unidentified Leakage (Step1.0[10]) on Appendix B in the last column that data is recorded.

LRM

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Primary to Secondary leakage is limited to 1 gpm. [Reference to this source note on page 13 is deleted by Revision 8, which incorporates Tech Spec Change WBN-TS-99-014.]	NCO 850404138 Watts Bar SER (NUREG-0847) Pages 15-18	1
A water inventory balance must be performed within one hour of receiving an alarm and confirming leakage in a flow path with no indicators.	NCO 850404025 Watts Bar SER (NUREG-0847) Pages 5-7	2
Steps to take when negative unidentified leakage is calculated.	NRC Inspection Report 50-327 NOV 50-327, 328/89-16-02	3
RCS leakage should NOT be measured using the reactor sump. Correction factors for PZR level need to be traceable. RCS temperature correction factor must be calculated for any change in initial and final RCS temperature.	NRC Inspection Report 50-390IFI 390/85-22-01	4
The pressurizer (PZR) mass volume (initial and final) should be obtained by adding the vapor space volume and the liquid space volume together.	WBPER960017	5

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit 1 is in Mode 1 at 100% power.
2. 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," performance is required.
3. The ICS Computer program RCSWIB is unreliable.
4. 1-SI-68-32 Appendix A, "Manual Performance of RCS Water Inventory Balance," has been completed through step 4.
5. An initial data set was entered at 1800 and a second data set was entered at 1900 on 1-SI-68-32 Appendix B, "RCS Water Inventory Balance Data Sheet."
6. You are an extra operator assigned to the shift.

INITIATING CUES:

3. The Unit SRO has directed you to complete 1-SI-68-32, Appendix C, "RCS WATER INVENTORY BALANCE CALCULATIONS" using the data provided.
4. Report the results of the surveillance to the Unit SRO.

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit 1 is in Mode 1 at 100% power.
2. 1-SI-68-32, "Reactor Coolant System Water Inventory Balance," performance is required.
3. The ICS Computer program RCSWIB is unreliable.
4. 1-SI-68-32 Appendix A, "Manual Performance of RCS Water Inventory Balance," has been completed through step 4.
5. An initial data set was entered at 1800 and a second data set was entered at 1900 on 1-SI-68-32 Appendix B, "RCS Water Inventory Balance Data Sheet."
6. You are an extra operator assigned to the shift.

INITIATING CUES:

1. The Unit SRO has directed you to complete 1-SI-68-32, Appendix C, "RCS WATER INVENTORY BALANCE CALCULATIONS," using the data provided.
2. After completion of 1-SI-68-32, Appendix C, "RCS WATER INVENTORY BALANCE CALCULATIONS," report your results to the Unit SRO.

A.3
Determine Potential Total Dose for Valve Alignment.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.3
2011-10 NRC Exam

EVALUATION SHEET

Task: Determine Potential Total Dose For Valve Alignment.

Alternate Path: n/a

Facility JPM #: 3-OT-JPMADA.3-1

Safety Function: n/a **Title:** Radiation Control

K/A 2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions.

Rating(s): 3.2/3.7 **CFR:** 41.12 / 43.4 / 45.10

Evaluation Method: Simulator _____ In-Plant _____ **Classroom** **X**

References:

Task Number: AUO-119-SSP-5.01-001 **Title:** Control Personal Radiation Exposure

Task Standard: The applicant determines total dose which an individual would receive while aligning 1-FCV-63-11 to be 361 - 364 mrem. When added to the total dose received for the year, the applicant states that the administrative dose limit 1000 mrem) will be exceeded.

Validation Time: 15 minutes **Time Critical:** Yes _____ No **X**

==========

Applicant: _____ _____ Time Start: _____
NAME Docket No. Time Finish: _____

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: _____ _____/_____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

_____

_____

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.3
2011-10 NRC Exam

ENSURE the applicant has a copy of the survey map for elevation 713' areas of interest.

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

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:

1. **A survey map is available for elevation 713' of the auxiliary building, showing dose rates and projected travel times to reach 1-FCV-63-11 and open it manually.**

2. **RADCON personnel are currently unavailable to provide assistance.**

INITIATING CUES:

1. **You have been directed to perform the alignment of 1-FCV-63-11.**

2. **Your total dose for the year to date is 700 mr.**

3. **Calculate your estimated total dose to perform this job using the attached survey map.**

4. **Determine if you can perform this job without exceeding your administrative dose limit. Show all work.**

START TIME: _____

EXAMINER: If the applicant asks if this is a planned special exposure, respond that the applicant should read initiating cues.

Examinee must calculate 2 way travel time through all transit areas. Allowable ranges are shown where applicable

STEP 1: Calculate exposure during transit through the sample room and penetration room to the valve and return. STANDARD: Sample Room: (475mr/hr)(0.5min)(hr/60min) x 2(trips) = **7.92 mr** Allowable range: (7.0mr to 8.0mr) Pen Room to STEP OFF PAD: (120mr/hr)(0.5min)(hr/60min) x 2(trips) = **2 mr** Allowable range: N/A Hot Spot: (2700mr/hr)(50sec)(min/60sec)(hr/60min) x 2(trips) = **75 mr** Allowable range: N/A Past BIT: (900mr/hr)(3min)(hr/60min) x 2(trips) = **90 mr** Allowable range: N/A Transit to valve: (350mr/hr)(7min)(hr/60min) x 2(trips) = **81.67 mr** Allowable range: (81mr to 82mr) Operate valve: (320mr/hr)(20min)(hr/60min) x 1(trip) = **106.67 mr** Allowable range: (106.0mr to 107mr) **Step is critical to avoid exceeding dose limits.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

EXAMINER: – Some rounding of numbers is allowed as long as the examinee follows sound mathematical standards. The acceptable total range is 361 to 364 mrem.	
STEP 2: Calculate the total exposure received while performing the task. STANDARD: Individual doses received are added up. 7.92 mr + 2 mr + 75 mr + 90 mr + 81.67 mr + 106.67 mr = **363.26 mr.** Rounding values: Low: 7.0 + 2 + 75 + 90 + 81 + 106.0 = **361 mr** High: 8 + 2+ 75 + 90 + 82 + 107 = **364 mr** **Acceptable Range - 361 - 364 mrem** **Step is critical to avoid exceeding dose limits.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 3. Applicant calculates his/her total estimated exposure. STANDARD: Total dose calculated in previous step is added to applicant's total dose for the year: 700 mr (total dose to date) + 363.26 mr (total dose for this job) = **1063.26** mrem. **Acceptable range of answer 1061 mrem to 1064 mrem.** **Critical step to calculate dose accurately in order to avoid exceeding dose limits.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 4: Applicant determines admin dose limit will be exceeded if the job is performed. Applicant notifies supervisor of findings, stating that admin dose limit will be exceeded. STANDARD: Admin dose limit for the year is 1000 mrem. Potential dose received is 361 to 364 mrem. Total is 1061 to 1064 mrem, **exceeding admin limit**. **CUE: When notified of applicant's findings, acknowledge report using repeat back, and state that this JPM is completed. Have applicant turn in all paperwork & calculations.** **Step is critical to avoid exceeding administrative dose limits.** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME _____

KEY
DO NOT HAND TO APPLICANT

SURVEY DATA:

- 1-FCV 63-11 is shown on the Survey map.
- Travel time from the sample room door thru the sample room is 30 seconds.
- Travel time from the sample room door thru the penetration room to the step off pad is 30 seconds.
- Travel time from the step off pad past the Hot Spot to the lower radiation area around the BIT is 50 seconds due to obstructions in the area.
- Travel time from the BIT area into the piping area is 180 seconds.
- Travel time thru the piping area to the valve is 420 seconds.
- Estimated time at valve is 20 minutes.
- General Area Dose rates are listed on the survey map.

RESULTS:

Sample Room and back	(475mr/hr)(0.5min)(hr/60min) x 2(trips)	**7.92 mr** Range: 7.0 - 8.0 mr
Pen Room to STEP OFF PAD and back	(120mr/hr)(0.5min)(2hr/60min) x 2(trips)	**2 mr** Range: N/A
Hot Spot and back	(2700mr/hr)(50sec)(min/60sec)(hr/60min) x 2(trips)	**75 mr** Range: N/A
Past BIT and back	(900mr/hr)(3min)(hr/60min) x 2(trips)	**90 mr** Range: N/A
Transit to valve and back	(350mr/hr)(7min)(hr/60min) x 2(trips)	**81.67 mr** Range: 81 - 82 mr
Operate valve	(320mr/hr)(20min)(hr/60min) x 1(trip)	**106.67 mr** Range: 106 - 107 mr
Total		**363.26 mr** Range: 361 - 364 mr

Accept 360 to 364 mrem as dose expected to perform task.

When added to current dose for the year of 700 mr, the administrative dose limit of 1000 mrem WILL BE EXCEEDED (total 1061 - 1064 mrem).

APPLICANT DATA SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. A survey map is available for elevation 713' of the auxiliary building, showing dose rates and projected travel times to reach 1-FCV-63-11 and open it manually.

2. RADCON personnel are currently unavailable to provide assistance.

INITIATING CUES:

1. You have been directed to perform the alignment of 1-FCV-63-11.

2. Your total dose for the year to date is 700 mr.

3. Calculate your estimated total dose to perform this job using the attached survey map.

4. Determine if you can perform this job without exceeding your administrative dose limit. Show all work.

APPLICANT DATA SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

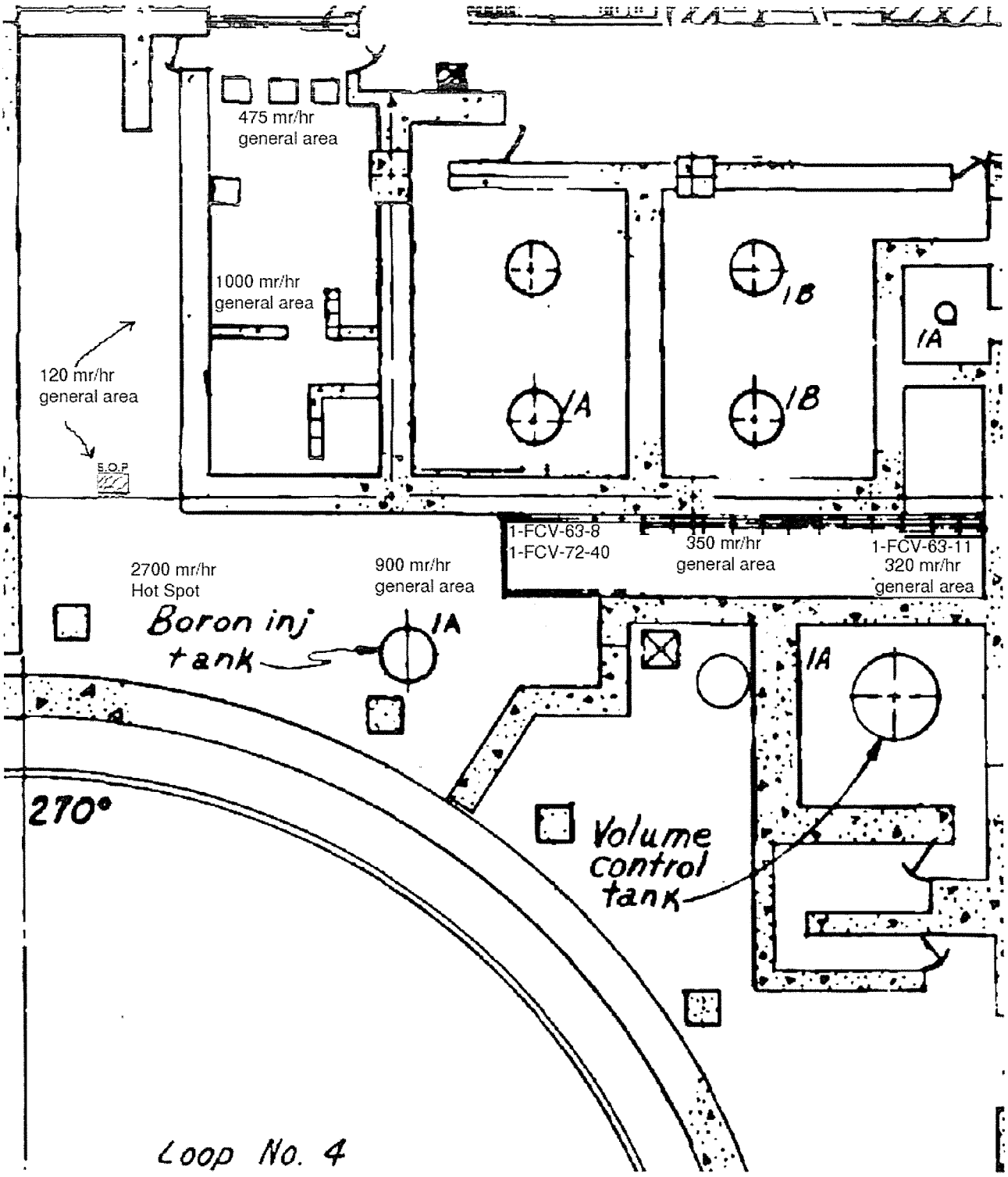
SURVEY DATA:

- 1-FCV 63-11 is shown on the Survey map.
- Travel time from the sample room door thru the sample room is 30 seconds.
- Travel time from the sample room door thru the penetration room to the step off pad is 30 seconds.
- Travel time from the step off pad past the Hot Spot to the lower radiation area around the BIT is 50 seconds due to obstructions in the area.
- Travel time from the BIT area into the piping area is 180 seconds.
- Travel time thru the piping area to the valve is 420 seconds.
- Estimated time at valve is 20 minutes.
- General Area Dose rates are listed on the survey map.

RESULTS:

APPLICANT DATA SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)



A.4
Determine if conditions warrant a Follow-up Report or Upgrade based on changing conditions.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.4
2011-10 NRC Exam

EVALUATION SHEET

Task: Determine if conditions warrant a Follow-up Report or Upgrade based on changing conditions.

Alternate Path: n/a

Facility JPM #: Modified 3-OT-JPMS081A

Safety Function: n/a **Title:**

K/A 2.4.40 Knowledge of SRO responsibilities in emergency plan implementation.

Rating(s): 2.7/4.5 **CFR:** 41.10 / 43.5 / 45.11

Evaluation Method: Simulator _____ In-Plant _____ **Classroom** **X**

References: EPIP-1 "Emergency Plan Classification Flowpath", Rev. 35.
EPIP-3 "ALERT", Rev. 33.
EPIP-5 "GENERAL EMERGENCY", Rev. 38.

Task Number: SRO-113-EPIP-001 **Title:** Classify emergency events requiring Emergency Plan Implementation.

Task Standard: The applicant:

1) Determines that an upgrade from an ALERT to a GENERAL EMERGENCY is required.
2) Prepares forms for emergency notification as indicated on the attached key.
3) Initiates Protective Action Recommendations, Recommendation 2.

Validation Time: 25 minutes **Time Critical:** Yes **X** No _____

==========

Applicant: _____ _____ Time Start: _____
NAME Docket No. Time Finish: _____

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: _____ _____/_____
NAME SIGNATURE DATE

==========

COMMENTS

_____

_____

_____

_____

_____

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.4
2011-10 NRC Exam

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

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 cue sheet I provided you.

INITIAL CONDITIONS:

TREAT THIS AS A RADIOLOGICAL EMERGENCY DRILL

1. **A Drill is being conducted during which Unit 1 was at 90% RTP when the crew manually initiated a Reactor Trip and Safety Injection due to a SGTR on SG #1 of approximately 100 gpm.**
2. **An ALERT was declared 15 minutes ago, and EPIP-3, "Alert" has been implemented.**
3. **The Shift Technical Advisor NOW reports the following conditions exist on Unit 1:**
   a. **One Safety Valve on SG #1 opened and failed to reclose.**
   b. **The Chemistry Supervisor reports RCS activity is 340 uCi/gram dose equivalent I-131.**
   c. **All Status Trees are GREEN except for FR-H.5, Steam Generator Low Level, which is YELLOW due to level in SG #1 at 50% wide range.**
   d. **Atmospheric conditions indicate the wind is from 90 degrees at 10 mph.**

INITIATING CUES:

1. **As the SED, you are to evaluate current plant conditions and decide the appropriate actions.**
2. **Once your decision is made, fill out the appropriate forms to make notifications to appropriate personnel.**
3. **This JPM contains time critical elements.**

STEP/STANDARD	SAT/UNSAT

START TIME: _____

STEP 1: Refers to EPIP-1 to determine level of classification required for the events in progress. STANDARD: Applicant refers to EPIP-1, Section 1, "Fission Product Barrier Matrix." Applicant determines that the following conditions exist: 1.1.2 Loss, "RCS sample activity is greater than 300 µCi/gm dose equivalent I-131." 1.2.3 Loss, "SGTR that results in a safety injection actuation OR entry into E-3." 1.3.4 Loss, "RUPTURED S/G is also FAULTED outside CNTMT OR Prolonged (>4 Hours) Secondary Side release outside CNTMT from a S/G with a SGTL > T/S Limits." Based on "Emergency Class Criteria", the applicant determines the need to upgrade to a **General Emergency**, based on the loss of 3 barriers. **Criteria to meet the critical step is for the EALs to be correctly identified and the declaration made within 15 minutes.** **EXAMINER**: **RECORD time that declaration was made:_____** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
EXAMINER: Completed copies of EPIP-5, General Emergency," Appendix A and B for this JPM are included and marked EXAM MATERIAL - KEY.	
STEP 3: INITIATES EPIP-5, "GENERAL EMERGENCY" Appendix A, "TVA Initial Notification Form For Site Area Emergency," and Appendix B."PROTECTIVE ACTION RECOMMENDATIONS." STANDARD: Applicant evaluates Appendix B ."PROTECTIVE ACTION RECOMMENDATIONS," flowchart and determines Recommendation 2 is required. Applicant completes Appendix A, "TVA Initial Notification Form For Site Area Emergency," **within 10 minutes after the declaration is made.** **Critical elements that must appear on Appendix A form:** **Item 1 - Marked as a Drill** **Item 3 - EAL Designators - 1.1.2 L, 1.2.3 L, 1.3.4 L** **Item 4. - Brief Description of Event - Events that occurred, in the words of the applicant. Concurrent with a 100 gpm SG tube rupture on SG 1, RCS Activity is 340 microcurries/gram dose equivalent I-131, and a SG 1 safety valve is failed open.** **Item 6. - Time that applicant declared the event and the date.** **Item 8. - Recommendation 2 selected with wind direction 69-110 and associated Sectors selected.** **EXAMINER:** **RECORD time that appendices are completed:_____** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME _____

Attachment 1
(Page 1 of 4)

Fission Product Barrier Matrix (Modes 1-4)

FISSION PRODUCT BARRIER MATRIX (Modes 1-4) 1

1.1 Fuel Clad
1.2 RCS
1.3 Containment

SYSTEM DEGRADATION 2

2.1 Loss of Instrumentation
2.2 Loss of Function/Communication
2.3 Failure of Reactor Protection
2.4 Fuel Clad Degradation
2.5 RCS Unidentified Leakage
2.6 RCS Identified Leakage
2.7 Uncontrolled Cool Down
2.8 Turbine Failure
2.9 Technical Specification
2.10 Safety Limit

LOSS OF POWER 3

3.1 Loss of AC (Power Ops)
3.2 Loss of AC (Shutdown)
3.3 Loss of DC

HAZARDS and SED JUDGMENT 4

4.1 Fire
4.2 Explosion
Table 4-1
Figure 4-A
4.3 Flammable Gas
4.4 Toxic Gas
Table 4-2
Figure 4-B
4.5 Control Room Evacuation
4.6 Security
4.7 SED Judgment

DESTRUCTIVE PHENOMENON 5

5.1 Earthquake
5.2 Tornado
5.3 Aircraft/Projectile
Crash Figure 5-A
Table 5-1
5.4 River Level High
5.5 River Level Low
5.6 Watercraft Crash

SHUTDOWN SYSTEM DEGRADATION 6

6.1 Loss of Shutdown Systems
6.2 Loss of AC (Shutdown)
6.3 Loss of DC (Shutdown)

RADIOLOGICAL 7

7.1 Gaseous Effluent
7.2 Liquid Effluent
Table 7-1
Figure 7-A
7.3 Radiation Levels
7.4 Fuel Handling
Table 7-2

Attachment 1 (Page 2 of 4)

UNUSUAL EVENT, ALERT, SITE AREA EMERGENCY and GENERAL **EMERGENCY**: (see SED Judgment 4.7).

BOMB: An explosive device (See EXPLOSION).

CIVIL DISTURBANCE: A group of twenty (20) or more persons violently protesting station operations or activities at the site.

CREDIBLE SITE-SPECIFIC -The determination is made by WBN senior plant management through use of information found in the Safeguards Contingency Plan.

CRITICAL-SAFETY FUNCTION (CSFs): A plant safety function required to prevent significant release of core radioactivity to the environment. There are six **CSFs**: Sub-criticality, Core Cooling, Heat Sink, Pressurized Thermal Shock, Integrity (Containment) and Inventory (RCS).

EVENT: Assessment of an **EVENT** commences when recognition is made that one or more of the conditions associated with the event exist. Implicit in this definition is the need for timely assessment, i.e. within 15 minutes.

EXCLUSION AREA BOUNDARY (EAB): The demarcation of the area surrounding the WBN units in which postulated FSAR accidents will not result in population doses exceeding the criteria of 10 CFR Part 100. Refer to Figure 7-A.

EXPLOSION: A rapid, violent, unconfined combustion or a catastrophic failure of pressurized equipment that potentially imparts significant energy to near-by structures and materials.

EXTORTION: An attempt to cause an action at the station by threat of force.

FAULTED: (Steam Generator) Existence of secondary side leakage (i.e., steam or feed line break) that results in an uncontrolled decrease in steam generator pressure or the steam generator being completely depressurized.

FIRE: Combustion characterized by heat and light. Source of smoke such as slipping drive belts or overheated electrical components do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

FLAMMABLE GAS: Combustible gases maintained at concentrations less than the **LOWER EXPLOSIVE LIMIT (LEL)** will not explode due to ignition.

HOSTAGE: A person(s) held as leverage against the station to ensure that demands will be met by the station.

HOSTILE ACTION: An act toward a nuclear power plant or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidates the licensee to achieve an end. This includes attack by air, land, or water; using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. HOSTILE ACTION should NOT be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on the nuclear power plant. Non-terrorism-based EALs should be used to address such activities, (e.g., violent acts between individuals in the owner controlled area.)

HOSTILE FORCE: Individual(s) involved with a HOSTILE ACTION. One or more individuals who are engaged in a determined assault, overtly or by stealth and deception, equipped with suitable weapons capable of killing, maiming, or causing destruction.

INEFFECTIVE: The specified restoration action(s) does not result in a reduction in the level of severity of the RED PATH condition within 15 minutes from identification of the Core Cooling CSF Status Tree RED PATH.
A reduction in the level of severity is an improvement in the applicable parameters, e.g., Increasing Trend in Reactor Vessel Water Level (Full RVLIS) and/or Decreasing Trend on Core Thermocouple Temperatures.

INITIATING CONDITIONS: Plant Parameters, radiation monitor readings or personnel observations that identify an Event for purposes of Emergency Plan Classification.

INTRUSION/INTRUDER: Suspected hostile individual present in a protected area without authorization.

ODCM: Offsite Dose Calculation Manual.

ORANGE PATH: Monitoring of one or more CSFs by FR-0 which indicates that the CSF(s) is under severe challenge.

PROJECTILE: An object ejected, thrown, or launched towards a plant structure. The source of the projectile may be onsite or offsite. Damage is sufficient to cause concern regarding the integrity of the affected structure or the operability or reliability of safety equipment contained therein.

PROTECTED AREA: Encompasses all owner controlled areas within the security protected area fence as shown on Figure 4-A.

RED PATH: Monitoring of one or more CSFs by the FR-0 which indicates that the CSF(s) is under extreme challenge; prompt operator action is required.

RUPTURED: (Steam Generator) Existence of primary to secondary leakage of a magnitude greater than charging pump capacity.

SABOTAGE: Deliberate damage, misalignment, or mis-operation of plant equipment with the intent to render the equipment inoperable.

SECURITY CONDITION- Any Security Event as listed in the approved security contingency plan that constitutes a threat/compromise to site security, threat/risk to site personnel, or a potential degradation to the level of safety of the plant. A SECURITY CONDITION does not involve a HOSTILE ACTION.

SIGNIFICANT TRANSIENT: An UNPLANNED event involving one or more of the following: (1) An automatic turbine runback > 15% thermal reactor power; (2) Electrical load rejection > 25% full electrical load; (3) Reactor Trip or (4) Safety Injection System Activation.

SITE PERIMETER: Encompasses all owner controlled areas in the immediate site environs as shown on Figures 4-A and 7-A.

STRIKE ACTION: A work stoppage within the PROTECTED AREA by a body of workers to enforce compliance with demands made on TVA. The STRIKE ACTION must threaten to interrupt normal plant operations.

TOXIC GAS: A gas that is dangerous to life or limb by reason of inhalation or skin contact (e.g., chlorine).

UNPLANNED: An event or action that is not the expected result of normal operations, testing, or maintenance. Events that result in corrective or mitigative actions being taken in accordance with abnormal or emergency procedures are UNPLANNED.

UNPLANNED: (With specific regard to radioactivity releases) A release of radioactivity is UNPLANNED if the release has not been authorized by a Discharge Permit (DP). Implicit in this definition are unintentional releases, unmonitored releases, or planned releases that exceed a condition specified on the DP, e.g., alarm setpoints, minimum dilution flow, minimum release times, maximum release rates, and/or discharge of incorrect tank.

VALID: An indication or report or condition is considered to be VALID when it is conclusively verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel. Implicit in this definition is the need for timely assessment, i.e., within 15 minutes.

VISIBLE DAMAGE: Damage to equipment that is readily observable without measurements, testing, or analyses. Damage is sufficient enough to cause concern regarding the continued operability or reliability of affected safety structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, and/or paint blistering. Surface blemishes (e.g., paint chipping, scratches) should NOT be included.

VITAL AREA: Is any area within the PROTECTED AREA which contains equipment, systems, devices, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

Attachment 1
(Page 3 of 4)

1.1. _ Fuel Clad Barrier	
1. Critical Safety Function Status	
LOSS	**Potential LOSS**
Core Cooling Red (FR-C.1)	Core Cooling Orange (FR-C.2) **OR** Heat Sink Red (FR-H.1) (RHR Not in Service)
-OR-	
2. Primary Coolant Activity Level	
LOSS	**Potential LOSS**
RCS sample activity is Greater Than 300 µCi/gm dose equivalent iodine-131	Not applicable
-OR-	
3. Incore TCs Hi Quad Average	
LOSS	**Potential LOSS**
Greater Than 1200°F	Greater Than 727°F
-OR-	
4. Reactor Vessel Water Level	
LOSS	**Potential LOSS**
Not Applicable	VALID RVLIS level <33% (No RCP running)
-OR-	
5. Containment Radiation Monitors	
LOSS	**Potential LOSS**
VALID reading increase of Greater Than: 293 R/hr On 1-RM-90-271 and 272 **OR** 261 R/hr On 1-RM-90-273 and 274 **(see instruction note 5)**	Not Applicable
-OR-	
6. Site Emergency Director Judgment	
Any condition that, in the Judgment of the SM/SED, Indicates Loss or Potential Loss of the Fuel Clad Barrier Comparable to the Conditions Listed Above.	

1.2. _ RCS Barrier	
1. Critical Safety Function Status	
LOSS	**Potential LOSS**
Not Applicable	Pressurized Thermal Shock Red (FR-P.1) **OR** Heat Sink Red (FR-H.1) (RHR **Not** in Service)
-OR-	
2. RCS Leakage/LOCA	
LOSS	**Potential LOSS**
RCS Leak results in Loss of subcooling (<65°F Indicated), [85°F ADV]	Non Isolatable RCS Leak Exceeding The Capacity of One Charging Pump (CCP) In the Normal Charging Alignment. **OR** RCS Leakage Results In Entry Into E-1
-OR-	
3. Steam Generator Tube Rupture	
LOSS	**Potential LOSS**
SGTR that results in a safety injection actuation **OR** Entry into E-3	Not Applicable
-OR-	
4. Reactor Vessel Water Level	
LOSS	**Potential LOSS**
VALID RVLIS level <33% (No RCP Running)	Not Applicable
-OR-	
5. Site Emergency Director Judgment	
Any condition that, in the Judgment of the SM/SED, Indicates Loss or Potential Loss of the RCS Barrier Comparable to the Conditions Listed Above.	

Attachment 1 (Page 4 of 4)

1.3. _ CNTMT Barrier

1. Critical Safety Function Status

LOSS	Potential LOSS
Not Applicable	Containment (FR-Z.1) Red **OR** Actions of FR-C.1 (Red Path) are INEFFECTIVE (i.e.: core TCs trending up)

-OR-

2. Containment Pressure/Hydrogen

LOSS	Potential LOSS
Rapid unexplained decrease following initial increase **OR** Containment pressure or Sump level **Not** increasing (with LOCA in progress)	Containment Hydrogen Increases to >4% by volume **OR** Pressure >2.8 PSIG (Phase B) with < One full train of Containment spray

-OR-

3. Containment Isolation Status

LOSS	Potential LOSS
Containment Isolation is Incomplete (when required) **AND** a Release Path to the Environment Exists	Not Applicable

-OR-

4. Containment Bypass

LOSS	Potential LOSS
RUPTURED S/G is also FAULTED outside CNTMT **OR** Prolonged (>4 Hours) Secondary Side release outside CNTMT from a S/G with a SGTL > T/S Limits	Unexplained VALID increase in area or ventilation RAD monitors in areas adjacent to CNTMT (with LOCA in progress)

-OR-

5. Significant Radioactivity in Containment

LOSS	Potential LOSS
Not Applicable	VALID Reading increase of Greater Than: 5290 R/hr on 1-RM-90-271 and 1-RM-90-272 **OR** 4710 R/hr on 1-RM-90-273 and 1-RM-90-274 **(see instruction note 5)**

-OR-

6. Site Emergency Director Judgment

Any condition that, in the Judgment of the SM/SED, Indicates Loss or Potential Loss of the CNTMT Barrier Comparable to the Conditions Listed Above.

Modes: 1, 2, 3, 4

INSTRUCTIONS

NOTE:
A condition is considered to be MET if, in the judgment of the Site Emergency Director, the condition will be MET imminently (i.e., within 1 to 2 hours, in the absence of a viable success path). The classification shall be made a soon as this determination is made.

1. In the matrix to the left, review the **INITIATING CONDITIONS** in all columns and identify which, if any, **INITIATING CONDITIONS** are MET. Circle these **CONDITIONS**.
2. For each of the three barriers, identify if any **LOSS** or Potential **LOSS INITIATING CONDITIONS** have been MET.
3. If a CSF is listed as an **INITIATING CONDITION**; the respective status tree criteria will be monitored and used to determine the **EVENT** classification for the Modes listed on the classification flowchart.
4. Compare the barrier losses and potential losses to the **EVENTS** below and make the appropriate declaration.
5. Containment High Range Radiation Monitors (HRRMs) are temperature sensitive and can be affected by both temperature induced currents and insulation resistance temperature effects. Following the initial increase in containment temperature the HRRM monitors can give erratic indication for up to 1 minute. Steady state temperature effects on cable insulation resistance for the HRRM signal cable is dependent on containment temperature and could result in a shift in monitor output indication. With a containment excursion temperature to 327 °F (HELB), the output of the HRRMs could potentially have up to a 25 R/hr indicated offset for duration of 10 minutes until the containment air return fans are started and temperature starts to reduce. (**Caution: Should the containment air return fans not start, containment temperatures could remain elevated resulting in potential false HRRM indicated readings).**

EVENTS

UNUSUAL EVENT
Loss **or** Potential LOSS of Containment Barrier

ALERT
Any LOSS **or** Potential LOSS of Fuel Clad barrier
OR
Any LOSS **or** Potential LOSS of RCS barrier

SITE AREA EMERGENCY
LOSS **or** Potential LOSS of any two barriers

GENERAL EMERGENCY
LOSS of any two barriers **and** Potential LOSS of third barrier

FISSION PRODUCT BARRIER MATRIX U1

Appendix A
(Page 1 of 1)

TVA Initial Notification Form For General Emergency

CRITICAL 1. ☒ This is a Drill ☐ This is an Actual Event - Repeat - This is an Actual Event

2. This is SED

Watts Bar has declared a **GENERAL EMERGENCY** affecting Unit 1

CRITICAL 3. **EAL Designator(s):** 1.1.2 L(OSS) / 1.2.3 L(OSS) / 1.3.4 L(OSS)

CRITICAL 4. Brief Description of the Event: Concurrent with a 100 gpm SG tube rupture on SG 1, RCS Activity is 340 microcurries/gram dose equivalent I-131, and a SG 1 safety valve is failed open.

5. **Radiological Conditions:** (Check one under **both** Airborne and Liquid column.)

Airborne Releases Offsite	**Liquid** Releases Offsite
☒ Minor releases within federally approved limits[1]	☒ Minor releases within federally approved limits[1]
☐ Releases above federally approved limits[1]	☐ Releases above federally approved limits[1]
☒ Release information not known ([1]Tech Specs)	☒ Release information not known ([1]Tech Specs)

CRITICAL 6. **Event Declared:** Time: TIME Date: TODAY

7. **The Meteorological Conditions are:** (Use 46 meter data from the Met Tower)

Wind Direction is FROM: 90 degrees Wind Speed: 10 m.p.h

CRITICAL 8. **Provide Protective Action Recommendation:** (Check 1, 2 or 3, and mark wind direction.)

☐ **Recommendation 1** →EVACUATE LISTED SECTORS (2 mile Radius and 10 miles downwind) →SHELTER remainder of 10 mile EPZ. →CONSIDER issuance of Potassium Iodide in accordance with the State Plan.	* REC 1	**WIND FROM [0] (Mark)**	* REC 2	☒ **Recommendation 2** →EVACUATE LISTED SECTORS (2 mile radius and 5 mile downwind) →SHELTER remainder of 10 mile EPZ. →CONSIDER issuance of Potassium Iodide in accordance with the State Plan.
A-1, B-1, C-1, D-1, **C**-7, -9, **D**-2, -4, -5, -6, -7, -8, -9		26-68		A-1, B-1, C-1, D-1, **C**-7, **D**-2, -4, -5
A-1, B-1, C-1, D-1, **A**-3, -4, **D**-2, -3, -4, -5, -6, -7, -8, -9		(69-110)	X	A-1, B-1, C-1, D-1, **A**-3, **D**-2, -4, -5
A-1, B-1, C-1, D-1, **A**-2, -3, -4, -5, -6, -7, **D**-2, -3, -5, -6		111-170		A-1, B-1, C-1, D-1, **A**-2, -3, **D**-2, -5
A-1, B-1, C-1, D-1, **A**-2, -3, -5, -6, -7, **B**-2, -3, -4, -5, **C**-2		171-230		A-1, B-1, C-1, D-1, **A**-2, -3, **B**-2, -4, **C**-2
A-1, B-1, C-1, D-1, **B**-2, -3, -4, -5, **C**-2, -3,		231-270		A-1, B-1, C-1, D-1, **B**-2, -4, **C**-2
A-1, B-1, C-1, D-1, **B**-2, -3, **C**-2, -3, -4, -5, -6, -11		271-325		A-1, B-1, C-1, D-1, **B**-2, **C**-2, -4, -5,
A-1, B-1, C-1, D-1, **C**-2, -4, -5, -6, -7, -8, -9, -10, -11, **D**-4, -9		326-25		A-1, B-1, C-1, D-1, **C**-2, -4, -5, -7, -8, **D**-4

☐ **Recommendation 3**
→SHELTER all sectors. →CONSIDER issuance of Potassium Iodide in accordance with the State Plan.

9. **FAX** this form to **CECC Director** at 5-751-1682 or **ODS** at 5-751-8620 or **TEMA** at 9-1-615-242-9635.

10. Call ODS or TEMA to ensure accuracy of the information provided.

Appendix B
(Page 1 of 1)
Protective Action Recommendations

NOTES

1) If conditions are unknown utilizing the flowchart, then answer is NO.
2) A short term release is defined as "a release that does not exceed a 15 minute duration".

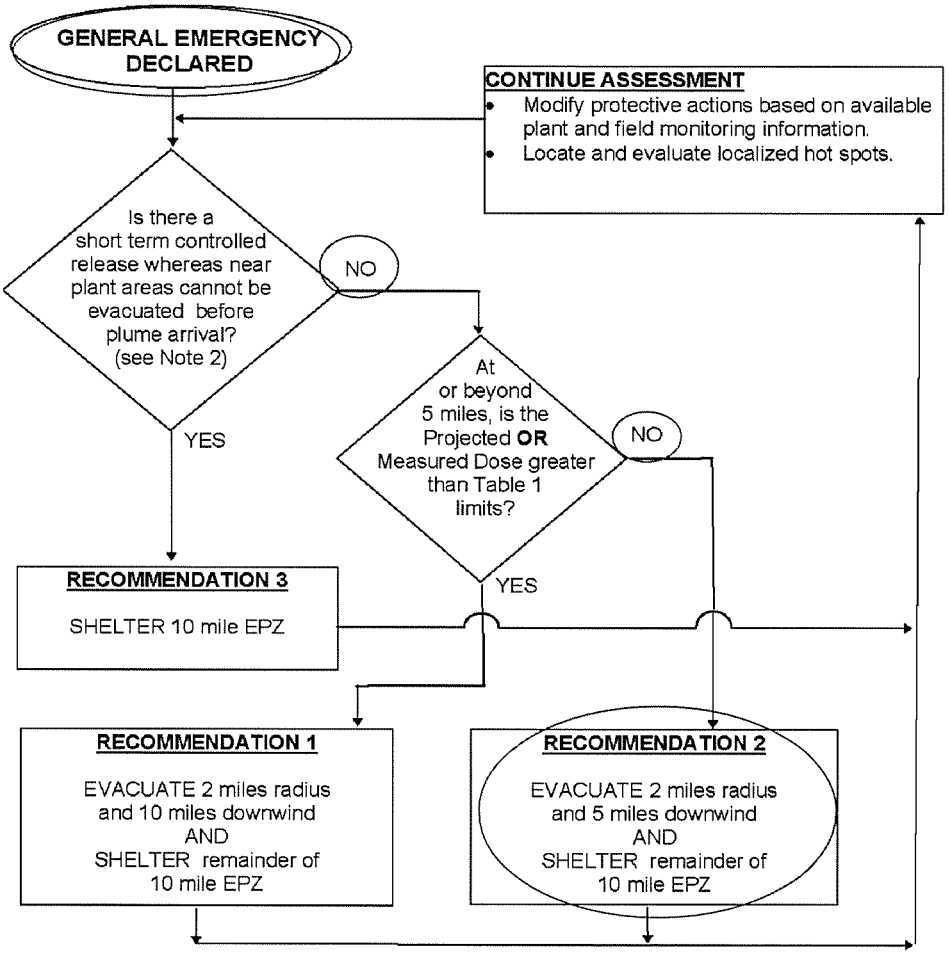


TABLE 1 Protective Action Guides (PAG)

TYPE	LIMIT
Measured	3.9 E-6 micro Ci/cc of Iodine 131 or 1 REM per hour External Dose
Projected	1 REM TEDE or 5 REM Thyroid CDE

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

TREAT THIS AS A RADIOLOGICAL EMERGENCY DRILL

1. A Drill is being conducted during which Unit 1 was at 90% RTP when the crew manually initiated a Reactor Trip and Safety Injection due to a SGTR on SG #1 of approximately 100 gpm.
2. An ALERT was declared 15 minutes ago, and EPIP-3, "Alert" has been implemented.
3. The Shift Technical Advisor NOW reports the following conditions exist on Unit 1:
   a. One Safety Valve on SG #1 opened and failed to reclose.
   b. The Chemistry Supervisor reports RCS activity is 340 uCi/gram dose equivalent I-131.
   c. All Status Trees are GREEN except for FR-H.5, Steam Generator Low Level, which is YELLOW due to level in SG #1 at 50% wide range.
   d. Atmospheric conditions indicate the wind is from 90 degrees at 10 mph.

INITIATING CUES:

1. As the SED, you are to evaluate current plant conditions and decide the appropriate actions.
2. Once your decision is made, fill out the appropriate forms to make notifications to appropriate personnel.
3. This JPM contains time critical elements.