Facility: **Waterford 3**		Date of Examination: **Mar 27, 2017**	
Examination Level: RO ☒ SRO ☐		Operating Test Number: 1	

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
A1 Conduct of Operations K/A Importance: 3.6	D, R	2.1.18, Ability to make accurate, clear, and concise logs, records, status boards, and reports. Complete OP-004-005, Core Operating Limits Supervisory System Operation, Attachment 11.6, Calculation of Charging and Letdown Parameters.
A2 Conduct of Operations K/A Importance: 4.3	N,R	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. Determine times to boil and core uncovery in accordance with OP-901-131, Shutdown Cooling Malfunction.
A3 Equipment Control K/A Importance: 3.7	N,R	2.2.12, Knowledge of Surveillance Procedures. Perform Keff Calculation in accordance with OP-903-090, Shutdown Margin, Section 7.5, Keff Calculation.
A4 Radiation Control K/A Importance: 3.8	P,D,R	2.3.11, Ability to control radiation releases. Evaluate Meteorological conditions for gaseous release from the Gaseous Waste Management System in accordance with OP-007-003, Gaseous Waste Management. **(From 2014 NRC Exam)**
Emergency Plan		Not Selected

NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

* 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)

Facility:	**Waterford 3**	Date of Examination:	**Mar 27, 2017**
Examination Level:	RO ☐ SRO ☒	Operating Test Number:	1

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
A5 Conduct of Operations K/A Importance: 3.8	D,R	2.1.18, Ability to make accurate, clear, and concise logs, records, status boards, and reports. Review and approve completed OP-903-117, Emergency Diesel Generator Fuel Oil Transfer Pump Operability Check, Attachment 10.1, Fuel Oil Transfer Pump A IST Data.
A6 Conduct of Operations K/A Importance: 4.4	N,R	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. Determine time to boil and identify containment closure requirements in accordance with OP-901-131, Shutdown Cooling Malfunction.
A7 Equipment Control K/A Importance: 4.1	N,R	2.2.12, Knowledge of Surveillance Procedures Review Keff Calculation in accordance with OP-903-090, Shutdown Margin, Section 7.5, Keff Calculation. Applicant determines Keff does not meet Tech Spec 3.1.2.9 requirements and identifies required corrective actions.
A8 Radiation Control K/A Importance: 3.8	P,M,R	2.3.14, Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. Calculate dose and assign non-licensed operators to vent Safety Injection piping in Safeguards Room A. Given dose rate with and without shielding installed, time to install shielding, and job completion time using 1 team or using 2 teams, determine proper job assignment. **(Modified from 2014 NRC Exam)**
A9 Emergency Plan K/A Importance: 4.6	N,R	2.4.41, Knowledge of the emergency action level thresholds and classifications. Determine appropriate Emergency Plan action level in accordance with EP-001-001, Recognition and Classification of Emergency Conditions.

NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

* 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)

Waterford 3

2017 RO NRC Exam

JOB PERFORMANCE MEASURE

A1

Complete OP-004-005, Core Operating Limits Supervisory System Operation, Attachment 11.6, Calculation of Charging and Letdown Parameters

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Complete OP-004-005, Core Operating Limits Supervisory System Operation, Attachment 11.6, Calculation of Charging and Letdown Parameters

Task Standard: Applicant correctly calculates new values for COLSS constants for Charging Enthalpy, Charging Flow, Letdown Enthalpy, Letdown Specific Volume, and Letdown Flow.

References: OP-004-005, Core Operating Limits Supervisory System Operation (rev 27)

Alternate Path: No   Time Critical: No   Validation Time: 15 mins.

K/A 2.1.18 Ability to make accurate, clear, and concise logs, records, status boards, and reports.   Importance Rating 3.6 RO

Applicant: ______________________________

Time Start: __________________   Time Finish: __________________

Performance Time: __________________ minutes

Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____

____

____

Examiner: ______________________________ Date: ________________

Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-004-005, Core Operating Limits Supervisory System Operation, Attachment 11.6, Calculation of Charging and Letdown Parameters (Applicant Handout)
- Personal computer or laptop (with wifi/LAN deactivated)
- Standard electronic references thumb drive (eCart)

Description:
This JPM requires the applicant to calculate COLSS constants for Charging Enthalpy, Charging Flow, Letdown Enthalpy, Letdown Specific Volume, and Letdown Flow using data provided on the cue sheet.

READ TO APPLICANT

DIRECTION TO APPLICANT:

Each administrative JPM has a cue sheet with the instructions for that JPM. Each administrative JPM stands alone, and conditions from 1 JPM do not carry over to any other JPM. If you have any questions, raise your hand and I will come to your desk.

Provide all answers on the sheets provided.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

Evaluator Note
The applicant will calculate COLSS constants for Charging Enthalpy, Charging Flow, Letdown Enthalpy, Letdown Specific Volume, and Letdown Flow. All required data to perform the calculation is supplied on the cue sheet.

TASK ELEMENT 1	STANDARD
Record the following data: • Plant Power (not critical) • RCS Pressure A12205 (not critical) • Charging Flow C26245 • Charging Temperature A39103 • Charging Pump Discharge Temperature A39102 • RCS Loop 2B T Cold A12120	Data is correctly transferred to Attachment 11.6
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 2	STANDARD
Perform the following calculations: 11.6.2.1 Charging Enthalpy	Calculation completed in accordance with key.
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
Perform the following calculations: 11.6.2.2 Charging Flow	Calculation completed in accordance with key.
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
Perform the following calculations: 11.6.2.3 Letdown Enthalpy	Calculation completed in accordance with key.
Comment:	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
Perform the following calculations: 11.6.2.4 Letdown Specific Volume	Calculation completed in accordance with key.
Comment:	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 6	STANDARD
Perform the following calculations: 11.6.2.5 Letdown Flow	Calculation completed in accordance with key.
Comment:	**<u>Critical</u>** **SAT / UNSAT**

END OF TASK

JPM A1 Key

11.6 CALCULATION OF CHARGING AND LETDOWN PARAMETERS

(typical)
Plant Power ___**100**____%

NOTE

If PMC point is not available, then use alternate indication and document indications used in Remarks.

11.6.1 Record the following data:

STEP	PARAMETER	PMC PID	VALUE	UNITS
11.6.1.1	RCS Pressure	A12205	**2245.4**	PSIA
11.6.1.2	Charging Flow	C26245	**87.7**	GPM
11.6.1.3	Charging Temperature	A39103	**324.4**	°F
11.6.1.4	Charging Pump Discharge Temperature	A39102	**118.5**	°F
11.6.1.5	RCS Loop 2B T Cold	A12120	**542.6**	°F

11.6.2 Perform the following calculations:

11.6.2.1 Charging Enthalpy (K24215) = [1.0705 x (Step 11.6.1.3)] – 50.765 = **296.5 (±0.5)** BTU/lbm

11.6.2.2 Charging Flow (K24214) = $\dfrac{\text{(Step 11.6.1.2) x 8.02}}{\text{.015615 + [0.000004 x (Step 11.6.1.4)]}}$ = **43,716.5 (±0.5)** lbm/hr

11.6.2.3 Letdown Enthalpy (K24203) = [1.2555 x (Step 11.6.1.5)] – 143.37 = **537.9 (±0.1)** BTU/lbm

11.6.2.4 Letdown Specific Volume = .004285 + [0.000031 x (Step 11.6.1.5)] = **0.0211 (±0.0001)** ft^3/lbm

11.6.2.5 Letdown Flow (K24202) = (Step 11.6.2.2) = **43,716.5 (±0.5)** lbm/hr

SIMULATOR OPERATOR INSTRUCTIONS

None.

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- The Plant is at 100% power
- A second Charging Pump has been started

INITIATING CUE(S):

The CRS has directed you to complete OP-004-005, Core Operating Limits Supervisory System Operation, Attachment 11.6, Calculation of Charging and Letdown Parameters, steps 11.6.1 and 11.6.2 using PMC data below.

PMC Group Display Data:

A12205	PZR PRES CNTRL-1	2245.4 PSIA
C26245	CHARGING FLOW CVCIFT0212	87.7 GPM
A39103	CVCS REGEN HX CHG OUTL TEMP	324.4°F
A39102	CVCS CHRG PMPS DISCH TEMP	118.5°F
A12120	RC LOOP 2B COLD LEG TEMP	542.6°F

6.2 CHANGING COLSS CONSTANTS

NOTE

(1) The following active documents are maintained by SM/CRS in the CPC and COLSS Constant Log Book:

- Attachment 11.2, COLSS Point Change Log
- Attachment 11.6, Calculation of Charging and Letdown Parameters
- Attachment 11.7, Changing Blowdown Flow Rate Constants

(2) Following a PMC failure, changes which return constants to their pre-failure values are not required to be logged on Attachment 11.2.

(3) Points K24228 and K24235 are default constants for Steam Generator Blowdown flow. COLSS automatically utilizes a conservative default value if the active point for Blowdown flow should go bad. Therefore, Points K24228 and K24235 should not be updated when changes to Blowdown flow are made. If changing these constants is desired, then change them in accordance with Attachment 11.7.

CAUTION

RX THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

6.2.1 If Charging and Letdown parameters or Blowdown Flow rates are to be changed, then determine the value to be inserted in accordance with Attachment 11.6, Calculation of Charging and Letdown Parameters, or Attachment 11.7, Changing Blowdown Flow Rate Constants, as appropriate.

6.2.2 Record new value to be inserted on Attachment 11.2.

6.2.3 If changing this point is being driven by another document, then obtain Independent Verification that the information was correctly transcribed and the point requires changing according to the driving document.

6.2.3.1 Document Independent Verification on Attachment 11.2.

6.2.4 Obtain SM/CRS permission to perform this section and document authorization on Attachment 11.2.

6.2.5 Display the COLSS Main Menu by using the menu display or by pressing the COLSS key.

11.6 CALCULATION OF CHARGING AND LETDOWN PARAMETERS

(typical)
Plant Power ____________%

NOTE

<u>If</u> PMC point is not available, <u>then</u> use alternate indication <u>and</u> document indications used in Remarks.

11.6.1 Record the following data:

STEP	PARAMETER	PMC PID	VALUE	UNITS
11.6.1.1	RCS Pressure	A12205		PSIA
11.6.1.2	Charging Flow	C26245		GPM
11.6.1.3	Charging Temperature	A39103		°F
11.6.1.4	Charging Pump Discharge Temperature	A39102		°F
11.6.1.5	RCS Loop 2B T Cold	A12120		°F

11.6.2 Perform the following calculations:

11.6.2.1 Charging Enthalpy (K24215) = [1.0705 x (Step 11.6.1.3)] – 50.765 = ________ BTU/lbm

11.6.2.2 Charging Flow (K24214) = $\dfrac{\text{(Step 11.6.1.2) x 8.02}}{\text{.015615 + [0.000004 x (Step 11.6.1.4)]}}$ = ________ lbm/hr

11.6.2.3 Letdown Enthalpy (K24203) = [1.2555 x (Step 11.6.1.5)] – 143.37 = ________ BTU/lbm

11.6.2.4 Letdown Specific Volume = .004285 + [0.000031 x (Step 11.6.1.5)] = ________ ft^3/lbm

11.6.2.5 Letdown Flow (K24202) = (Step 11.6.2.2) = ________ lbm/hr

NOTE

Letdown Flow is set equal to Charging Flow in order to compensate for energy removed by the Controlled Bleed Off flow from the RCP Seals.

11.6.3 Enter changes using Section 6.2, Changing COLSS Constants.

11.6.4 Complete documentation on this attachment.

11.6.5 Place this Attachment in the CPC/COLSS Constant Log Book and transmit old Attachment to Plant Records.

REMARKS: ____

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Calculations performed by: ______________________ (Signature) __________ (Date)

SM/CRS Review: ______________________ (Signature) ______________ (Date/Time)

REQUEST/APPROVAL PAGE

# SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-004-005		REVISION: 027
TITLE: Core Operating Limits Supervisory System Operation		
PROCEDURE OWNER (Position Title): Operations Manager - Support		

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 12/5/2016

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

In section 5.1 added new step 5.1.1 to verify that COLSS loaded addressable constants are correct prior to scheduling COLSS. Also added guidance in this step and in a preceding Note on how to verify COLSS loaded addressable constants are correct. The new step includes substep 5.1.1.1 to notify Nuclear IT and Reactor Engineering to have these addressable constants corrected if they were found to be incorrect and a substep 5.1.1.2 to explicitly limit not proceeding to following steps to schedule COLSS until all COLSS loaded addressable constants are correct. This is supported by a new Caution statement preceding step 5.1.1 which states, "DO NOT PROCEED WITH SCHEDULING OF COLSS UNTIL LOADED ADDRESSABLE CONSTANTS HAVE BEEN VERIFIED TO BE CORRECT OR HAVE BEEN CORRECTED IF THERE WERE ANY DISCREPANCIES".

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			Nicole Blank	11/28/2016
EC SUPERVISOR	Administrative Review and Approval		(sign) [illegible]	12/1/16
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Operations - DPIC		Stephen Smith	12/1/2016
	Engineering - Reactor		Pamela Hernandez	12/1/2016
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐	PA Exclusion ☐	N/A	
TECHNICAL	Review ☐	Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐		N/A	
GROUP/DEPT. HEAD	Review ☐	Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 When the reactor is in Mode 1 above 20% power, the COLSS program must comply with the following Technical Specifications sections:

3.1.1.1 3/4.2.1, Linear Heat Rate

3.1.1.2 3/4.2.2, Planer Radial Peaking Factor

3.1.1.3 3/4.2.3, Azimuthal Power Tilt

3.1.1.4 3/4.2.4, DNBR Margin

3.1.1.5 3/4.2.7, Axial Shape Index

3.1.2 COLSS should be in service prior to criticality to ensure accuracy of incore detector depletion calculations.

3.1.3 COLSS is used to calculate RCS Flow to ensure compliance with TS 4.2.5 (RCS Flow) in Mode 1. NE-004-004, RCS Flow Rate Calculation with COLSS Inoperable may be used to meet this surveillance requirement when COLSS is out of service.

3.1.4 Deleting a COLSS point from scan may result in inaccurate COLSS calculations.

3.1.5 When the reactor is in Mode 1 above 50% power, the UFM must be operable to comply with TRM 3.3.5.

3.2 LIMITATIONS

3.2.1 The following situations define COLSS Out-of-Service conditions. In these situations, refer to OP-901-501, PMC or Core Operating Limit Supervisory System Inoperable:

3.2.1.1 Plant Computer out of service.

3.2.1.2 The failure of redundant sensors of variables that are used in COLSS calculations. The COLSS MASTER annunciator (A-6 on Panel L) will be energized.

3.2.1.3 COLSS in the “unscheduled” mode. The COLSS OUT-OF-SERVICE annunciator (E-6 on Panel L) will be energized.

3.2.2 <u>If</u> a loss of BSCAL occurs (loss of USBSCAL, MSBSCAL, and FWBSCAL), <u>then</u> COLSS should be considered operable <u>provided</u> BTFSP <u>or</u> BDELT remain operable. In this situation, Reactor Engineering should be contacted to determine affects of BSCAL loss on long term operation with power greater than 3660 MWt (98.5%) <u>and</u> to assist in performing manual USBSCAL calculations.

3.2.3 COLSS addressable constants for letdown flow rate (K24202) <u>and</u> charging pump mass flow rate (K24214) should be manually changed when system flow rates are changed. Retain the latest copy of Attachment 11.6, Calculation of Charging and Letdown Parameters, in the CPC and COLSS Constant Log book.

3.2.4 Points K24228 <u>and</u> K24235 are default constants for Steam Generator blowdown flow. COLSS automatically utilizes a conservative default value if the associated active point for blowdown flow (S11403 for SG 1 <u>and</u> S11404 for SG 2) should go bad. Therefore, Points K24228 <u>and</u> K24235 should <u>not</u> be updated when changes to blowdown flow are made. <u>If</u> changing the blowdown constants are desired, <u>then</u> change them in accordance with Attachment 11.7, Changing Blowdown Flow Rate Constants.

3.2.5 Reactor Engineering should be contacted <u>prior</u> to scheduling COLSS to determine if the COLSS program should be halted <u>and</u> restarted to ensure an accurate power history is applied to the various COLSS functions.

3.2.6 No valid reports are available with COLSS in the “unscheduled” mode.

3.2.7 <u>If</u> <u>both</u> the primary and redundant sensors fail, <u>then</u> the COLSS program will continue, with bad quality indication for affected calculations <u>and</u> the COLSS MASTER annunciator will be actuated.

3.2.8 Following a Plant Monitoring Computer failure, ensure the COLSS constants listed in the COLSS Constant Log Book which have <u>not</u> been installed in the database are reinserted. It is <u>not</u> necessary to make a new entry when returning these constants to their pre-failure value.

3.2.9 A dropped or misaligned CEA can energize the COLSS MASTER annunciator (A-6 on panel L). Refer to actions required by Technical Specification 3.1.3.1 and OP-901-102, CEA or CEDMCS Malfunction.

3.2.10 On a sensor failure, the computer will select a redundant input, if possible, <u>and</u> will flag the failed sensor on the Alarm CRT.

3.2.11 Hardware maintenance <u>or</u> a failure at an RA 2104 halfsite has the potential to corrupt CEA pulse counter indications which will affect COLSS operability. A PMC Reboot <u>or</u> Failure should <u>not</u> corrupt CEA indications unless an RA 2104 halfsite has been out of service while CEA’s were being moved.

3.2.12 <u>If</u> USBSCAL is <u>not</u> in service, <u>then</u> COLSS Steam calorimetric will automatically enable <u>when</u> MSBSCAL (PMC PID C24246) is greater than or equal to 95% power <u>and</u> will automatically disable <u>when</u> MSBSCAL drops below 95% power.

3.2.13 <u>If</u> USBSCAL is <u>not</u> in service, there may be a step change in indicated plant power of approximately 1.0% <u>when</u> COLSS Steam Calorimetric is enabled or disabled.

3.2.14 USBSCAL calibrates FWBSCAL and MSBSCAL periodically (approximately every 60 minutes). Therefore, when USBSCAL is restored to service there may be a temporary power deviation between USBSCAL and FWBSCAL or MSBSCAL. Calibrations will not occur during power movements of greater than 1% per hour when smoothing is in effect (>98%).

3.2.15 When calibrations of FWBSCAL and MSBSCAL stop due to an unknown reason, then contact Reactor Engineering to investigate cause. The UFM remains operable, but the time in which calibrations have stopped should be limited due to the potential for a UFM failure and a more restrictive time being available for returning the UFM to service. The following are indications and some potential causes for the loss of calibration update:

- B24009 UFM CAL STOP W/USBSCAL INSERV (BOOL1)

  (calibrations stopped, USBSCAL in service)
- B24010 UFM CALIBRATIONS STOPPED (BOOL2)

  (calibrations stopped, USBSCAL may or may not be in service)
- B24005 UFM BD FLW SUBSTITUTE OR BAD (BDNMAN)

  (PMC PID S11403 or S11404 having quality other than “GOOD”)
- B24007 MSBSCAL/MSBSRAW MISMATCH (ALARMPR)

  (power greater than 98% and mismatch between C24631 and C24246 greater than 0.5%)

3.2.16 Calibrations will stop when steam flow or feedwater flow is bad.

6.2 CHANGING COLSS CONSTANTS

NOTE

(1) The following active documents are maintained by SM/CRS in the CPC and COLSS Constant Log Book:

- Attachment 11.2, COLSS Point Change Log
- Attachment 11.6, Calculation of Charging and Letdown Parameters
- Attachment 11.7, Changing Blowdown Flow Rate Constants

(2) Following a PMC failure, changes which return constants to their pre-failure values are not required to be logged on Attachment 11.2.

(3) Points K24228 and K24235 are default constants for Steam Generator Blowdown flow. COLSS automatically utilizes a conservative default value if the active point for Blowdown flow should go bad. Therefore, Points K24228 and K24235 should not be updated when changes to Blowdown flow are made. If changing these constants is desired, then change them in accordance with Attachment 11.7.

CAUTION

RX THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

6.2.1 If Charging and Letdown parameters or Blowdown Flow rates are to be changed, then determine the value to be inserted in accordance with Attachment 11.6, Calculation of Charging and Letdown Parameters, or Attachment 11.7, Changing Blowdown Flow Rate Constants, as appropriate.

6.2.2 Record new value to be inserted on Attachment 11.2.

6.2.3 If changing this point is being driven by another document, then obtain Independent Verification that the information was correctly transcribed and the point requires changing according to the driving document.

6.2.3.1 Document Independent Verification on Attachment 11.2.

6.2.4 Obtain SM/CRS permission to perform this section and document authorization on Attachment 11.2.

6.2.5 Display the COLSS Main Menu by using the menu display or by pressing the COLSS key.

11.6 CALCULATION OF CHARGING AND LETDOWN PARAMETERS

(typical)
Plant Power ____________%

NOTE

If PMC point is not available, then use alternate indication and document indications used in Remarks.

11.6.1 Record the following data:

STEP	PARAMETER	PMC PID	VALUE	UNITS
11.6.1.1	RCS Pressure	A12205		PSIA
11.6.1.2	Charging Flow	C26245		GPM
11.6.1.3	Charging Temperature	A39103		°F
11.6.1.4	Charging Pump Discharge Temperature	A39102		°F
11.6.1.5	RCS Loop 2B T Cold	A12120		°F

11.6.2 Perform the following calculations:

11.6.2.1 Charging Enthalpy (K24215) = [1.0705 x (Step 11.6.1.3)] – 50.765 = ________ BTU/lbm

11.6.2.2 Charging Flow (K24214) = $\dfrac{\text{(Step 11.6.1.2) x 8.02}}{\text{.015615 + [0.000004 x (Step 11.6.1.4)]}}$ = ________ lbm/hr

11.6.2.3 Letdown Enthalpy (K24203) = [1.2555 x (Step 11.6.1.5)] – 143.37 = ________ BTU/lbm

11.6.2.4 Letdown Specific Volume = .004285 + [0.000031 x (Step 11.6.1.5)] = ________ ft^3/lbm

11.6.2.5 Letdown Flow (K24202) = (Step 11.6.2.2) = ________ lbm/hr

NOTE

Letdown Flow is set equal to Charging Flow in order to compensate for energy removed by the Controlled Bleed Off flow from the RCP Seals.

11.6.3 Enter changes using Section 6.2, Changing COLSS Constants.

11.6.4 Complete documentation on this attachment.

11.6.5 Place this Attachment in the CPC/COLSS Constant Log Book and transmit old Attachment to Plant Records.

REMARKS: ____

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Calculations performed by: ______________________ (Signature) __________ (Date)

SM/CRS Review: ______________________ (Signature) __________ (Date/Time)

Waterford 3

2017 RO NRC Exam

JOB PERFORMANCE MEASURE

A2

Determine time to boil and time to core uncovery per OP-901-131, Shutdown Cooling Malfunction

Applicant: ____________________________________

Examiner: ____________________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Determine time to boil and time to core uncovery per OP-901-131, Shutdown Cooling Malfunction.

Task Standard: Determined time after shutdown, time to boil and time to core uncovery per OP-901-131, Shutdown Cooling Malfunction.

References: OP-901-131, revision 304

Alternate Path: No Time Critical: No Validation Time: 12 min

K/A 2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation.

Importance Rating 4.3
RO

Applicant: ______________________________

Time Start: __________________ Time Finish: __________________

Performance Time: __________________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____

____

____

Examiner: ________________________________ Date: ________________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-901-131, Shutdown Cooling Malfunction
- Personal computer or laptop (with wifi/LAN deactivated)
- Standard electronic references thumb drive (eCart)
- Handouts (only if paper copy is requested):
  - Handout 1 (Time to Boil Tables)
  - Handout 2 (Time to Core Uncovery Graphs)

Description:
This JPM requires the applicant to determine the time the reactor has been shutdown and then using tables and graphs in OP-901-131, Shutdown Cooling Malfunction, determine the time for the water in the reactor to boil and the time for core uncovery.

READ TO APPLICANT

DIRECTION TO APPLICANT:

Each administrative JPM has a cue sheet with the instructions for that JPM. Each administrative JPM stands alone, and conditions from 1 JPM do not carry over to any other JPM. If you have any questions, raise your hand and I will come to your desk.

Provide all answers on the sheets provided.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

Evaluator Note
The applicant should be able to make all determinations using the electronic copy of OP-901-131, Shutdown Cooling Malfunction. Handout 1 (Time to Boil Tables) and Handout 2 (Time to Core Uncovery Graphs) are available should the applicant request a paper copy of either or both. Do not hand out unless the applicant requests the specific attachment(s).

TASK ELEMENT 1	STANDARD
Determined time after shutdown in days using information in the cue sheet.	17 days
Comment: Examiner note: The applicant must correctly determine time after shutdown as 17 days in order to determine the correct time to boil in Task Element 2, but it is not critical for the applicant to document the time after shutdown.	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
Determined RCS time to boil using tables on Attachment 2 of OP-901-131, Shutdown Cooling Malfunction.	34.3 minutes
Comment: Examiner note: This action is normally directed by OP-901-131, Section E2, step 10. The applicant will use time after shutdown, knowledge of RCS elevations (i.e. Top of Hot Leg = 15.13 FT), and data provided in the cue sheet to determine time to boil. The correct time is found on page 5 of Attachment 2 of OP-901-131, Shutdown Cooling Malfunction. Refer to answer key.	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
Determined time for core uncovery using graphs on Attachment 3 of OP-901-131, Shutdown Cooling Malfunction.	2.85 - 2.90 hours
Comment: Examiner note: This action is normally directed by OP-901-131, Section E0, step 7.The applicant will use time after shutdown and data provided in the cue sheet to determine time to core uncovery. The correct time is found using the first graph of Attachment 3 of OP-901-131, Shutdown Cooling Malfunction. Refer to answer key.	**Critical** **SAT / UNSAT**

END OF TASK

SIMULATOR OPERATOR INSTRUCTIONS

None.

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- Today's date and time are 3/27/2017, 1300
- The reactor was shutdown on 3/10/2017 at 1300
- Plant is in Mode 5 for a refueling outage
- RCS Temperature is 110°F
- RCS Level is 15.13 FT
- Pressurizer manway is removed
- Steam Generator nozzle dams are installed
- A loss of Shutdown cooling has occurred
- The crew has entered OP-901-131, Shutdown Cooling Malfunction

INITIATING CUE(S):

The CRS directs you to determine RCS time to boil <u>and</u> the time to core uncovery in accordance with OP-901-131, Shutdown Cooling Malfunction.

Document the results on this cue sheet.

Time to boil: _______________

Time to core uncovery: _______________

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL

Tem(F)	90	90	90	90	90	90	90	90	90
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	11.1	13.5	15.2	16.6	69.1	79.6	95.3	111.1	121.6
2.0	13.8	16.7	18.8	20.6	85.6	98.6	118.1	137.6	150.6
3.0	15.7	18.9	21.3	23.4	97.1	111.9	134.0	156.1	170.9
4.0	17.6	21.2	23.9	26.2	108.9	125.5	150.3	175.1	191.7
5.0	19.5	23.6	26.6	29.1	121.2	139.6	167.2	194.8	213.2
6.0	21.1	25.5	28.7	31.4	130.6	150.4	180.2	210.0	229.8
7.0	22.8	27.6	31.0	34.0	141.4	162.9	195.1	227.3	248.8
8.0	24.1	29.1	32.8	35.9	149.3	172.0	206.0	240.1	262.7
9.0	25.5	30.8	34.7	38.1	158.2	182.3	218.3	254.4	278.4
10.0	26.7	32.3	36.3	39.8	165.7	190.8	228.6	266.3	291.5
11.0	27.9	33.7	37.9	41.6	172.8	199.1	238.5	277.9	304.1
12.0	29.0	35.0	39.4	43.2	179.5	206.8	247.7	288.6	315.9
13.0	29.8	36.1	40.6	44.5	185.1	213.2	255.4	297.6	325.7
14.0	30.8	37.2	41.9	45.9	191.0	220.0	263.5	307.1	336.1
15.0	31.8	38.5	43.3	47.5	197.3	227.3	272.2	317.2	347.2
16.0	32.9	39.8	44.8	49.1	204.1	235.1	281.5	328.0	359.0
17.0	34.1	41.2	46.4	50.8	211.3	243.4	291.5	339.6	371.7
18.0	35.0	42.3	47.6	52.2	217.0	249.9	299.4	348.8	381.8
19.0	35.8	43.2	48.7	53.3	221.8	255.5	306.0	356.6	390.3
20.0	36.6	44.2	49.8	54.6	226.9	261.3	313.0	364.7	399.2
21.0	37.4	45.3	50.9	55.8	232.2	267.4	320.3	373.2	408.5
22.0	38.3	46.3	52.2	57.2	237.7	273.8	328.0	382.1	418.2
23.0	39.3	47.5	53.4	58.6	243.5	280.5	336.0	391.5	428.5
24.0	39.9	48.2	54.2	59.4	247.1	284.7	341.0	397.3	434.8
25.0	40.4	48.8	55.0	60.2	250.4	288.5	345.5	402.6	440.7
26.0	40.9	49.5	55.7	61.0	253.8	292.4	350.2	408.1	446.6
27.0	41.5	50.2	56.5	61.9	257.3	296.4	355.0	413.7	452.7
28.0	42.1	50.9	57.2	62.7	260.9	300.5	360.0	419.4	459.0
29.0	42.7	51.6	58.1	63.6	264.6	304.8	365.1	425.3	465.5
30.0	43.3	52.3	58.9	64.5	268.4	309.1	370.3	431.4	472.2
31.0	43.9	53.1	59.7	65.5	272.3	313.6	375.7	437.7	479.0
32.0	44.6	53.9	60.6	66.4	276.3	318.2	381.2	444.1	486.1
33.0	45.2	54.7	61.5	67.4	280.4	323.0	386.9	450.8	493.4
34.0	45.9	55.5	62.5	68.5	284.7	327.9	392.8	457.6	500.9
35.0	46.6	56.3	63.4	69.5	289.1	333.0	398.8	464.7	508.6
36.0	47.3	57.2	64.4	70.6	293.6	338.2	405.1	472.0	516.6
37.0	48.1	58.1	65.4	71.7	298.3	343.6	411.5	479.5	524.8
38.0	48.9	59.1	66.5	72.9	303.1	349.1	418.2	487.2	533.3
39.0	49.7	60.0	67.6	74.1	308.1	354.8	425.0	495.2	542.0
40.0	50.5	61.1	68.7	75.3	313.2	360.8	432.1	503.5	551.1
41.0	51.4	62.1	69.9	76.6	318.5	366.9	439.5	512.1	560.4
42.0	52.3	63.2	71.1	77.9	324.0	373.2	447.1	520.9	570.1
43.0	53.2	64.3	72.3	79.3	329.7	379.8	454.9	530.1	580.2
44.0	54.1	65.4	73.6	80.7	335.6	386.6	463.1	539.6	590.5
45.0	55.1	66.6	75.0	82.2	341.8	393.7	471.5	549.4	601.3
46.0	56.1	67.9	76.4	83.7	348.1	401.0	480.3	559.6	612.5
47.0	56.8	68.6	77.3	84.7	352.2	405.7	485.9	566.2	619.7
48.0	57.3	69.3	78.0	85.4	355.3	409.3	490.2	571.2	625.1
49.0	57.8	69.9	78.7	86.2	358.5	412.9	494.6	576.3	630.7
50.0	58.3	70.5	79.4	87.0	361.7	416.6	499.0	581.5	636.4
51.0	58.9	71.1	80.1	87.8	365.0	420.4	503.6	586.7	642.2
52.0	59.4	71.8	80.8	88.6	368.3	424.3	508.2	592.1	648.1
53.0	59.9	72.5	81.6	89.4	371.7	428.2	512.9	597.6	654.1
54.0	60.5	73.1	82.3	90.2	375.2	432.2	517.7	603.2	660.2

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	90	90	90	90	90	90	90	90	90
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
55.0	61.1	73.8	83.1	91.1	378.7	436.3	522.6	608.9	666.4
56.0	61.7	74.5	83.9	92.0	382.3	440.4	527.5	614.7	672.7
57.0	62.3	75.2	84.7	92.8	386.0	444.7	532.6	620.6	679.2
58.0	62.9	76.0	85.5	93.7	389.8	449.0	537.8	626.6	685.8
59.0	63.5	76.7	86.4	94.7	393.6	453.4	543.1	632.7	692.5
60.0	64.1	77.5	87.2	95.6	397.5	457.9	548.4	639.0	699.4
61.0	64.7	78.3	88.1	96.5	401.5	462.4	553.9	645.4	706.4
62.0	65.4	79.0	89.0	97.5	405.5	467.1	559.5	651.9	713.5
63.0	66.1	79.8	89.9	98.5	409.6	471.9	565.2	658.5	720.8
64.0	66.7	80.7	90.8	99.5	413.9	476.7	571.0	665.3	728.2
65.0	67.4	81.5	91.8	100.6	418.2	481.7	577.0	672.3	735.8
66.0	68.1	82.4	92.7	101.6	422.6	486.8	583.0	679.3	743.5
67.0	68.9	83.2	93.7	102.7	427.1	491.9	589.2	686.5	751.4
68.0	69.6	84.1	94.7	103.8	431.7	497.2	595.6	693.9	759.5
69.0	70.4	85.1	95.7	104.9	436.3	502.6	602.0	701.5	767.7
70.0	71.0	85.8	96.6	105.8	440.0	506.9	607.2	707.4	774.3
71.0	71.4	86.3	97.2	106.5	442.9	510.2	611.2	712.1	779.4
72.0	71.9	86.9	97.8	107.2	445.9	513.6	615.2	716.8	784.5
73.0	72.4	87.5	98.5	107.9	448.8	517.0	619.3	721.6	789.8
74.0	72.9	88.1	99.1	108.7	451.9	520.5	623.5	726.4	795.1
75.0	73.4	88.7	99.8	109.4	454.9	524.0	627.7	731.3	800.4
76.0	73.9	89.3	100.5	110.1	458.0	527.6	631.9	736.3	805.9
77.0	74.4	89.9	101.2	110.9	461.1	531.2	636.3	741.3	811.4
78.0	74.9	90.5	101.9	111.7	464.3	534.9	640.7	746.5	817.0
79.0	75.4	91.1	102.6	112.4	467.6	538.6	645.1	751.6	822.7
80.0	75.9	91.8	103.3	113.2	470.8	542.3	649.6	756.9	828.4
81.0	76.5	92.4	104.0	114.0	474.1	546.2	654.2	762.2	834.2
82.0	77.0	93.1	104.8	114.8	477.5	550.0	658.8	767.6	840.2
83.0	77.6	93.7	105.5	115.7	480.9	554.0	663.5	773.1	846.2
84.0	78.1	94.4	106.3	116.5	484.4	557.9	668.3	778.7	852.2
85.0	78.7	95.1	107.0	117.3	487.9	562.0	673.2	784.3	858.4
86.0	79.3	95.8	107.8	118.2	491.4	566.1	678.1	790.0	864.7
87.0	79.8	96.5	108.6	119.1	495.1	570.3	683.0	795.8	871.0
88.0	80.4	97.2	109.4	119.9	498.7	574.5	688.1	801.7	877.5
89.0	81.0	97.9	110.2	120.8	502.4	578.8	693.2	807.7	884.0
90.0	81.6	98.7	111.1	121.7	506.2	583.1	698.5	813.8	890.7
91.0	82.3	99.4	111.9	122.7	510.1	587.5	703.7	820.0	897.4
92.0	82.9	100.2	112.8	123.6	513.9	592.0	709.1	826.2	904.3
93.0	83.4	100.9	113.5	124.4	517.4	596.0	713.9	831.8	910.4
94.0	83.9	101.4	114.1	125.1	520.2	599.2	717.7	836.3	915.3
95.0	84.3	101.9	114.8	125.8	523.0	602.5	721.6	840.8	920.2
96.0	84.8	102.5	115.4	126.5	525.9	605.7	725.6	845.4	925.3
97.0	85.3	103.1	116.0	127.2	528.7	609.1	729.5	850.0	930.3
98.0	85.7	103.6	116.7	127.9	531.7	612.4	733.5	854.7	935.4
99.0	86.2	104.2	117.3	128.6	534.6	615.8	737.6	859.4	940.6
100.0	86.7	104.8	118.0	129.3	537.6	619.2	741.7	864.2	945.9

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	100	100	100	100	100	100	100	100	100
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	10.2	12.3	13.9	15.2	63.3	72.9	87.3	101.8	111.4
2.0	12.7	15.3	17.2	18.9	78.4	90.3	108.2	126.1	138.0
3.0	14.4	17.3	19.5	21.4	89.0	102.5	122.8	143.0	156.6
4.0	16.1	19.5	21.9	24.0	99.8	115.0	137.7	160.5	175.6
5.0	17.9	21.6	24.4	26.7	111.0	127.9	153.2	178.5	195.3
6.0	19.3	23.3	26.3	28.8	119.7	137.8	165.1	192.4	210.6
7.0	20.9	25.3	28.4	31.2	129.6	149.2	178.7	208.3	227.9
8.0	22.1	26.7	30.0	32.9	136.8	157.6	188.8	220.0	240.8
9.0	23.4	28.3	31.8	34.9	145.0	167.0	200.0	233.1	255.1
10.0	24.5	29.6	33.3	36.5	151.8	174.9	209.4	244.0	267.1
11.0	25.5	30.9	34.8	38.1	158.4	182.4	218.5	254.6	278.7
12.0	26.5	32.1	36.1	39.6	164.5	189.5	227.0	264.5	289.4
13.0	27.4	33.1	37.2	40.8	169.6	195.4	234.0	272.7	298.4
14.0	28.2	34.1	38.4	42.1	175.0	201.6	241.5	281.4	308.0
15.0	29.2	35.3	39.7	43.5	180.8	208.3	249.5	290.7	318.1
16.0	30.2	36.5	41.0	45.0	187.0	215.4	258.0	300.6	329.0
17.0	31.2	37.7	42.5	46.6	193.6	223.0	267.1	311.2	340.6
18.0	32.1	38.8	43.6	47.8	198.8	229.0	274.3	319.6	349.8
19.0	32.8	39.6	44.6	48.9	203.3	234.1	280.4	326.7	357.6
20.0	33.5	40.5	45.6	50.0	207.9	239.5	286.8	334.2	365.8
21.0	34.3	41.5	46.7	51.2	212.7	245.0	293.5	342.0	374.3
22.0	35.1	42.5	47.8	52.4	217.8	250.9	300.5	350.1	383.2
23.0	36.0	43.5	49.0	53.7	223.1	257.0	307.9	358.7	392.6
24.0	36.5	44.2	49.7	54.5	226.5	260.9	312.5	364.0	398.4
25.0	37.0	44.7	50.4	55.2	229.5	264.3	316.6	368.9	403.8
26.0	37.5	45.3	51.0	55.9	232.6	267.9	320.9	373.9	409.2
27.0	38.0	46.0	51.7	56.7	235.8	271.6	325.3	379.0	414.9
28.0	38.6	46.6	52.5	57.5	239.1	275.4	329.8	384.3	420.6
29.0	39.1	47.3	53.2	58.3	242.4	279.3	334.5	389.7	426.6
30.0	39.7	47.9	54.0	59.2	245.9	283.3	339.3	395.3	432.7
31.0	40.2	48.6	54.8	60.0	249.5	287.4	344.2	401.1	439.0
32.0	40.8	49.4	55.6	60.9	253.2	291.6	349.3	407.0	445.4
33.0	41.4	50.1	56.4	61.8	256.9	296.0	354.5	413.1	452.1
34.0	42.1	50.9	57.2	62.7	260.8	300.5	359.9	419.3	458.9
35.0	42.7	51.6	58.1	63.7	264.9	305.1	365.4	425.8	466.0
36.0	43.4	52.5	59.0	64.7	269.0	309.9	371.2	432.5	473.3
37.0	44.1	53.3	60.0	65.7	273.3	314.8	377.1	439.3	480.9
38.0	44.8	54.1	60.9	66.8	277.7	319.9	383.2	446.4	488.6
39.0	45.5	55.0	62.0	67.9	282.3	325.2	389.5	453.8	496.7
40.0	46.3	56.0	63.0	69.0	287.0	330.6	396.0	461.4	505.0
41.0	47.1	56.9	64.1	70.2	291.9	336.2	402.7	469.2	513.5
42.0	47.9	57.9	65.2	71.4	296.9	342.0	409.7	477.3	522.4
43.0	48.7	58.9	66.3	72.7	302.1	348.0	416.9	485.7	531.6
44.0	49.6	60.0	67.5	74.0	307.5	354.3	424.3	494.4	541.1
45.0	50.5	61.1	68.7	75.3	313.2	360.7	432.1	503.4	551.0
46.0	51.5	62.2	70.0	76.7	319.0	367.4	440.1	512.8	561.2
47.0	52.1	62.9	70.8	77.6	322.7	371.7	445.3	518.8	567.8
48.0	52.5	63.5	71.5	78.3	325.6	375.0	449.2	523.4	572.8
49.0	53.0	64.0	72.1	79.0	328.5	378.4	453.2	528.0	577.9
50.0	53.5	64.6	72.7	79.7	331.4	381.8	457.3	532.8	583.1
51.0	53.9	65.2	73.4	80.4	334.4	385.2	461.4	537.6	588.4
52.0	54.4	65.8	74.1	81.2	337.5	388.8	465.7	542.6	593.8
53.0	54.9	66.4	74.8	81.9	340.6	392.4	470.0	547.6	599.3
54.0	55.5	67.0	75.5	82.7	343.8	396.0	474.4	552.7	604.9
55.0	56.0	67.7	76.2	83.5	347.1	399.8	478.8	557.9	610.6
56.0	56.5	68.3	76.9	84.3	350.4	403.6	483.4	563.2	616.4

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	100	100	100	100	100	100	100	100	100
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	57.1	69.0	77.6	85.1	353.7	407.5	488.0	568.6	622.4
58.0	57.6	69.6	78.4	85.9	357.2	411.4	492.8	574.2	628.4
59.0	58.2	70.3	79.2	86.8	360.7	415.4	497.6	579.8	634.6
60.0	58.8	71.0	79.9	87.6	364.2	419.5	502.5	585.5	640.8
61.0	59.3	71.7	80.7	88.5	367.9	423.7	507.6	591.4	647.2
62.0	59.9	72.4	81.5	89.4	371.6	428.0	512.7	597.3	653.8
63.0	60.6	73.2	82.4	90.3	375.4	432.4	517.9	603.4	660.4
64.0	61.2	73.9	83.2	91.2	379.2	436.8	523.2	609.6	667.2
65.0	61.8	74.7	84.1	92.2	383.2	441.4	528.7	616.0	674.2
66.0	62.5	75.5	85.0	93.1	387.2	446.0	534.2	622.5	681.3
67.0	63.1	76.3	85.9	94.1	391.3	450.8	539.9	629.1	688.5
68.0	63.8	77.1	86.8	95.1	395.5	455.6	545.7	635.8	695.9
69.0	64.5	78.0	87.7	96.2	399.8	460.6	551.7	642.8	703.5
70.0	65.0	78.6	88.5	97.0	403.2	464.5	556.3	648.2	709.5
71.0	65.5	79.1	89.1	97.6	405.9	467.5	560.0	652.5	714.1
72.0	65.9	79.7	89.7	98.3	408.6	470.6	563.7	656.8	718.9
73.0	66.3	80.2	90.3	98.9	411.3	473.8	567.5	661.2	723.6
74.0	66.8	80.7	90.9	99.6	414.1	476.9	571.3	665.6	728.5
75.0	67.2	81.3	91.5	100.3	416.8	480.2	575.1	670.1	733.4
76.0	67.7	81.8	92.1	101.0	419.7	483.4	579.1	674.7	738.4
77.0	68.2	82.4	92.7	101.6	422.6	486.7	583.0	679.3	743.5
78.0	68.6	83.0	93.4	102.3	425.5	490.1	587.0	684.0	748.6
79.0	69.1	83.5	94.0	103.1	428.4	493.5	591.1	688.7	753.8
80.0	69.6	84.1	94.7	103.8	431.4	497.0	595.2	693.5	759.1
81.0	70.1	84.7	95.3	104.5	434.5	500.5	599.4	698.4	764.4
82.0	70.6	85.3	96.0	105.2	437.5	504.0	603.7	703.4	769.8
83.0	71.1	85.9	96.7	106.0	440.7	507.6	608.0	708.4	775.3
84.0	71.6	86.5	97.4	106.8	443.8	511.3	612.4	713.5	780.9
85.0	72.1	87.2	98.1	107.5	447.1	515.0	616.8	718.7	786.6
86.0	72.6	87.8	98.8	108.3	450.3	518.7	621.3	723.9	792.3
87.0	73.2	88.4	99.6	109.1	453.6	522.5	625.9	729.2	798.1
88.0	73.7	89.1	100.3	109.9	457.0	526.4	630.5	734.6	804.1
89.0	74.3	89.8	101.0	110.7	460.4	530.3	635.2	740.1	810.1
90.0	74.8	90.4	101.8	111.6	463.9	534.3	640.0	745.7	816.1
91.0	75.4	91.1	102.6	112.4	467.4	538.4	644.8	751.3	822.3
92.0	76.0	91.8	103.4	113.3	470.9	542.5	649.8	757.1	828.6
93.0	76.5	92.4	104.1	114.0	474.1	546.1	654.1	762.2	834.2
94.0	76.9	92.9	104.6	114.7	476.7	549.1	657.7	766.3	838.7
95.0	77.3	93.4	105.2	115.3	479.2	552.0	661.2	770.4	843.2
96.0	77.7	93.9	105.8	115.9	481.9	555.0	664.8	774.6	847.8
97.0	78.2	94.5	106.3	116.5	484.5	558.1	668.5	778.9	852.5
98.0	78.6	95.0	106.9	117.2	487.2	561.2	672.2	783.1	857.1
99.0	79.0	95.5	107.5	117.8	489.9	564.3	675.9	787.5	861.9
100.0	79.5	96.0	108.1	118.5	492.6	567.4	679.6	791.9	866.7

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	110	110	110	110	110	110	110	110	110
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	9.3	11.2	12.6	13.8	57.5	66.3	79.4	92.5	101.2
2.0	11.5	13.9	15.6	17.1	71.3	82.1	98.3	114.6	125.4
3.0	13.0	15.8	17.8	19.5	80.9	93.1	111.6	130.0	142.3
4.0	14.6	17.7	19.9	21.8	90.7	104.5	125.2	145.8	159.6
5.0	16.3	19.7	22.1	24.3	100.9	116.2	139.2	162.2	177.5
6.0	17.6	21.2	23.9	26.2	108.8	125.3	150.1	174.8	191.3
7.0	19.0	23.0	25.8	28.3	117.7	135.6	162.4	189.3	207.1
8.0	20.1	24.3	27.3	29.9	124.4	143.2	171.6	199.9	218.8
9.0	21.3	25.7	28.9	31.7	131.8	151.8	181.8	211.8	231.8
10.0	22.3	26.9	30.3	33.2	138.0	158.9	190.3	221.8	242.7
11.0	23.2	28.1	31.6	34.6	143.9	165.8	198.6	231.4	253.3
12.0	24.1	29.2	32.8	36.0	149.5	172.2	206.3	240.3	263.0
13.0	24.9	30.1	33.8	37.1	154.1	177.5	212.7	247.8	271.2
14.0	25.7	31.0	34.9	38.3	159.1	183.2	219.5	255.7	279.9
15.0	26.5	32.0	36.1	39.5	164.3	189.3	226.7	264.1	289.1
16.0	27.4	33.1	37.3	40.9	169.9	195.7	234.5	273.2	299.0
17.0	28.4	34.3	38.6	42.3	175.9	202.7	242.7	282.8	309.5
18.0	29.2	35.2	39.7	43.5	180.7	208.1	249.3	290.5	317.9
19.0	29.8	36.0	40.5	44.4	184.7	212.8	254.9	296.9	325.0
20.0	30.5	36.8	41.5	45.5	188.9	217.6	260.7	303.7	332.4
21.0	31.2	37.7	42.4	46.5	193.3	222.7	266.7	310.8	340.1
22.0	31.9	38.6	43.5	47.6	197.9	228.0	273.1	318.2	348.3
23.0	32.7	39.5	44.5	48.8	202.8	233.6	279.8	326.0	356.8
24.0	33.2	40.1	45.2	49.5	205.8	237.1	284.0	330.8	362.1
25.0	33.7	40.7	45.8	50.2	208.6	240.2	287.7	335.3	366.9
26.0	34.1	41.2	46.4	50.9	211.4	243.5	291.6	339.8	371.9
27.0	34.6	41.8	47.0	51.6	214.3	246.8	295.6	344.5	377.0
28.0	35.1	42.4	47.7	52.3	217.3	250.3	299.8	349.3	382.3
29.0	35.6	43.0	48.4	53.0	220.3	253.8	304.0	354.2	387.7
30.0	36.1	43.6	49.1	53.8	223.5	257.4	308.3	359.3	393.2
31.0	36.6	44.2	49.8	54.5	226.7	261.2	312.8	364.5	398.9
32.0	37.1	44.9	50.5	55.4	230.1	265.0	317.4	369.8	404.8
33.0	37.7	45.5	51.3	56.2	233.5	269.0	322.2	375.4	410.8
34.0	38.3	46.2	52.0	57.0	237.1	273.1	327.1	381.1	417.1
35.0	38.8	46.9	52.8	57.9	240.7	277.3	332.1	387.0	423.5
36.0	39.5	47.7	53.7	58.8	244.5	281.6	337.3	393.0	430.1
37.0	40.1	48.4	54.5	59.8	248.4	286.1	342.7	399.3	437.0
38.0	40.7	49.2	55.4	60.7	252.4	290.7	348.2	405.7	444.1
39.0	41.4	50.0	56.3	61.7	256.5	295.5	353.9	412.4	451.4
40.0	42.1	50.9	57.3	62.8	260.8	300.4	359.9	419.3	458.9
41.0	42.8	51.7	58.2	63.8	265.3	305.5	366.0	426.4	466.7
42.0	43.5	52.6	59.2	64.9	269.8	310.8	372.3	433.8	474.8
43.0	44.3	53.6	60.3	66.1	274.6	316.3	378.8	441.4	483.1
44.0	45.1	54.5	61.4	67.2	279.5	322.0	385.6	449.3	491.8
45.0	45.9	55.5	62.5	68.5	284.6	327.8	392.7	457.5	500.7
46.0	46.8	56.5	63.6	69.7	289.9	333.9	399.9	466.0	510.0
47.0	47.3	57.2	64.4	70.6	293.3	337.8	404.6	471.5	516.0
48.0	47.7	57.7	65.0	71.2	295.9	340.8	408.2	475.6	520.6
49.0	48.2	58.2	65.5	71.8	298.5	343.9	411.9	479.9	525.2
50.0	48.6	58.7	66.1	72.5	301.2	347.0	415.6	484.2	529.9
51.0	49.0	59.3	66.7	73.1	303.9	350.1	419.3	488.6	534.8
52.0	49.5	59.8	67.3	73.8	306.7	353.3	423.2	493.1	539.7
53.0	50.0	60.4	68.0	74.5	309.6	356.6	427.1	497.6	544.7
54.0	50.4	60.9	68.6	75.2	312.5	359.9	431.1	502.3	549.7
55.0	50.9	61.5	69.2	75.9	315.4	363.3	435.2	507.0	554.9
56.0	51.4	62.1	69.9	76.6	318.4	366.8	439.3	511.8	560.2

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	110	110	110	110	110	110	110	110	110
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	51.9	62.7	70.6	77.3	321.5	370.3	443.5	516.8	565.6
58.0	52.4	63.3	71.3	78.1	324.6	373.9	447.8	521.8	571.1
59.0	52.9	63.9	72.0	78.9	327.8	377.5	452.2	526.9	576.7
60.0	53.4	64.6	72.7	79.6	331.0	381.3	456.7	532.1	582.4
61.0	53.9	65.2	73.4	80.4	334.3	385.1	461.3	537.4	588.2
62.0	54.5	65.9	74.1	81.2	337.7	389.0	465.9	542.8	594.1
63.0	55.0	66.5	74.9	82.1	341.1	392.9	470.7	548.4	600.2
64.0	55.6	67.2	75.7	82.9	344.6	397.0	475.5	554.0	606.4
65.0	56.2	67.9	76.4	83.8	348.2	401.1	480.5	559.8	612.7
66.0	56.8	68.6	77.2	84.7	351.9	405.3	485.5	565.7	619.1
67.0	57.4	69.4	78.1	85.6	355.6	409.7	490.7	571.7	625.7
68.0	58.0	70.1	78.9	86.5	359.5	414.1	495.9	577.8	632.4
69.0	58.6	70.9	79.8	87.4	363.4	418.6	501.3	584.1	639.3
70.0	59.1	71.5	80.4	88.2	366.5	422.1	505.6	589.1	644.7
71.0	59.5	71.9	81.0	88.7	368.9	424.9	508.9	593.0	649.0
72.0	59.9	72.4	81.5	89.3	371.3	427.7	512.3	596.9	653.3
73.0	60.3	72.9	82.1	89.9	373.8	430.6	515.7	600.9	657.6
74.0	60.7	73.4	82.6	90.5	376.3	433.4	519.2	604.9	662.1
75.0	61.1	73.9	83.2	91.1	378.8	436.4	522.7	609.0	666.5
76.0	61.5	74.4	83.7	91.8	381.4	439.3	526.2	613.1	671.1
77.0	62.0	74.9	84.3	92.4	384.0	442.3	529.8	617.3	675.7
78.0	62.4	75.4	84.9	93.0	386.7	445.4	533.5	621.6	680.3
79.0	62.8	75.9	85.5	93.7	389.4	448.5	537.2	625.9	685.0
80.0	63.3	76.5	86.1	94.3	392.1	451.6	541.0	630.3	689.8
81.0	63.7	77.0	86.7	95.0	394.8	454.8	544.8	634.7	694.7
82.0	64.2	77.6	87.3	95.7	397.6	458.0	548.6	639.2	699.6
83.0	64.6	78.1	87.9	96.4	400.5	461.3	552.5	643.8	704.6
84.0	65.1	78.7	88.5	97.0	403.4	464.6	556.5	648.4	709.7
85.0	65.6	79.2	89.2	97.7	406.3	468.0	560.6	653.1	714.8
86.0	66.0	79.8	89.8	98.5	409.2	471.4	564.6	657.9	720.0
87.0	66.5	80.4	90.5	99.2	412.3	474.9	568.8	662.7	725.3
88.0	67.0	81.0	91.2	99.9	415.3	478.4	573.0	667.6	730.7
89.0	67.5	81.6	91.8	100.7	418.4	482.0	577.3	672.6	736.2
90.0	68.0	82.2	92.5	101.4	421.6	485.6	581.6	677.7	741.7
91.0	68.5	82.8	93.2	102.2	424.8	489.3	586.0	682.8	747.3
92.0	69.1	83.5	94.0	103.0	428.0	493.0	590.5	688.0	753.0
93.0	69.5	84.0	94.6	103.7	430.9	496.3	594.5	692.6	758.1
94.0	69.9	84.5	95.1	104.2	433.2	499.0	597.7	696.4	762.2
95.0	70.3	84.9	95.6	104.8	435.5	501.7	600.9	700.1	766.3
96.0	70.7	85.4	96.1	105.4	437.9	504.4	604.2	704.0	770.5
97.0	71.1	85.9	96.7	105.9	440.3	507.2	607.5	707.8	774.7
98.0	71.4	86.3	97.2	106.5	442.7	510.0	610.8	711.7	779.0
99.0	71.8	86.8	97.7	107.1	445.2	512.8	614.2	715.7	783.3
100.0	72.2	87.3	98.3	107.7	447.7	515.7	617.6	719.6	787.6

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	120	120	120	120	120	120	120	120	120
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after									
Shutdown	Time To	Time To	Time To	Time To	Time To	Time To	Time To	Time To	Time To
(days)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)
1.0	8.4	10.1	11.4	12.5	51.8	59.6	71.4	83.2	91.1
2.0	10.4	12.5	14.1	15.4	64.1	73.9	88.5	103.1	112.8
3.0	11.7	14.2	16.0	17.5	72.8	83.8	100.4	117.0	128.0
4.0	13.2	15.9	17.9	19.6	81.6	94.0	112.6	131.2	143.6
5.0	14.7	17.7	19.9	21.9	90.8	104.6	125.3	146.0	159.7
6.0	15.8	19.1	21.5	23.6	97.9	112.7	135.0	157.3	172.2
7.0	17.1	20.7	23.3	25.5	105.9	122.0	146.2	170.3	186.4
8.0	18.1	21.8	24.6	26.9	111.9	128.9	154.4	179.9	196.9
9.0	19.1	23.1	26.0	28.5	118.6	136.6	163.6	190.6	208.6
10.0	20.0	24.2	27.3	29.9	124.1	143.0	171.3	199.6	218.4
11.0	20.9	25.3	28.4	31.2	129.5	149.2	178.7	208.2	227.9
12.0	21.7	26.2	29.5	32.4	134.5	155.0	185.6	216.3	236.7
13.0	22.4	27.1	30.5	33.4	138.7	159.8	191.4	223.0	244.0
14.0	23.1	27.9	31.4	34.4	143.1	164.9	197.5	230.1	251.8
15.0	23.9	28.8	32.5	35.6	147.9	170.3	204.0	237.7	260.1
16.0	24.7	29.8	33.6	36.8	152.9	176.1	211.0	245.8	269.0
17.0	25.6	30.9	34.8	38.1	158.3	182.4	218.4	254.5	278.5
18.0	26.2	31.7	35.7	39.1	162.6	187.3	224.3	261.4	286.1
19.0	26.8	32.4	36.5	40.0	166.2	191.5	229.3	267.2	292.4
20.0	27.4	33.2	37.3	40.9	170.0	195.8	234.6	273.3	299.1
21.0	28.1	33.9	38.2	41.9	174.0	200.4	240.0	279.7	306.1
22.0	28.8	34.7	39.1	42.9	178.1	205.2	245.7	286.3	313.4
23.0	29.5	35.6	40.1	43.9	182.5	210.2	251.8	293.3	321.0
24.0	29.9	36.1	40.7	44.6	185.2	213.3	255.5	297.7	325.8
25.0	30.3	36.6	41.2	45.2	187.7	216.2	258.9	301.7	330.2
26.0	30.7	37.1	41.8	45.8	190.2	219.1	262.4	305.8	334.6
27.0	31.1	37.6	42.3	46.4	192.8	222.1	266.0	310.0	339.2
28.0	31.6	38.1	42.9	47.0	195.5	225.2	269.7	314.3	344.0
29.0	32.0	38.7	43.5	47.7	198.3	228.4	273.5	318.7	348.8
30.0	32.5	39.2	44.2	48.4	201.1	231.6	277.5	323.3	353.8
31.0	32.9	39.8	44.8	49.1	204.0	235.0	281.5	328.0	359.0
32.0	33.4	40.4	45.5	49.8	207.0	238.5	285.6	332.8	364.2
33.0	33.9	41.0	46.1	50.6	210.1	242.0	289.9	337.8	369.7
34.0	34.4	41.6	46.8	51.3	213.3	245.7	294.3	342.9	375.3
35.0	35.0	42.3	47.6	52.1	216.6	249.5	298.8	348.2	381.1
36.0	35.5	42.9	48.3	52.9	220.0	253.4	303.5	353.6	387.1
37.0	36.1	43.6	49.1	53.8	223.5	257.4	308.4	359.3	393.2
38.0	36.7	44.3	49.9	54.7	227.1	261.6	313.3	365.1	399.6
39.0	37.3	45.0	50.7	55.6	230.8	265.9	318.5	371.1	406.1
40.0	37.9	45.8	51.5	56.5	234.7	270.3	323.8	377.3	412.9
41.0	38.5	46.6	52.4	57.4	238.7	274.9	329.3	383.7	419.9
42.0	39.2	47.4	53.3	58.4	242.8	279.7	335.0	390.3	427.2
43.0	39.9	48.2	54.3	59.5	247.1	284.6	340.9	397.2	434.7
44.0	40.6	49.1	55.2	60.5	251.5	289.7	347.0	404.3	442.5
45.0	41.3	50.0	56.2	61.6	256.1	295.0	353.3	411.7	450.6
46.0	42.1	50.9	57.3	62.8	260.9	300.5	359.9	419.3	458.9
47.0	42.6	51.5	57.9	63.5	263.9	304.0	364.1	424.2	464.3
48.0	43.0	51.9	58.5	64.1	266.2	306.7	367.3	428.0	468.4
49.0	43.4	52.4	59.0	64.6	268.6	309.4	370.6	431.8	472.6
50.0	43.8	52.9	59.5	65.2	271.0	312.2	373.9	435.7	476.9
51.0	44.2	53.4	60.1	65.8	273.5	315.0	377.3	439.7	481.2
52.0	44.6	53.8	60.6	66.4	276.0	317.9	380.8	443.7	485.6
53.0	45.0	54.3	61.2	67.0	278.6	320.9	384.3	447.8	490.1
54.0	45.4	54.9	61.7	67.7	281.2	323.9	387.9	452.0	494.7
55.0	45.8	55.4	62.3	68.3	283.8	326.9	391.6	456.2	499.3
56.0	46.3	55.9	62.9	69.0	286.5	330.0	395.3	460.6	504.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	120	120	120	120	120	120	120	120	120
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after									
Shutdown	Time To	Time To	Time To	Time To	Time To	Time To	Time To	Time To	Time To
(days)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)
57.0	46.7	56.4	63.5	69.6	289.3	333.2	399.1	465.0	508.9
58.0	47.2	57.0	64.1	70.3	292.1	336.4	403.0	469.5	513.9
59.0	47.6	57.5	64.8	71.0	294.9	339.7	406.9	474.1	518.9
60.0	48.1	58.1	65.4	71.7	297.9	343.1	410.9	478.8	524.0
61.0	48.6	58.7	66.1	72.4	300.8	346.5	415.1	483.6	529.3
62.0	49.1	59.3	66.7	73.1	303.9	350.0	419.2	488.5	534.6
63.0	49.6	59.9	67.4	73.9	307.0	353.6	423.5	493.5	540.1
64.0	50.1	60.5	68.1	74.6	310.1	357.2	427.9	498.5	545.6
65.0	50.6	61.1	68.8	75.4	313.4	361.0	432.3	503.7	551.3
66.0	51.1	61.8	69.5	76.2	316.7	364.7	436.9	509.0	557.1
67.0	51.7	62.4	70.3	77.0	320.0	368.6	441.5	514.4	563.0
68.0	52.2	63.1	71.0	77.8	323.5	372.6	446.3	520.0	569.1
69.0	52.8	63.8	71.8	78.7	327.0	376.6	451.1	525.6	575.3
70.0	53.2	64.3	72.4	79.4	329.8	379.8	455.0	530.1	580.2
71.0	53.6	64.8	72.9	79.9	331.9	382.3	457.9	533.6	584.0
72.0	53.9	65.2	73.4	80.4	334.1	384.9	461.0	537.1	587.8
73.0	54.3	65.6	73.9	80.9	336.4	387.4	464.1	540.7	591.8
74.0	54.7	66.1	74.4	81.5	338.6	390.0	467.2	544.3	595.7
75.0	55.0	66.5	74.9	82.0	340.9	392.7	470.3	548.0	599.8
76.0	55.4	67.0	75.4	82.6	343.2	395.3	473.5	551.7	603.8
77.0	55.8	67.4	75.9	83.2	345.6	398.0	476.8	555.5	608.0
78.0	56.2	67.9	76.4	83.7	347.9	400.8	480.1	559.3	612.2
79.0	56.6	68.4	76.9	84.3	350.4	403.6	483.4	563.2	616.4
80.0	57.0	68.8	77.5	84.9	352.8	406.4	486.8	567.1	620.7
81.0	57.4	69.3	78.0	85.5	355.3	409.3	490.2	571.1	625.1
82.0	57.8	69.8	78.6	86.1	357.8	412.2	493.7	575.2	629.5
83.0	58.2	70.3	79.1	86.7	360.4	415.1	497.2	579.3	634.0
84.0	58.6	70.8	79.7	87.3	363.0	418.1	500.8	583.5	638.6
85.0	59.0	71.3	80.3	88.0	365.6	421.1	504.4	587.7	643.2
86.0	59.5	71.8	80.9	88.6	368.3	424.2	508.1	592.0	647.9
87.0	59.9	72.4	81.5	89.3	371.0	427.3	511.8	596.3	652.7
88.0	60.3	72.9	82.1	89.9	373.7	430.5	515.6	600.8	657.5
89.0	60.8	73.5	82.7	90.6	376.5	433.7	519.5	605.2	662.4
90.0	61.2	74.0	83.3	91.3	379.3	437.0	523.4	609.8	667.4
91.0	61.7	74.6	83.9	92.0	382.2	440.3	527.3	614.4	672.5
92.0	62.2	75.1	84.6	92.7	385.1	443.6	531.4	619.1	677.6
93.0	62.6	75.6	85.1	93.3	387.7	446.6	534.9	623.3	682.1
94.0	62.9	76.0	85.6	93.8	389.8	449.0	537.8	626.6	685.8
95.0	63.3	76.5	86.1	94.3	391.9	451.4	540.7	630.0	689.5
96.0	63.6	76.9	86.5	94.8	394.1	453.9	543.7	633.4	693.3
97.0	64.0	77.3	87.0	95.3	396.2	456.4	546.7	636.9	697.1
98.0	64.3	77.7	87.5	95.9	398.4	458.9	549.7	640.4	700.9
99.0	64.7	78.2	88.0	96.4	400.6	461.4	552.7	644.0	704.8
100.0	65.0	78.6	88.5	96.9	402.8	464.0	555.8	647.6	708.7

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	130	130	130	130	130	130	130	130	130
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	7.4	9.0	10.1	11.1	46.0	53.0	63.5	74.0	81.0
2.0	9.2	11.1	12.5	13.7	57.0	65.7	78.7	91.7	100.3
3.0	10.4	12.6	14.2	15.6	64.7	74.5	89.3	104.0	113.8
4.0	11.7	14.2	15.9	17.5	72.6	83.6	100.1	116.7	127.7
5.0	13.0	15.8	17.7	19.4	80.7	93.0	111.4	129.8	142.0
6.0	14.1	17.0	19.1	20.9	87.0	100.2	120.0	139.9	153.1
7.0	15.2	18.4	20.7	22.7	94.2	108.5	129.9	151.4	165.7
8.0	16.1	19.4	21.9	23.9	99.5	114.6	137.3	159.9	175.0
9.0	17.0	20.6	23.2	25.4	105.4	121.4	145.4	169.4	185.4
10.0	17.8	21.5	24.2	26.6	110.4	127.1	152.3	177.4	194.2
11.0	18.6	22.5	25.3	27.7	115.2	132.6	158.9	185.1	202.6
12.0	19.3	23.3	26.3	28.8	119.6	137.8	165.0	192.3	210.4
13.0	19.9	24.1	27.1	29.7	123.3	142.0	170.1	198.2	216.9
14.0	20.6	24.8	27.9	30.6	127.3	146.6	175.6	204.5	223.9
15.0	21.2	25.7	28.9	31.6	131.5	151.4	181.4	211.3	231.3
16.0	22.0	26.5	29.9	32.7	135.9	156.6	187.6	218.5	239.2
17.0	22.7	27.5	30.9	33.9	140.7	162.1	194.2	226.2	247.6
18.0	23.3	28.2	31.8	34.8	144.6	166.5	199.4	232.4	254.3
19.0	23.9	28.8	32.5	35.6	147.8	170.2	203.9	237.5	260.0
20.0	24.4	29.5	33.2	36.4	151.1	174.1	208.5	242.9	265.9
21.0	25.0	30.2	34.0	37.2	154.7	178.1	213.4	248.6	272.1
22.0	25.6	30.9	34.8	38.1	158.4	182.4	218.5	254.5	278.6
23.0	26.2	31.7	35.6	39.0	162.2	186.9	223.8	260.8	285.4
24.0	26.6	32.1	36.2	39.6	164.6	189.6	227.1	264.7	289.7
25.0	26.9	32.6	36.6	40.2	166.8	192.2	230.2	268.2	293.5
26.0	27.3	33.0	37.1	40.7	169.1	194.8	233.3	271.8	297.5
27.0	27.7	33.5	37.7	41.3	171.4	197.5	236.5	275.6	301.6
28.0	28.1	33.9	38.2	41.8	173.8	200.2	239.8	279.4	305.8
29.0	28.5	34.4	38.7	42.4	176.3	203.0	243.2	283.3	310.1
30.0	28.9	34.9	39.3	43.0	178.8	205.9	246.7	287.4	314.5
31.0	29.3	35.4	39.8	43.7	181.4	208.9	250.2	291.6	319.1
32.0	29.7	35.9	40.4	44.3	184.1	212.0	253.9	295.9	323.8
33.0	30.2	36.5	41.0	45.0	186.8	215.2	257.7	300.3	328.6
34.0	30.6	37.0	41.7	45.6	189.6	218.4	261.6	304.8	333.6
35.0	31.1	37.6	42.3	46.4	192.6	221.8	265.7	309.5	338.8
36.0	31.6	38.2	43.0	47.1	195.6	225.3	269.8	314.4	344.1
37.0	32.1	38.8	43.6	47.8	198.7	228.9	274.1	319.4	349.6
38.0	32.6	39.4	44.3	48.6	201.9	232.6	278.6	324.6	355.2
39.0	33.1	40.1	45.1	49.4	205.2	236.4	283.1	329.9	361.1
40.0	33.7	40.7	45.8	50.2	208.7	240.3	287.9	335.4	367.1
41.0	34.3	41.4	46.6	51.1	212.2	244.4	292.8	341.1	373.3
42.0	34.9	42.1	47.4	52.0	215.9	248.6	297.8	347.0	379.8
43.0	35.5	42.9	48.2	52.9	219.7	253.0	303.1	353.1	386.5
44.0	36.1	43.6	49.1	53.8	223.6	257.6	308.5	359.4	393.4
45.0	36.8	44.4	50.0	54.8	227.7	262.2	314.1	366.0	400.5
46.0	37.5	45.3	50.9	55.8	231.9	267.1	319.9	372.8	408.0
47.0	37.9	45.8	51.5	56.5	234.6	270.3	323.7	377.1	412.8
48.0	38.2	46.2	52.0	57.0	236.7	272.6	326.6	380.5	416.4
49.0	38.6	46.6	52.5	57.5	238.8	275.1	329.5	383.9	420.1
50.0	38.9	47.0	52.9	58.0	241.0	277.6	332.4	387.3	423.9
51.0	39.3	47.5	53.4	58.5	243.1	280.1	335.5	390.8	427.8
52.0	39.6	47.9	53.9	59.1	245.4	282.6	338.5	394.4	431.7
53.0	40.0	48.3	54.4	59.6	247.6	285.3	341.7	398.1	435.7
54.0	40.4	48.8	54.9	60.2	250.0	287.9	344.9	401.8	439.8
55.0	40.8	49.2	55.4	60.7	252.3	290.6	348.1	405.6	443.9
56.0	41.1	49.7	55.9	61.3	254.7	293.4	351.4	409.4	448.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	130	130	130	130	130	130	130	130	130
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	41.5	50.2	56.5	61.9	257.2	296.2	354.8	413.4	452.4
58.0	41.9	50.7	57.0	62.5	259.7	299.1	358.2	417.4	456.8
59.0	42.3	51.2	57.6	63.1	262.2	302.0	361.8	421.5	461.3
60.0	42.8	51.7	58.2	63.7	264.8	305.0	365.3	425.7	465.9
61.0	43.2	52.2	58.7	64.4	267.4	308.1	369.0	429.9	470.5
62.0	43.6	52.7	59.3	65.0	270.1	311.2	372.7	434.2	475.3
63.0	44.1	53.3	59.9	65.7	272.9	314.3	376.5	438.7	480.1
64.0	44.5	53.8	60.6	66.4	275.7	317.6	380.4	443.2	485.1
65.0	45.0	54.4	61.2	67.1	278.6	320.9	384.3	447.8	490.1
66.0	45.5	54.9	61.8	67.8	281.5	324.3	388.4	452.5	495.3
67.0	45.9	55.5	62.5	68.5	284.5	327.7	392.5	457.3	500.5
68.0	46.4	56.1	63.2	69.2	287.6	331.2	396.7	462.2	505.9
69.0	46.9	56.7	63.8	70.0	290.7	334.8	401.0	467.3	511.4
70.0	47.3	57.2	64.4	70.6	293.2	337.7	404.5	471.2	515.8
71.0	47.7	57.6	64.8	71.0	295.1	339.9	407.1	474.3	519.1
72.0	48.0	58.0	65.2	71.5	297.0	342.2	409.8	477.5	522.6
73.0	48.3	58.4	65.7	72.0	299.0	344.4	412.5	480.7	526.1
74.0	48.6	58.7	66.1	72.5	301.0	346.7	415.3	483.9	529.6
75.0	48.9	59.1	66.6	73.0	303.1	349.1	418.1	487.2	533.2
76.0	49.3	59.5	67.0	73.4	305.1	351.5	421.0	490.5	536.8
77.0	49.6	60.0	67.5	74.0	307.2	353.9	423.8	493.8	540.5
78.0	50.0	60.4	67.9	74.5	309.3	356.3	426.8	497.2	544.2
79.0	50.3	60.8	68.4	75.0	311.5	358.8	429.7	500.7	548.0
80.0	50.7	61.2	68.9	75.5	313.7	361.3	432.7	504.2	551.8
81.0	51.0	61.6	69.4	76.0	315.9	363.8	435.8	507.7	555.7
82.0	51.4	62.1	69.9	76.6	318.1	366.4	438.9	511.3	559.6
83.0	51.7	62.5	70.4	77.1	320.4	369.0	442.0	515.0	563.6
84.0	52.1	63.0	70.9	77.7	322.7	371.7	445.2	518.7	567.7
85.0	52.5	63.4	71.4	78.2	325.0	374.4	448.4	522.5	571.8
86.0	52.9	63.9	71.9	78.8	327.4	377.1	451.7	526.3	576.0
87.0	53.3	64.4	72.4	79.4	329.8	379.9	455.0	530.1	580.2
88.0	53.7	64.8	73.0	80.0	332.2	382.7	458.4	534.1	584.5
89.0	54.1	65.3	73.5	80.6	334.7	385.6	461.8	538.0	588.9
90.0	54.5	65.8	74.1	81.2	337.2	388.5	465.3	542.1	593.3
91.0	54.9	66.3	74.6	81.8	339.8	391.4	468.8	546.2	597.8
92.0	55.3	66.8	75.2	82.4	342.4	394.4	472.4	550.4	602.4
93.0	55.7	67.3	75.7	83.0	344.7	397.0	475.6	554.1	606.4
94.0	56.0	67.6	76.1	83.4	346.6	399.2	478.1	557.1	609.7
95.0	56.3	68.0	76.5	83.9	348.4	401.3	480.7	560.1	613.0
96.0	56.6	68.4	76.9	84.3	350.3	403.5	483.3	563.1	616.3
97.0	56.9	68.7	77.4	84.8	352.2	405.7	486.0	566.2	619.7
98.0	57.2	69.1	77.8	85.3	354.2	408.0	488.7	569.3	623.1
99.0	57.5	69.5	78.2	85.7	356.1	410.2	491.4	572.5	626.6
100.0	57.8	69.9	78.7	86.2	358.1	412.5	494.1	575.7	630.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	140	140	140	140	140	140	140	140	140
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	6.5	7.9	8.9	9.7	40.3	46.4	55.6	64.8	70.9
2.0	8.1	9.7	11.0	12.0	49.9	57.5	68.9	80.3	87.8
3.0	9.2	11.1	12.4	13.6	56.6	65.3	78.2	91.1	99.7
4.0	10.3	12.4	14.0	15.3	63.6	73.2	87.7	102.2	111.8
5.0	11.4	13.8	15.5	17.0	70.7	81.4	97.5	113.6	124.3
6.0	12.3	14.9	16.7	18.3	76.2	87.8	105.1	122.5	134.0
7.0	13.3	16.1	18.1	19.9	82.5	95.0	113.8	132.6	145.1
8.0	14.1	17.0	19.1	21.0	87.1	100.3	120.2	140.0	153.3
9.0	14.9	18.0	20.3	22.2	92.3	106.3	127.3	148.4	162.4
10.0	15.6	18.9	21.2	23.3	96.6	111.3	133.3	155.3	170.0
11.0	16.3	19.7	22.2	24.3	100.8	116.1	139.1	162.1	177.4
12.0	16.9	20.4	23.0	25.2	104.7	120.6	144.5	168.3	184.2
13.0	17.4	21.1	23.7	26.0	108.0	124.4	149.0	173.6	190.0
14.0	18.0	21.8	24.5	26.8	111.4	128.3	153.7	179.1	196.0
15.0	18.6	22.5	25.3	27.7	115.1	132.6	158.8	185.0	202.5
16.0	19.2	23.2	26.2	28.7	119.0	137.1	164.2	191.3	209.4
17.0	19.9	24.1	27.1	29.7	123.2	142.0	170.0	198.1	216.8
18.0	20.5	24.7	27.8	30.5	126.6	145.8	174.6	203.5	222.7
19.0	20.9	25.3	28.4	31.2	129.4	149.0	178.5	208.0	227.6
20.0	21.4	25.8	29.1	31.9	132.3	152.4	182.6	212.7	232.8
21.0	21.9	26.4	29.8	32.6	135.4	156.0	186.8	217.7	238.3
22.0	22.4	27.1	30.5	33.4	138.7	159.7	191.3	222.9	243.9
23.0	23.0	27.7	31.2	34.2	142.1	163.6	196.0	228.3	249.9
24.0	23.3	28.1	31.7	34.7	144.2	166.1	198.9	231.7	253.6
25.0	23.6	28.5	32.1	35.2	146.1	168.3	201.6	234.8	257.0
26.0	23.9	28.9	32.5	35.7	148.1	170.6	204.3	238.0	260.5
27.0	24.3	29.3	33.0	36.1	150.1	172.9	207.1	241.3	264.1
28.0	24.6	29.7	33.4	36.6	152.2	175.3	210.0	244.6	267.7
29.0	24.9	30.1	33.9	37.2	154.3	177.8	212.9	248.1	271.5
30.0	25.3	30.6	34.4	37.7	156.6	180.3	216.0	251.6	275.4
31.0	25.7	31.0	34.9	38.2	158.8	182.9	219.1	255.3	279.4
32.0	26.0	31.5	35.4	38.8	161.2	185.6	222.3	259.1	283.5
33.0	26.4	31.9	35.9	39.4	163.6	188.4	225.7	262.9	287.8
34.0	26.8	32.4	36.5	40.0	166.1	191.3	229.1	266.9	292.1
35.0	27.2	32.9	37.0	40.6	168.6	194.2	232.6	271.0	296.6
36.0	27.7	33.4	37.6	41.2	171.3	197.3	236.3	275.3	301.3
37.0	28.1	34.0	38.2	41.9	174.0	200.4	240.0	279.7	306.1
38.0	28.6	34.5	38.8	42.6	176.8	203.6	243.9	284.2	311.0
39.0	29.0	35.1	39.5	43.3	179.7	207.0	247.9	288.9	316.1
40.0	29.5	35.7	40.1	44.0	182.7	210.5	252.1	293.7	321.4
41.0	30.0	36.3	40.8	44.7	185.8	214.0	256.3	298.7	326.9
42.0	30.5	36.9	41.5	45.5	189.0	217.7	260.8	303.8	332.5
43.0	31.1	37.6	42.3	46.3	192.3	221.6	265.4	309.2	338.4
44.0	31.6	38.2	43.0	47.1	195.8	225.5	270.1	314.7	344.4
45.0	32.2	38.9	43.8	48.0	199.4	229.6	275.0	320.5	350.7
46.0	32.8	39.6	44.6	48.9	203.1	233.9	280.1	326.4	357.2
47.0	33.2	40.1	45.1	49.5	205.4	236.6	283.4	330.2	361.4
48.0	33.5	40.5	45.5	49.9	207.3	238.7	285.9	333.2	364.6
49.0	33.8	40.8	45.9	50.4	209.1	240.9	288.5	336.1	367.9
50.0	34.1	41.2	46.4	50.8	211.0	243.0	291.1	339.2	371.2
51.0	34.4	41.6	46.8	51.3	212.9	245.2	293.7	342.2	374.6
52.0	34.7	41.9	47.2	51.7	214.9	247.5	296.4	345.4	378.0
53.0	35.0	42.3	47.6	52.2	216.9	249.8	299.2	348.6	381.5
54.0	35.4	42.7	48.1	52.7	218.9	252.1	302.0	351.8	385.1
55.0	35.7	43.1	48.5	53.2	220.9	254.5	304.8	355.1	388.7
56.0	36.0	43.5	49.0	53.7	223.0	256.9	307.7	358.5	392.4

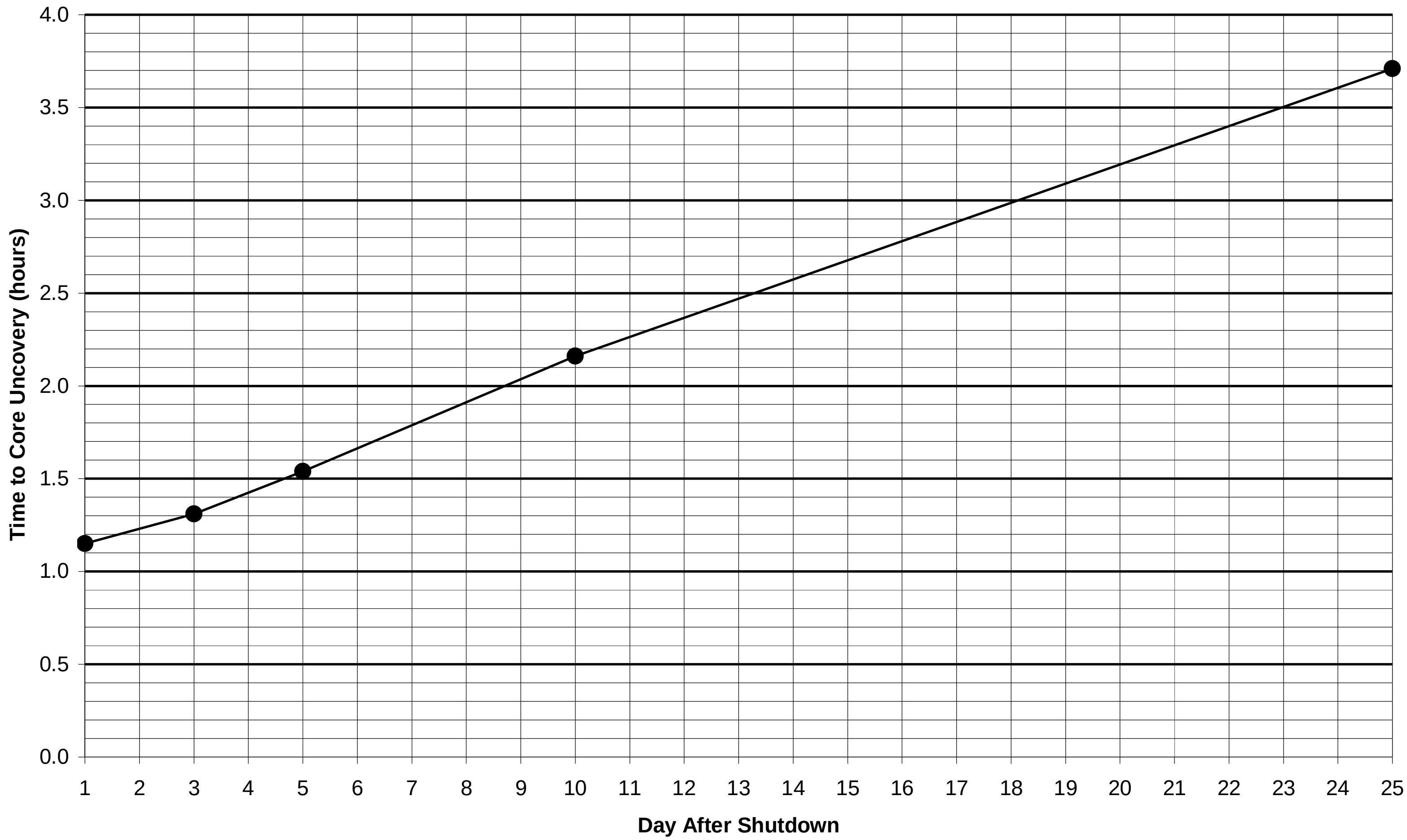
ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	140	140	140	140	140	140	140	140	140
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	36.4	44.0	49.5	54.2	225.2	259.4	310.7	362.0	396.2
58.0	36.7	44.4	50.0	54.7	227.4	261.9	313.7	365.5	400.0
59.0	37.1	44.8	50.4	55.3	229.6	264.5	316.8	369.1	403.9
60.0	37.5	45.3	50.9	55.8	231.9	267.1	319.9	372.7	407.9
61.0	37.8	45.7	51.5	56.4	234.2	269.8	323.1	376.4	412.0
62.0	38.2	46.2	52.0	57.0	236.6	272.5	326.4	380.2	416.2
63.0	38.6	46.7	52.5	57.5	239.0	275.3	329.7	384.1	420.4
64.0	39.0	47.1	53.0	58.1	241.4	278.1	333.1	388.1	424.7
65.0	39.4	47.6	53.6	58.7	243.9	281.0	336.5	392.1	429.1
66.0	39.8	48.1	54.2	59.4	246.5	283.9	340.1	396.2	433.7
67.0	40.3	48.6	54.7	60.0	249.1	287.0	343.7	400.4	438.3
68.0	40.7	49.2	55.3	60.6	251.8	290.0	347.4	404.7	443.0
69.0	41.1	49.7	55.9	61.3	254.5	293.2	351.2	409.1	447.8
70.0	41.5	50.1	56.4	61.8	256.7	295.7	354.2	412.6	451.6
71.0	41.8	50.4	56.8	62.2	258.4	297.6	356.5	415.3	454.6
72.0	42.0	50.8	57.1	62.6	260.1	299.6	358.8	418.1	457.6
73.0	42.3	51.1	57.5	63.0	261.8	301.6	361.2	420.9	460.6
74.0	42.6	51.5	57.9	63.5	263.6	303.6	363.7	423.7	463.7
75.0	42.9	51.8	58.3	63.9	265.4	305.7	366.1	426.6	466.9
76.0	43.2	52.2	58.7	64.3	267.2	307.8	368.6	429.5	470.0
77.0	43.5	52.5	59.1	64.8	269.0	309.9	371.1	432.4	473.3
78.0	43.8	52.9	59.5	65.2	270.9	312.0	373.7	435.4	476.5
79.0	44.1	53.2	59.9	65.7	272.7	314.2	376.3	438.4	479.8
80.0	44.4	53.6	60.3	66.1	274.7	316.4	378.9	441.5	483.2
81.0	44.7	54.0	60.8	66.6	276.6	318.6	381.6	444.6	486.6
82.0	45.0	54.4	61.2	67.1	278.6	320.8	384.3	447.7	490.0
83.0	45.3	54.8	61.6	67.5	280.5	323.1	387.0	450.9	493.5
84.0	45.7	55.2	62.1	68.0	282.6	325.5	389.8	454.2	497.1
85.0	46.0	55.6	62.5	68.5	284.6	327.8	392.6	457.5	500.7
86.0	46.3	56.0	63.0	69.0	286.7	330.2	395.5	460.8	504.3
87.0	46.7	56.4	63.5	69.5	288.8	332.6	398.4	464.2	508.0
88.0	47.0	56.8	63.9	70.1	290.9	335.1	401.4	467.6	511.8
89.0	47.4	57.2	64.4	70.6	293.1	337.6	404.4	471.1	515.6
90.0	47.7	57.7	64.9	71.1	295.3	340.1	407.4	474.7	519.5
91.0	48.1	58.1	65.4	71.6	297.5	342.7	410.5	478.3	523.4
92.0	48.4	58.5	65.9	72.2	299.8	345.3	413.6	481.9	527.4
93.0	48.8	58.9	66.3	72.7	301.8	347.7	416.4	485.2	531.0
94.0	49.0	59.2	66.7	73.1	303.5	349.5	418.7	487.8	533.9
95.0	49.3	59.6	67.0	73.5	305.1	351.4	420.9	490.4	536.7
96.0	49.6	59.9	67.4	73.9	306.8	353.3	423.2	493.1	539.7
97.0	49.8	60.2	67.8	74.3	308.4	355.3	425.5	495.8	542.6
98.0	50.1	60.5	68.1	74.7	310.1	357.2	427.9	498.5	545.6
99.0	50.4	60.9	68.5	75.1	311.9	359.2	430.2	501.3	548.6
100.0	50.7	61.2	68.9	75.5	313.6	361.2	432.6	504.1	551.7

JPM A2 Handout 2

ATTACHMENT 3: ESTIMATED TIMES FOR UNCOVERY DURING LOWERED INVENTORY

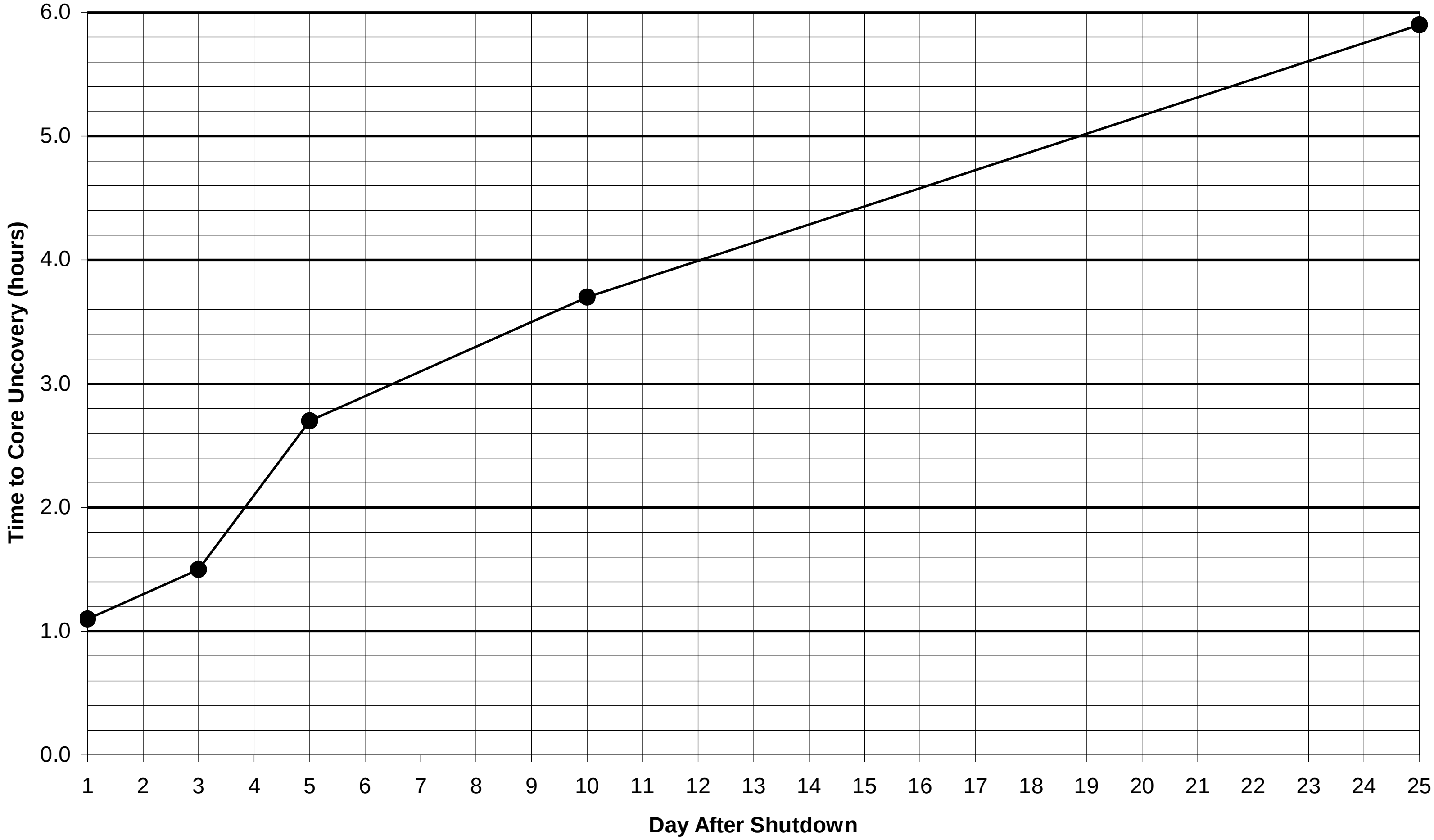
Estimated Time to Core Uncovery
Pressurizer Manway Removed & Nozzle Dams Installed 1



1 **Any nozzle dam configuration allowed by OP-010-006, Attachment 9.11.**

ATTACHMENT 3: ESTIMATED TIMES FOR UNCOVERY DURING LOWERED INVENTORY (CONT'D)

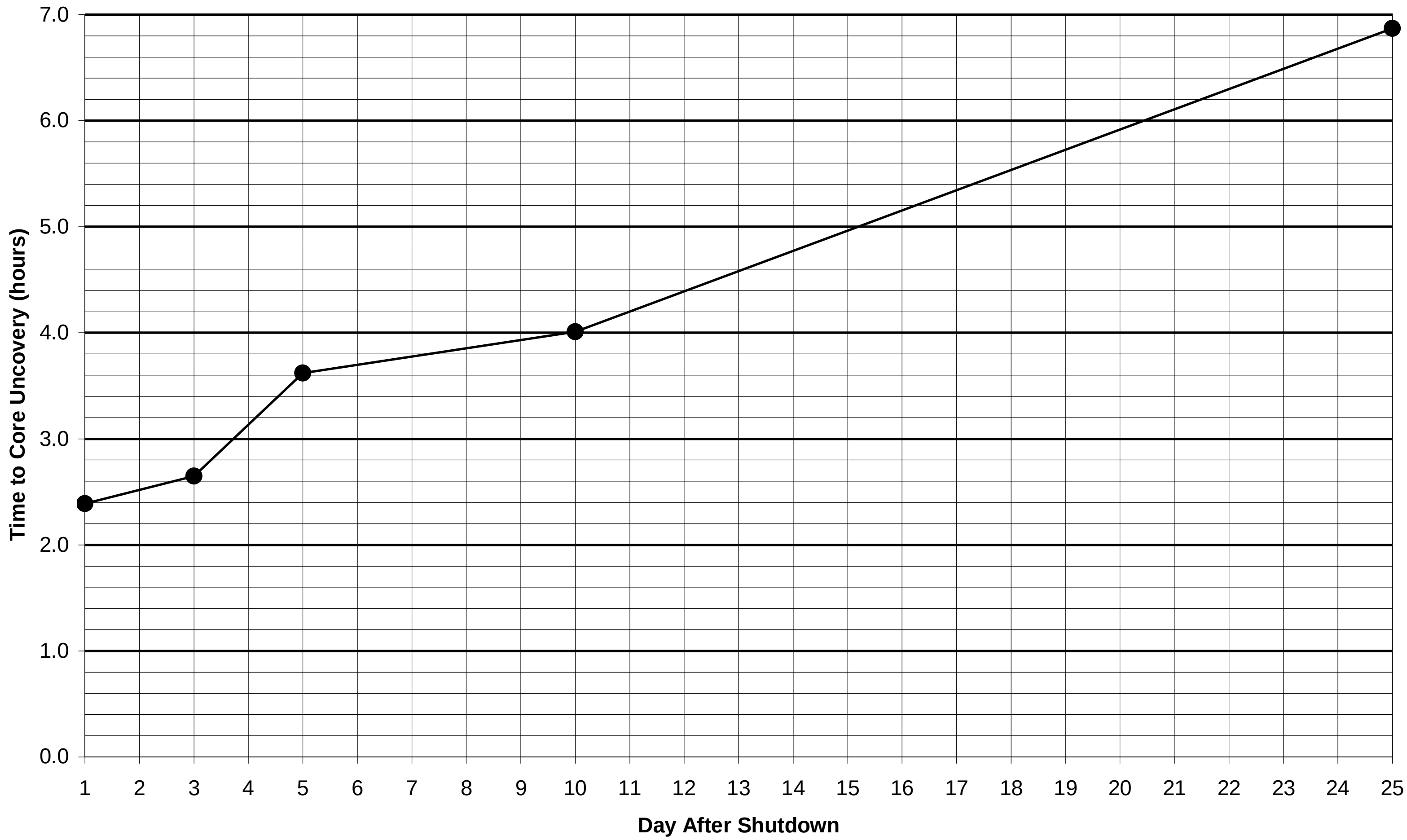
Estimated Time to Core Uncovery
Reactor Vessel Head Removed, Pressurizer Manway Installed & Nozzle Dams Installed 1



1 **Any nozzle dam configuration allowed by OP-010-006, Attachment 9.11.**

ATTACHMENT 3: ESTIMATED TIMES FOR UNCOVERY DURING LOWERED INVENTORY (CONT'D)

Estimated Time to Core Uncovery
Pressurizer Manway Removed, One SG Available for Cooling,
No Nozzle Dams or FME Covers Installed, Cold Leg Opening Exists 2



2 Cold Leg Opening: any opening in a cold leg, examples: RCP Seal removed, RTD Well removed, SI Loop Check Valve opened, and any Cold Leg Inventor Control Path not isolated (OP-010-006, Att. 9.11).

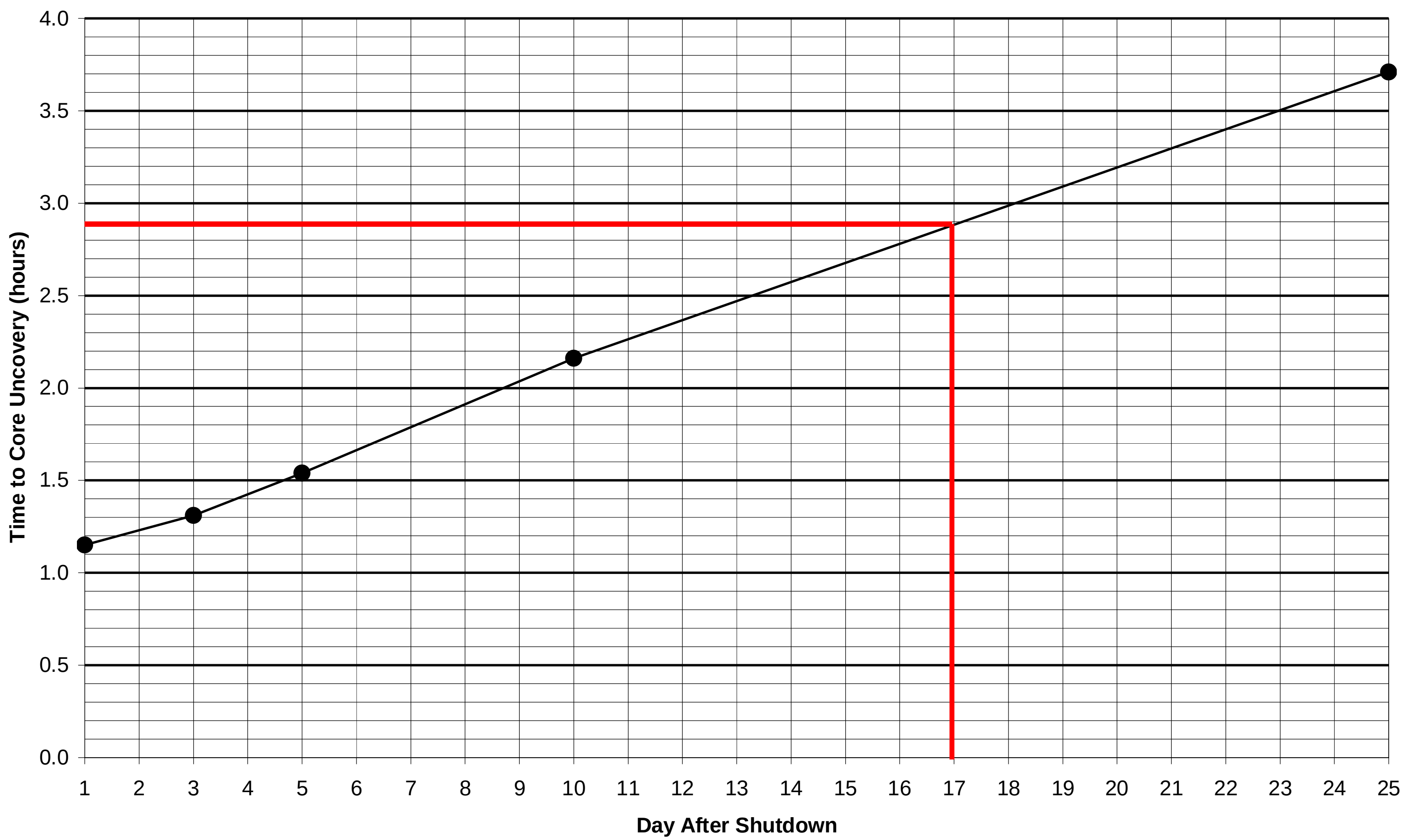
ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	110	**110**	110	110	110	110	110	110	110
Level	Mid-Loop	**Top-HL**	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	9.3	11.2	12.6	13.8	57.5	66.3	79.4	92.5	101.2
2.0	11.5	13.9	15.6	17.1	71.3	82.1	98.3	114.6	125.4
3.0	13.0	15.8	17.8	19.5	80.9	93.1	111.6	130.0	142.3
4.0	14.6	17.7	19.9	21.8	90.7	104.5	125.2	145.8	159.6
5.0	16.3	19.7	22.1	24.3	100.9	116.2	139.2	162.2	177.5
6.0	17.6	21.2	23.9	26.2	108.8	125.3	150.1	174.8	191.3
7.0	19.0	23.0	25.8	28.3	117.7	135.6	162.4	189.3	207.1
8.0	20.1	24.3	27.3	29.9	124.4	143.2	171.6	199.9	218.8
9.0	21.3	25.7	28.9	31.7	131.8	151.8	181.8	211.8	231.8
10.0	22.3	26.9	30.3	33.2	138.0	158.9	190.3	221.8	242.7
11.0	23.2	28.1	31.6	34.6	143.9	165.8	198.6	231.4	253.3
12.0	24.1	29.2	32.8	36.0	149.5	172.2	206.3	240.3	263.0
13.0	24.9	30.1	33.8	37.1	154.1	177.5	212.7	247.8	271.2
14.0	25.7	31.0	34.9	38.3	159.1	183.2	219.5	255.7	279.9
15.0	26.5	32.0	36.1	39.5	164.3	189.3	226.7	264.1	289.1
16.0	27.4	33.1	37.3	40.9	169.9	195.7	234.5	273.2	299.0
17.0	28.4	**34.3**	38.6	42.3	175.9	202.7	242.7	282.8	309.5
18.0	29.2	35.2	39.7	43.5	180.7	208.1	249.3	290.5	317.9
19.0	29.8	36.0	40.5	44.4	184.7	212.8	254.9	296.9	325.0
20.0	30.5	36.8	41.5	45.5	188.9	217.6	260.7	303.7	332.4
21.0	31.2	37.7	42.4	46.5	193.3	222.7	266.7	310.8	340.1
22.0	31.9	38.6	43.5	47.6	197.9	228.0	273.1	318.2	348.3
23.0	32.7	39.5	44.5	48.8	202.8	233.6	279.8	326.0	356.8
24.0	33.2	40.1	45.2	49.5	205.8	237.1	284.0	330.8	362.1
25.0	33.7	40.7	45.8	50.2	208.6	240.2	287.7	335.3	366.9
26.0	34.1	41.2	46.4	50.9	211.4	243.5	291.6	339.8	371.9
27.0	34.6	41.8	47.0	51.6	214.3	246.8	295.6	344.5	377.0
28.0	35.1	42.4	47.7	52.3	217.3	250.3	299.8	349.3	382.3
29.0	35.6	43.0	48.4	53.0	220.3	253.8	304.0	354.2	387.7
30.0	36.1	43.6	49.1	53.8	223.5	257.4	308.3	359.3	393.2
31.0	36.6	44.2	49.8	54.5	226.7	261.2	312.8	364.5	398.9
32.0	37.1	44.9	50.5	55.4	230.1	265.0	317.4	369.8	404.8
33.0	37.7	45.5	51.3	56.2	233.5	269.0	322.2	375.4	410.8
34.0	38.3	46.2	52.0	57.0	237.1	273.1	327.1	381.1	417.1
35.0	38.8	46.9	52.8	57.9	240.7	277.3	332.1	387.0	423.5
36.0	39.5	47.7	53.7	58.8	244.5	281.6	337.3	393.0	430.1
37.0	40.1	48.4	54.5	59.8	248.4	286.1	342.7	399.3	437.0
38.0	40.7	49.2	55.4	60.7	252.4	290.7	348.2	405.7	444.1
39.0	41.4	50.0	56.3	61.7	256.5	295.5	353.9	412.4	451.4
40.0	42.1	50.9	57.3	62.8	260.8	300.4	359.9	419.3	458.9
41.0	42.8	51.7	58.2	63.8	265.3	305.5	366.0	426.4	466.7
42.0	43.5	52.6	59.2	64.9	269.8	310.8	372.3	433.8	474.8
43.0	44.3	53.6	60.3	66.1	274.6	316.3	378.8	441.4	483.1
44.0	45.1	54.5	61.4	67.2	279.5	322.0	385.6	449.3	491.8
45.0	45.9	55.5	62.5	68.5	284.6	327.8	392.7	457.5	500.7
46.0	46.8	56.5	63.6	69.7	289.9	333.9	399.9	466.0	510.0
47.0	47.3	57.2	64.4	70.6	293.3	337.8	404.6	471.5	516.0
48.0	47.7	57.7	65.0	71.2	295.9	340.8	408.2	475.6	520.6
49.0	48.2	58.2	65.5	71.8	298.5	343.9	411.9	479.9	525.2
50.0	48.6	58.7	66.1	72.5	301.2	347.0	415.6	484.2	529.9
51.0	49.0	59.3	66.7	73.1	303.9	350.1	419.3	488.6	534.8
52.0	49.5	59.8	67.3	73.8	306.7	353.3	423.2	493.1	539.7
53.0	50.0	60.4	68.0	74.5	309.6	356.6	427.1	497.6	544.7
54.0	50.4	60.9	68.6	75.2	312.5	359.9	431.1	502.3	549.7
55.0	50.9	61.5	69.2	75.9	315.4	363.3	435.2	507.0	554.9
56.0	51.4	62.1	69.9	76.6	318.4	366.8	439.3	511.8	560.2

JPM A2 KEY

ATTACHMENT 3: ESTIMATED TIMES FOR UNCOVERY DURING LOWERED INVENTORY

Estimated Time to Core Uncovery
Pressurizer Manway Removed & Nozzle Dams Installed 1



1 **Any nozzle dam configuration allowed by OP-010-006, Attachment 9.11.**

REQUEST/APPROVAL PAGE

SAFETY RELATED
PROCEDURE

Normal Review Class (check one):

☐ **OSRC**

☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-901-131	REVISION: 304
TITLE: Shutdown Cooling Malfunction	
PROCEDURE OWNER (Position Title): Operations Manager - Support	

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 3/5/2015

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

This procedure revision added step 5 of section E0 which states, " IF RCS temperature is approaching 140° F AND Shutdown Cooling Purification Letdown Heat Exchanger Bypass Valve SI-424 is open, THEN at SM/CRS discretion perform one or both of the following as necessary to avoid damaging CVC ion exchanger resin:
•Perform OP-009-005 section 6.5 Securing Alternate Shutdown Cooling Purification
•Place Ion Exchanger Bypass, CVC-140, to BYPASS"

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES		PRINT NAME OR SIGNATURE	DATE
PREPARER		Daryl Roy	3/3/2015
EC SUPERVISOR	Administrative Review and Approval	(sign) [signature]	3/4/15
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐ PA Exclusion ☐	N/A	
TECHNICAL	Review ☐ Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐	N/A	
GROUP/DEPT. HEAD	Review ☐ Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐ Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS	Approval ☐	(sign) N/A	

E SUBSEQUENT OPERATOR ACTIONS

E0 GENERAL

	PLACEKEEPER START	DONE
1. At SM/CRS discretion, sound the Station Alarm and announce the following twice: "ATTENTION STATION PERSONNEL, ATTENTION STATION PERSONNEL, A SHUTDOWN COOLING MALFUNCTION HAS OCCURRED. ALL UNNECESSARY PERSONNEL EVACUATE CONTAINMENT."	☐	☐
2. Advise the Shift Manager to refer to EP-001-001, RECOGNITION AND CLASSIFICATION OF EMERGENCY CONDITIONS.	☐	☐

CAUTION

ATTACHMENT 1: CONTAINMENT CLOSURE CHECKLIST, SPECIFIES ACTIONS THAT MAY HAVE TO BE PERFORMED BEFORE THE CALCULATED RCS TIME TO BOIL, WITHIN 30 MINUTES, 1.0 HR, 1.5 HRS, OR 4 HRS. **[SOER 09-01 Recommendation #11]**

3. If in Mode 5, 6 or defueled, then complete Attachment 1: Containment Closure Checklist, within the required time constraints listed on Attachment 1: Containment Closure Checklist.	☐	☐
4. IF EITHER of the following occurs, THEN verify ALL available Containment Fan Coolers running: • Core Exit Thermocouples >195°F OR • IF CETs NOT available AND RCS temperature >195°F as determined by Attachment 2: Calculated RCS Time to Boil.	☐	☐

E0 GENERAL (Cont'd)

	PLACEKEEPER START	PLACEKEEPER DONE
5. IF RCS temperature is approaching 140° F AND Shutdown Cooling Purification Letdown Heat Exchanger Bypass Valve SI-424 is open, THEN at SM/CRS discretion perform one or both of the following as necessary to avoid damaging CVC ion exchanger resin: • Perform OP-009-005 section 6.15 Securing Alternate Shutdown Cooling Purification. • Place Ion Exchanger Bypass, CVC-140, to BYPASS	☐	☐
6. IF Plant is in Mode 4, THEN go to Subprocedure E_4. System Malfunction in Mode 4.	☐	☐

CAUTION

LEVEL INSTRUMENTATION MAY BE INACCURATE WHEN BULK BOILING EXISTS IN RCS DUE TO HIGH STEAM VELOCITY IN THE SURGE LINE.

	START	DONE
7. IF in lowered inventory condition, THEN refer to Attachment 3: Estimated Times for Core Uncovery During lowered Inventory.	☐	☐
8. IF Refueling Level Indicating System (RLIS) is in service, THEN locally close the following RLIS isolation valves: • REFLG WTR LO LVL STA ISOL VLV (RC 1054) • PRESSURIZER VENT VLV (RC 318).	☐	☐
9. IF RCS inventory is unexpectedly dropping, THEN go to Subprocedure E_1. System Leakage.		☐
11. IF Component Cooling Water is lost to operating Shutdown Cooling Train, THEN go to Subprocedure E_3. Loss of Shutdown Cooling Heat Removal Capability.		☐

E0 GENERAL (Cont'd)

PLACEKEEPER
START DONE

12. IF RCS level is stable $\geq$13.46 feet AND ANY of the following occur, THEN go to Subprocedure E_2. Loss of Shutdown Cooling Flow: ☐

- Operating LPSI Pump trips
- Closure of any Shutdown Cooling Suction Isolation valve on operating LPSI Pump
- Cavitation/Air binding of LPSI Pump as indicated by ANY of the following:
  - Dropping OR erratic ammeter indication
  - Dropping OR erratic Shutdown Cooling flow
  - Steady low flow AND amperage less than expected for system configuration
  - Local observation

Waterford 3

2017 RO NRC Exam

JOB PERFORMANCE MEASURE

A3

Perform K-Effective Calculation in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation.

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Calculate K-Effective in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation.

Task Standard: Calculated K-Effective in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation and the attached answer key.

References: OP-903-090 (rev 305); Cycle 21 Plant Data Book (rev 9) Figures 1.4.1 & 1.4.2.

Alternate Path: No Time Critical: No Validation Time: 20 min

K/A 2.2.12 Knowledge of Surveillance Procedures. Importance Rating 3.7 RO

Applicant: ____________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes

Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____________________

Examiner: ____________________ Date: ______________

Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation (Applicant Handout 1)
- OP-903-090, Attachment 10.5 (Applicant Handout 2)
- Personal computer or laptop (with wifi/LAN deactivated)
- Standard electronic references thumb drive (eCart)

Description:
This JPM requires the applicant to calculate K-Effective in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation. Use attached answer key to check applicants work.

READ TO APPLICANT

DIRECTION TO APPLICANT:

Each administrative JPM has a cue sheet with the instructions for that JPM. Each administrative JPM stands alone, and conditions from 1 JPM do not carry over to any other JPM. If you have any questions, raise your hand and I will come to your desk.

Provide all answers on the sheets provided.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

Examiner Note
The applicant will calculate K-Effective in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation. All required data to perform the calculation is supplied on the cue sheet. Provide Applicant Handouts 1 and 2 to applicant at the start of the JPM.

TASK ELEMENT 1	STANDARD
7.5.1 Enter the following current plant data on Attachment 10.5: (N/A this section if Reactor Engineering has supplied a letter with a Boron concentration that will meet the required Keff requirements for Refueling)	See Answer Key
Comment: Applicant entered plant data information in steps 7.5.1.1, 7.5.1.2 and 7.5.1.3 of Attachment 10.5. This is given information (on cue sheet).	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
7.5.2 Determine current HZP Inverse Boron Worth, using current EFPD and PDB Figure 1.4.1, HZP Inverse Boron Worth vs. Burnup.	117 – 118.5 PPM/%ΔK/K
Comment: Entered in step 7.5.2 of Attachment 10.5. This information is obtained using Plant Data Book Figure 1.4.1.	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
7.5.3 Determine current Normalized Boron Worth, using temperature recorded in step 7.5.1.2 and PDB Figure 1.4.2, Normalized Boron Worth Versus Temperature Normalized to 541°F.	1.14 – 1.15
Comment: Entered in step 7.5.3 of Attachment 10.5. This information is obtained using Plant Data Book Figure 1.4.2.	**Critical** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
7.5.4 Obtain Required Shutdown Margin Boron Concentration from Attachment 10.1, step 7.1.3.4 or Attachment 10.4, step 7.4.3.5.7.5.4.1. Circle step number used on Attachment 10.5.	876 PPM
Comment: This is given information (on cue sheet). Applicant enters information in step 7.5.4 of Attachment 10.5.	**SAT / UNSAT**

TASK ELEMENT 5	STANDARD
7.5.5 Obtain Required Shutdown Margin from T.S. 3.1.1.1 <u>or</u> 3.1.1.2.	1.5 %ΔK/K
Comment: Entered in step 7.5.5 of Attachment 10.5. This information is obtained using COLR Figure 1.	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 6	STANDARD
7.5.6 Calculate K-Effective on Attachment 10.5 as follows: 7.5.6.1 Calculate Actual Boron Concentration above Shutdown Margin Requirement by subtracting value recorded in step 7.5.4 from value recorded in step 7.5.1.1.	24 PPM
Comment: Calculated per step 7.5.6.1 of Attachment 10.5.	**SAT / UNSAT**

TASK ELEMENT 7	STANDARD
7.5.6.2 Calculate Adjusted Inverse Boron Worth by dividing value recorded in step 7.5.2 by value recorded in step 7.5.3.	102.2 – 104.5 PPM/%ΔK/K
Comment: Calculated per step 7.5.6.2 of Attachment 10.5.	**SAT / UNSAT**

TASK ELEMENT 8	STANDARD
7.5.6.3 Calculate Boron Worth above Shutdown Margin Requirement by dividing value recorded in step 7.5.6.1 by value recorded in step 7.5.6.2.	0.229 – 0.235 %ΔK/K
Comment: Calculated per step 7.5.6.3 of Attachment 10.5.	**SAT / UNSAT**

TASK ELEMENT 9	STANDARD
7.6.5.4 Calculate Total Excess Reactivity Worth by adding value recorded in step 7.5.5 to value recorded in step 7.5.6.3.	1.729 – 1.735 %ΔK/K
Comment: Calculated per step 7.5.6.4 of Attachment 10.5.	**SAT / UNSAT**

TASK ELEMENT 10	STANDARD
7.5.6.5 Convert %K/K to ΔK/K by dividing value recorded in step 7.5.6.4 by 100.	0.01729 – 0.01735 ΔK/K
Comment: Calculated per step 7.5.6.5 of Attachment 10.5.	**SAT / UNSAT**

TASK ELEMENT 11	STANDARD
7.5.6.6 Calculate K-Effective by dividing 1 by the sum of 1 + step 7.5.6.5.	0.982 – 0.984
Comment: Calculated per step 7.5.6.6 of Attachment 10.5.	**<u>Critical</u>** **SAT / UNSAT**

Evaluator Note
The applicant is directed (per the cue sheet) to stop after step 7.5.6.6 is completed.

END OF TASK

ANSWER KEY

10.5 K-EFFECTIVE CALCULATION

(Typical)

Step	Description	Value	Units
7.5.1.1	RCS BORON CONCENTRATION	**900**	PPM
7.5.1.2	T_{AVE}	**400**	^{o}F
7.5.1.3	CYCLE BURNUP (POINT ID C24110 OR EQUIVALENT)	**200**	EFPD
7.5.2	HZP INVERSE BORON WORTH	**117-118.5**	PPM/%Δk/k
7.5.3	NORMALIZED BORON WORTH FACTOR	**1.14-1.15**	
7.5.4	REQUIRED SHUTDOWN MARGIN BORON CONCENTRATION ATT. 10.1, STEP 7.1.3.4 OR ATT. 10.4, STEP 7.4.3.5 (CIRCLE ATTACHMENT USED)	**876**	PPM
7.5.5	T.S. SHUTDOWN MARGIN REQUIREMENT T.S. 3.1.1.1 OR 3.1.1.2	**1.5**	%Δk/k

7.5.6.1 ACTUAL PPM BORON ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.1.1(**900**) − step 7.5.4 (**876**) = ______**24**_______PPM

7.5.6.2 ADJUSTED INVERSE BORON WORTH

step 7.5.2 (**117 - 118.5**) ÷ step 7.5.3 (**1.14 - 1.15**) = __**102.2 - 104.5**__PPM/% ΔK/K

7.5.6.3 BORON REACTIVITY WORTH ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.6.1 (**24**) ÷ step 7.5.6.2 (**102.2 - 104.5**) = ___**0.229 - 0.235**__%ΔK/K

7.5.6.4 TOTAL EXCESS REACTIVITY WORTH

step 7.5.5 (**1.5**) + step 7.5.6.3 (**0.229 - 0.235**) = __**1.729 - 1.735**_%ΔK/K

7.5.6.5 UNIT CONVERSION

step 7.5.6.4 (**1.729 - 1.735**) ÷ 100 = __**0.01729 - 0.01735**__ΔK/K

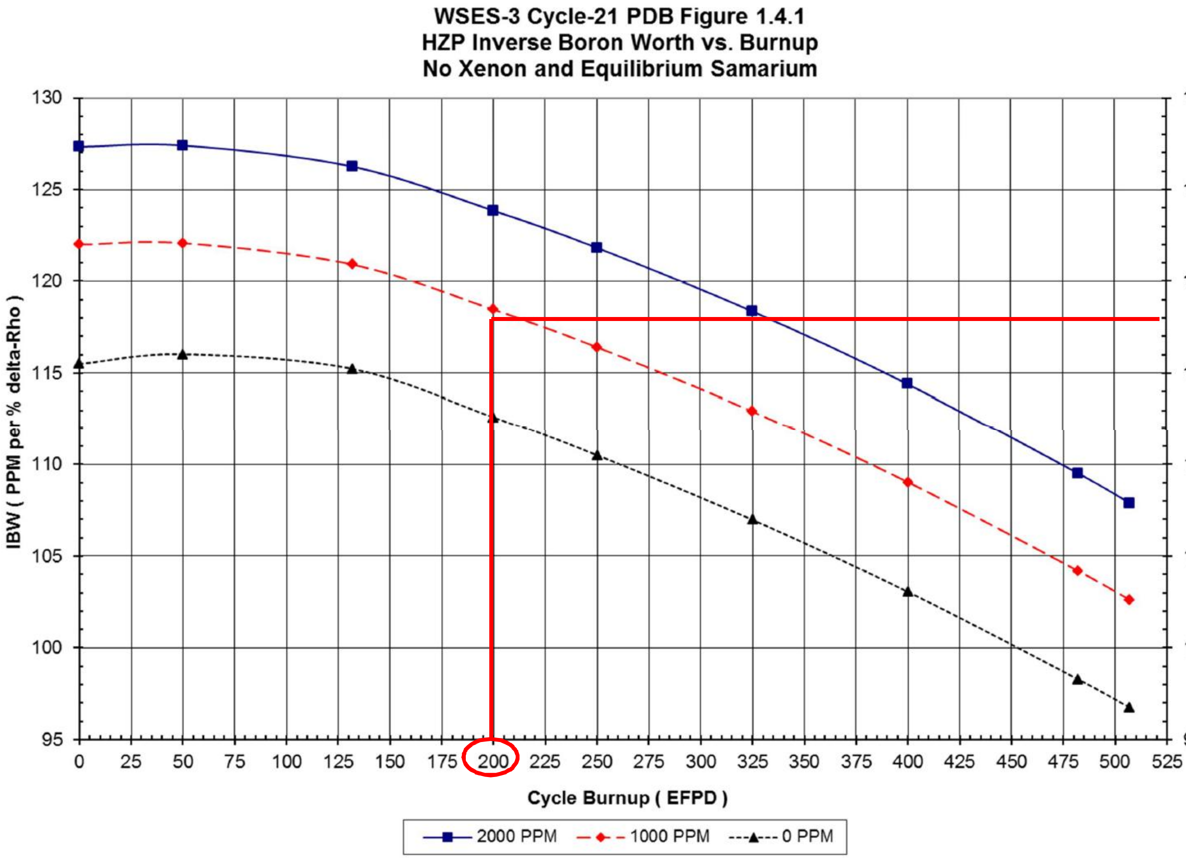
K-Effective Calculation

$$K_{EFF} = \frac{1}{1 + \text{step 7.5.6.5 } (\mathbf{0.01729 - 0.01735})} = \mathbf{0.982 - 0.984}$$

7.5.6.7 $K_{EFF} \leq K_{EFF}$ REQUIRED BY COLR YES NO (circle one)

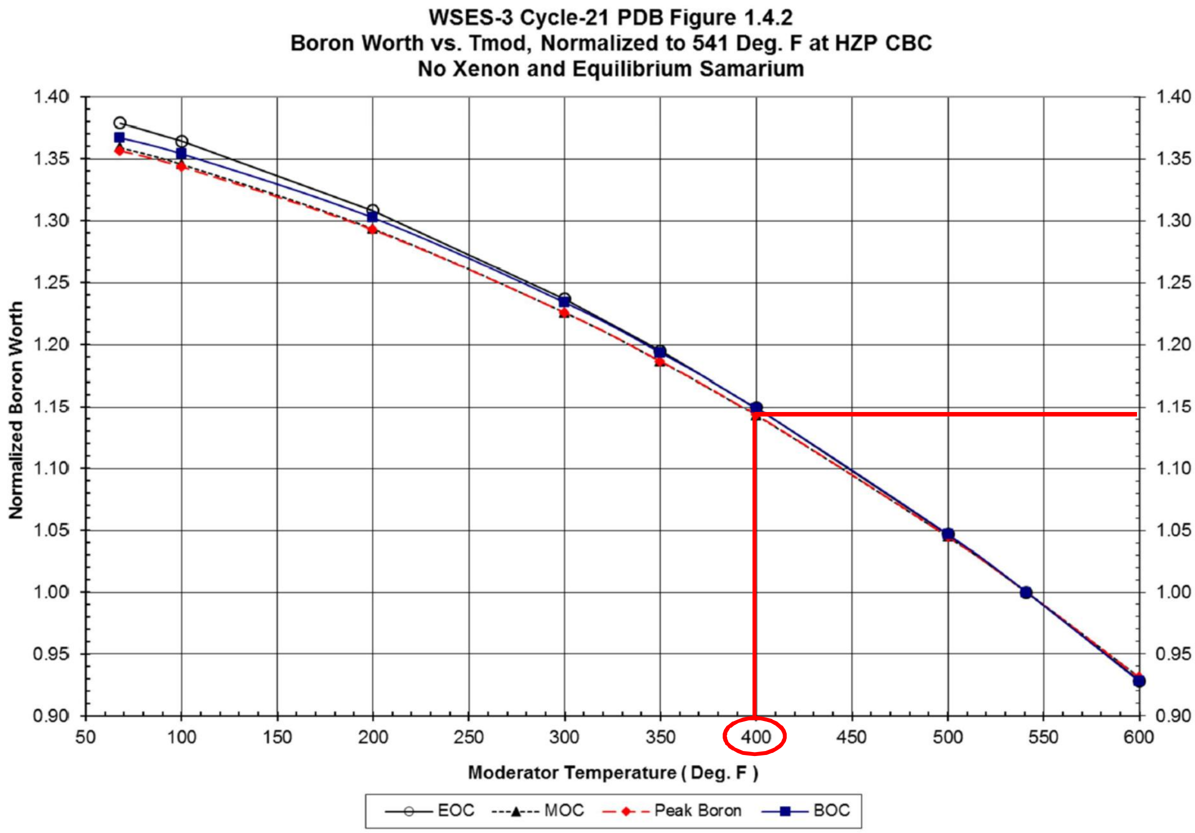
ANSWER KEY

ANSWER KEY



ANSWER KEY

ANSWER KEY



ANSWER KEY

SIMULATOR OPERATOR INSTRUCTIONS

None.

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- Plant is shutdown, all CEAs inserted
- RCS boron concentration is 900 PPM
- RCS Thot and Tcold are 400°F
- EFPD is 200 (MOC)
- A Shutdown Margin calculation was completed satisfactorily using OP-903-090 Attachment 10.1 and calculated to be 876 PPM.

INITIATING CUE(S):

The CRS directs you to calculate K-Effective in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation. <u>Stop</u> after step 7.5.6.6 is completed.

Document the results on this cue sheet.

K-Effective: _______________

7.5 K-EFFECTIVE CALCULATION

CAUTION

R THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

NOTE

(1) Due to an inability to calculate Keff when CEA uncoupling begins in Mode 6, Reactor Engineering will supply a letter stating a Boron concentration that will meet the Keff requirements for Refueling. (This section is N/A when the letter is in place and CEA uncoupling has begun).

(2) When using graphs and tables in the Plant Data Book (PDB), to obtain the necessary data, it may be necessary and is acceptable to interpolate (approximate between data points or curves). However, extrapolation (approximation outside of the bounds of the data or curves) should not be used.

7.5.1 Enter the following current plant data on Attachment 10.5: (N/A this section if Reactor Engineering has supplied a letter with a Boron concentration that will meet the required Keff requirements for Refueling)

7.5.1.1 Current RCS Boron Concentration from latest Chemistry sample.

7.5.1.2 RCS T_{AVE}

7.5.1.3 Cycle Burnup (Point ID C24110 or equivalent).

7.5.2 Determine current HZP Inverse Boron Worth, using current EFPD and PDB Figure 1.4.1, HZP Inverse Boron Worth vs. Burnup.

7.5.3 Determine current Normalized Boron Worth, using temperature recorded in step 7.5.1.2 and PDB Figure 1.4.2, Normalized Boron Worth Versus Temperature Normalized to 541°F.

7.5.4 Obtain Required Shutdown Margin Boron Concentration from Attachment 10.1, step 7.1.3.4 or Attachment 10.4, step 7.4.3.5.7.5.4.1. Circle step number used on Attachment 10.5.

7.5.5 Obtain Required Shutdown Margin from T.S. 3.1.1.1 or 3.1.1.2.

7.5.6 Calculate K-Effective on Attachment 10.5 as follows:

7.5.6.1 Calculate Actual Boron Concentration above Shutdown Margin Requirement by subtracting value recorded in step 7.5.4 from value recorded in step 7.5.1.1.

7.5.6.2 Calculate Adjusted Inverse Boron Worth by dividing value recorded in step 7.5.2 by value recorded in step 7.5.3.

7.5.6.3 Calculate Boron Worth above Shutdown Margin Requirement by dividing value recorded in step 7.5.6.1 by value recorded in step 7.5.6.2.

7.5.6.4 Calculate Total Excess Reactivity Worth by adding value recorded in step 7.5.5 to value recorded in step 7.5.6.3.

7.5.6.5 Convert %K/K to ΔK/K by dividing value recorded in step 7.5.6.4 by 100.

7.5.6.6 Calculate K-Effective by dividing 1 by the sum of 1 + step 7.5.6.5.

7.5.6.7 Verify K-Effective less than or equal to that required by the COLR.

7.5.6.7.1 Designate Yes or No on Attachment 10.5.

R

7.5.7 If the requirements of Technical Specifications 3.1.2.9 or 3.9.1 are not met, then Commence Emergency Boration and go to OP-901-103, Emergency Boration.

10.5 K-EFFECTIVE CALCULATION

(Typical)

Step	Description	Value	Units
7.5.1.1	RCS BORON CONCENTRATION		PPM
7.5.1.2	T_{AVE}		^{o}F
7.5.1.3	CYCLE BURNUP (POINT ID C24110 OR EQUIVALENT)		EFPD
7.5.2	HZP INVERSE BORON WORTH		PPM/%Δk/k
7.5.3	NORMALIZED BORON WORTH FACTOR		
7.5.4	REQUIRED SHUTDOWN MARGIN BORON CONCENTRATION ATT. 10.1, STEP 7.1.3.4 <u>OR</u> ATT. 10.4, STEP 7.4.3.5 (CIRCLE ATTACHMENT USED)		PPM
7.5.5	T.S. SHUTDOWN MARGIN REQUIREMENT T.S. 3.1.1.1 <u>OR</u> 3.1.1.2		%Δk/k

7.5.6.1 ACTUAL PPM BORON ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.1.1( ) − step 7.5.4 ( ) = ________________PPM

7.5.6.2 ADJUSTED INVERSE BORON WORTH

step 7.5.2 ( ) ÷ step 7.5.3 ( ) = ______________PPM/% ΔK/K

7.5.6.3 BORON REACTIVITY WORTH ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.6.1 ( ) ÷ step 7.5.6.2 ( ) = __________________%ΔK/K

7.5.6.4 TOTAL EXCESS REACTIVITY WORTH

step 7.5.5 ( ) + step 7.5.6.3 ( ) = __________________%ΔK/K

7.5.6.5 UNIT CONVERSION

step 7.5.6.4 ( ) ÷ 100 = ___________________ΔK/K

K-Effective Calculation

$$K_{EFF} = \frac{1}{1 + \text{step 7.5.6.5 (\qquad)}} = \underline{\qquad\qquad\qquad\qquad}$$

7.5.6.7 $K_{EFF} \leq K_{EFF}$ REQUIRED BY COLR YES NO

(circle one)

JPM A3 - Applicant Handout 2

K-EFFECTIVE CALCULATION (CONT'D)

REMARKS: ____

____

____

____

____

____

____

____

Performed by: ______________________________ ____________

(Signature) (Date)

IV of Calculations by: ______________________________ ____________

(Signature) (Date)

SM/CRS Review: ______________________________ ______/______

(Signature) (Date/Time)

REQUEST/APPROVAL PAGE

SAFETY RELATED

PROCEDURE

Normal Review Class (check one):

☐ **OSRC**

☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-903-090	REVISION: 305

TITLE: Shutdown Margin

PROCEDURE OWNER (Position Title) : Operations Manager - Support

TERM (check one) : ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 7/6/16

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

In Limitations 3.2.2 and 3.2.1, deleted specific EFPD ranges for the listed core life cycle periods (Beginning of Cycle (BOC) Peak Boron, Middle of Cycle (MOC), and End of Cycle (EOC)) and Plant Data Base figures. Also, in Limitation 3.2.2 clarified that ranges for these periods vary from cycle to cycle and (therefore) the current applicable range should normally be provided by RXE in the monthly Reactivity Management Plan. Currently the titles of the figures and tables in PDB-001 all refer to a single EFPD value and not a range over which the figures and tables are applicable. The previously stated EFPD ranges in this procedure have been inconsistent with the proper method of determining the ranges, which according to RXE should be based upon the mid ranges between the EFPD values upon which the figures and tables are based.

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES		PRINT NAME OR SIGNATURE	DATE
PREPARER		David R. Voisin	6/23/2016
EC SUPERVISOR	Administrative Review and Approval	(sign) [signature]	6-29-16
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Engineering - Reactor	Pamela Hernandez	6/23/2016
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐ PA Exclusion ☐	N/A	
TECHNICAL	Review ☐ Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐	N/A	
GROUP/DEPT. HEAD	Review ☐ Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐ Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS	Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Shutdown Margin shall be greater than or equal to that specified in the Core Operating Limits Report (COLR), as required by Technical Specification 3.1.1.1 or 3.1.1.2.

3.1.2 Shutdown Margin less conservative than specified by Technical Specification 3.1.1.1 or 3.1.1.2 is a Reportable Occurrence.

3.1.3 RHOBAL Program shall be used to determine initial Xenon Reactivity Worth if a Reactor Trip occurs during non-equilibrium Xenon conditions. Post-trip transient Xenon Worth may be obtained by running a RHOBAL poison transient in accordance with section 7.6, RHOBAL Poison Transient of this procedure or by contacting Reactor Engineering.

3.1.4 For worksheets which perform projections in the RHOBAL program, a poison transient must be performed to update the Xenon and Net Samarium worths. If manual Xenon and/or Net Samarium data is input, the projection will not be performed.

3.2 LIMITATIONS

3.2.1 Information from Plant Data Book (PDB) and Reactor Engineering Book is necessary to perform this procedure unless using RHOBAL. Figure numbers contained in this procedure refer to appropriate section of the PDB. When using graphs and tables in the Plant Data Book (PDB), to obtain the necessary data, it may be necessary and is acceptable to interpolate (approximate between data points or curves). However, extrapolation (approximation outside of the bounds of the data or curves) should not be used.

3.2.2 When using graphs and tables in the Plant Data Book (PDB-001), the core life cycle periods are defined as follows. The Effective Full Power Days (EFPD) ranges for these periods vary from cycle to cycle. The current applicable range should normally be provided by RXE in the monthly Reactivity Management Plan.

- Beginning of Cycle (BOC)
- Peak Boron
- Middle of Cycle (MOC)
- End of Cycle (EOC)

3.2.3 When using Xenon Worth graphs and tables in the Plant Data Book, use the figure or table associated with the current core life cycle period as listed below:

- Figure 1.6.1.1: BOC and Peak Boron
- Figure 1.6.1.2: MOC
- Figure 1.6.1.3: EOC

3.2.4 Column F of Attachment 11.1 of OP-004-019, Estimated Critical Configuration, can be used to satisfy Shutdown Margin in Mode 3 per either Technical Specification 4.1.1.1 (5.15% Δ k/k when Shutdown Bank CEAs are not fully inserted) or Technical Specification 4.1.1.2 (4.6% Δ k/k when all CEAs are fully inserted) as directed by OP-010-003, Plant Startup [CRs 98-0970, 01-0209]. This is done by verifying that the actual RCS boron concentration is no more than 20 ppm below Critical Boron Concentration of Column F, Att.11.1 and the question of “Allowable CEA Range is verified to be above Transient Insertion Limit for critical operations (Group 5 $\geq$ 60 inches)” is answered yes.

3.2.5 In the RHOBAL program when calculating Critical Boron Concentration, the adjusted boron concentration column of step 4.2 on Worksheet 1 for Critical Boron Concentration of OP-004-019, Estimated Critical Configuration, can be used to satisfy Shutdown Margin in Mode 3 per either Technical Specification 4.1.1.1 (5.15% Δ k/k when Shutdown Bank CEAs are not fully inserted) or Technical Specification 4.1.1.2 (4.6% Δ k/k when all CEAs are fully inserted) as directed by OP-010-003, Plant Startup [CRs 98-0970, 01-0209]. This is done by verifying that the Actual RCS Boron Concentration is no more than 20 ppm below the Estimated Critical Boron in step 4.2 of Worksheet 1 for Critical Boron Concentration, and the –0.5%Δk/k rod position in step 5.3 of Worksheet 1 for Critical Rod Position is above the Transient Insertion Limit for critical operations (Group 5 $\geq$ 60 inches).

3.2.6 In the RHOBAL program, if an input parameter is beyond the range of the cycle specific input database, a warning message is printed on the screen and/or the error log. This is intended to prevent performing a calculation outside the analyzed window.

3.2.7 In the RHOBAL program, screen minimization is not allowed. When the calculations are completed on a particular screen, it must be closed for control to return to a previous screen.

3.2.8 Changes to this procedure shall be reviewed by the Reactor Engineering (RE) Department prior to approval. **[P-21855]**

7.5 K-EFFECTIVE CALCULATION

CAUTION

R THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

NOTE

(1) Due to an inability to calculate Keff when CEA uncoupling begins in Mode 6, Reactor Engineering will supply a letter stating a Boron concentration that will meet the Keff requirements for Refueling. (This section is N/A when the letter is in place and CEA uncoupling has begun).

(2) When using graphs and tables in the Plant Data Book (PDB), to obtain the necessary data, it may be necessary and is acceptable to interpolate (approximate between data points or curves). However, extrapolation (approximation outside of the bounds of the data or curves) should not be used.

7.5.1 Enter the following current plant data on Attachment 10.5: (N/A this section if Reactor Engineering has supplied a letter with a Boron concentration that will meet the required Keff requirements for Refueling)

7.5.1.1 Current RCS Boron Concentration from latest Chemistry sample.

7.5.1.2 RCS T_{AVE}

7.5.1.3 Cycle Burnup (Point ID C24110 or equivalent).

7.5.2 Determine current HZP Inverse Boron Worth, using current EFPD and PDB Figure 1.4.1, HZP Inverse Boron Worth vs. Burnup.

7.5.3 Determine current Normalized Boron Worth, using temperature recorded in step 7.5.1.2 and PDB Figure 1.4.2, Normalized Boron Worth Versus Temperature Normalized to 541°F.

7.5.4 Obtain Required Shutdown Margin Boron Concentration from Attachment 10.1, step 7.1.3.4 or Attachment 10.4, step 7.4.3.5.7.5.4.1. Circle step number used on Attachment 10.5.

7.5.5 Obtain Required Shutdown Margin from T.S. 3.1.1.1 or 3.1.1.2.

7.5.6 Calculate K-Effective on Attachment 10.5 as follows:

7.5.6.1 Calculate Actual Boron Concentration above Shutdown Margin Requirement by subtracting value recorded in step 7.5.4 from value recorded in step 7.5.1.1.

7.5.6.2 Calculate Adjusted Inverse Boron Worth by dividing value recorded in step 7.5.2 by value recorded in step 7.5.3.

7.5.6.3 Calculate Boron Worth above Shutdown Margin Requirement by dividing value recorded in step 7.5.6.1 by value recorded in step 7.5.6.2.

7.5.6.4 Calculate Total Excess Reactivity Worth by adding value recorded in step 7.5.5 to value recorded in step 7.5.6.3.

7.5.6.5 Convert %K/K to ΔK/K by dividing value recorded in step 7.5.6.4 by 100.

7.5.6.6 Calculate K-Effective by dividing 1 by the sum of 1 + step 7.5.6.5.

7.5.6.7 Verify K-Effective <u>less</u> <u>than</u> <u>or</u> <u>equal</u> <u>to</u> that required by the COLR.

7.5.6.7.1 Designate Yes <u>or</u> No on Attachment 10.5.

R

7.5.7 <u>If</u> the requirements of Technical Specifications 3.1.2.9 <u>or</u> 3.9.1 are <u>not</u> met, <u>then</u> Commence Emergency Boration <u>and</u> <u>go</u> <u>to</u> OP-901-103, Emergency Boration.

10.5 K-EFFECTIVE CALCULATION

(Typical)

Step	Description	Value	Units
7.5.1.1	RCS BORON CONCENTRATION		PPM
7.5.1.2	T_{AVE}		^{o}F
7.5.1.3	CYCLE BURNUP (POINT ID C24110 OR EQUIVALENT)		EFPD
7.5.2	HZP INVERSE BORON WORTH		PPM/%Δk/k
7.5.3	NORMALIZED BORON WORTH FACTOR		
7.5.4	REQUIRED SHUTDOWN MARGIN BORON CONCENTRATION ATT. 10.1, STEP 7.1.3.4 OR ATT. 10.4, STEP 7.4.3.5 (CIRCLE ATTACHMENT USED)		PPM
7.5.5	T.S. SHUTDOWN MARGIN REQUIREMENT T.S. 3.1.1.1 OR 3.1.1.2		%Δk/k

7.5.6.1 ACTUAL PPM BORON ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.1.1( ) − step 7.5.4 ( ) = ________________PPM

7.5.6.2 ADJUSTED INVERSE BORON WORTH

step 7.5.2 ( ) ÷ step 7.5.3 ( ) = ______________PPM/% ΔK/K

7.5.6.3 BORON REACTIVITY WORTH ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.6.1 ( ) ÷ step 7.5.6.2 ( ) = __________________%ΔK/K

7.5.6.4 TOTAL EXCESS REACTIVITY WORTH

step 7.5.5 ( ) + step 7.5.6.3 ( ) = __________________%ΔK/K

7.5.6.5 UNIT CONVERSION

step 7.5.6.4 ( ) ÷ 100 = ___________________ΔK/K

K-Effective Calculation

$$K_{EFF} = \frac{1}{1 + \text{step 7.5.6.5 (\quad)}} = \underline{\hspace{6cm}}$$

7.5.6.7 $K_{EFF} \leq K_{EFF}$ REQUIRED BY COLR YES NO

(circle one)

REMARKS: ____

Performed by: ______________________ (Signature) __________ (Date)

IV of Calculations by: ______________________ (Signature) __________ (Date)

SM/CRS Review: ______________________ (Signature) _____ / _____ (Date/Time)

CYCLE 21 PLANT DATA BOOK

Data provided is compiled from EC 58032 and 61508 which issue the Physics Data Book and Reactivity Balance Update, which combined comprise the Plant Data Book Volume 1. Approvals of PDB and RBU are documented in the respective ECs

WSES-3 Cycle 21

Physics Data Book

Table 1.4.1

Inverse Boron Worth vs. Burnup,
HZP, Tavg = 541 °F, No Xenon and Equilibrium Samarium

(PPM/%Δρ)

PPM	<---				**EFPD** -->				
	0	**50**	**132**	**200**	**250**	**325**	**400**	**482**	**507**
0	115.505	116.028	115.237	112.629	110.501	106.974	103.047	98.295	96.751
200	116.898	117.298	116.401	113.831	111.723	108.214	104.290	99.524	97.972
400	118.244	118.539	117.551	115.015	112.925	109.432	105.509	100.729	99.169
600	119.544	119.750	118.688	116.182	114.108	110.628	106.705	101.910	100.343
800	120.796	120.931	119.810	117.331	115.270	111.801	107.877	103.067	101.493
1000	122.002	122.083	120.919	118.463	116.413	112.952	109.026	104.201	102.620
1200	123.161	123.206	122.013	119.576	117.536	114.080	110.151	105.311	103.723
1400	124.274	124.299	123.094	120.673	118.639	115.187	111.252	106.398	104.803
1600	125.340	125.363	124.161	121.751	119.722	116.271	112.330	107.461	105.860
1800	126.358	126.398	125.213	122.812	120.785	117.333	113.385	108.500	106.893
2000	127.331	127.403	126.252	123.855	121.829	118.373	114.416	109.516	107.903

WSES-3 Cycle 21

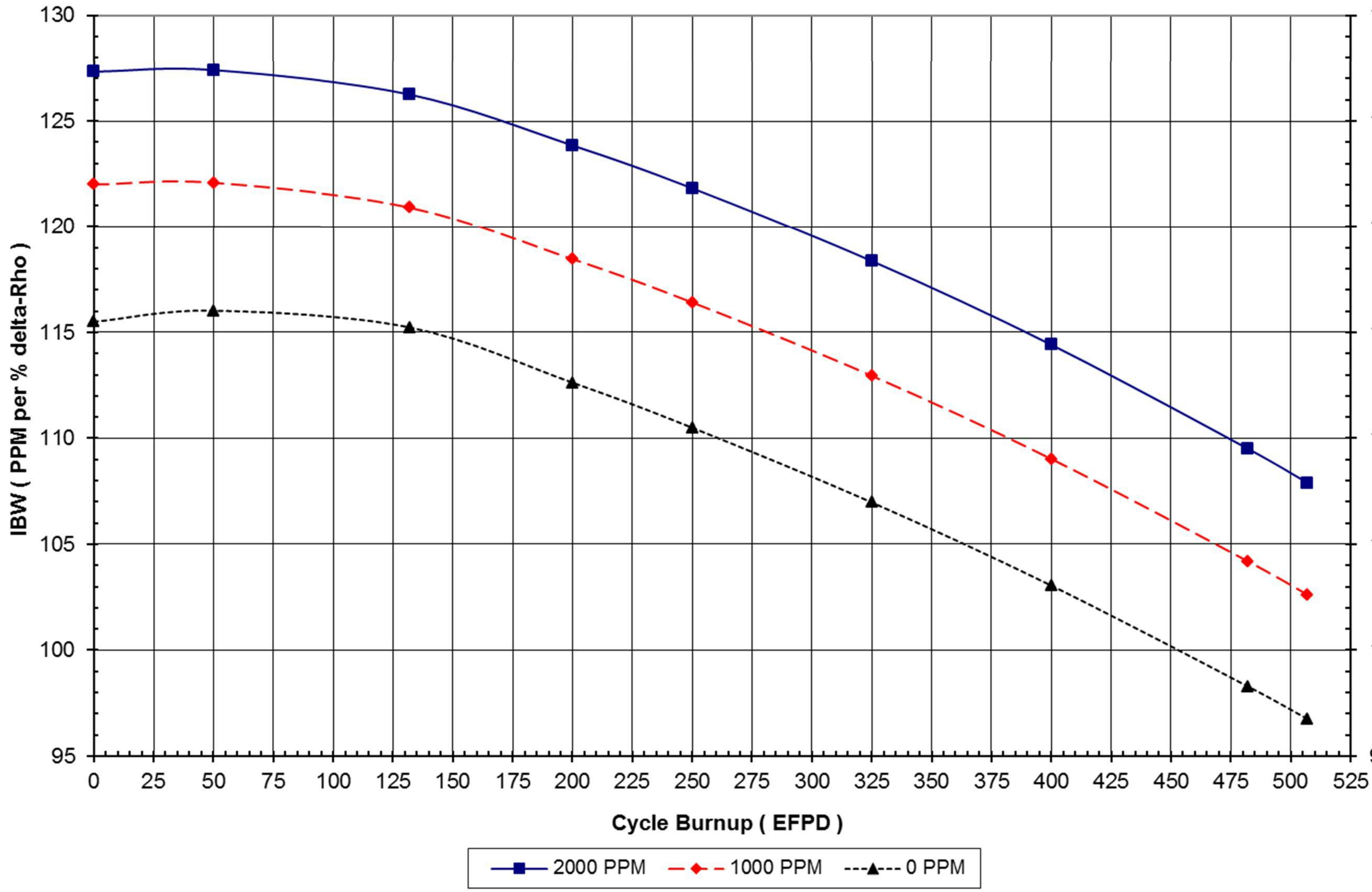
Physics Data Book

Table 1.4.2

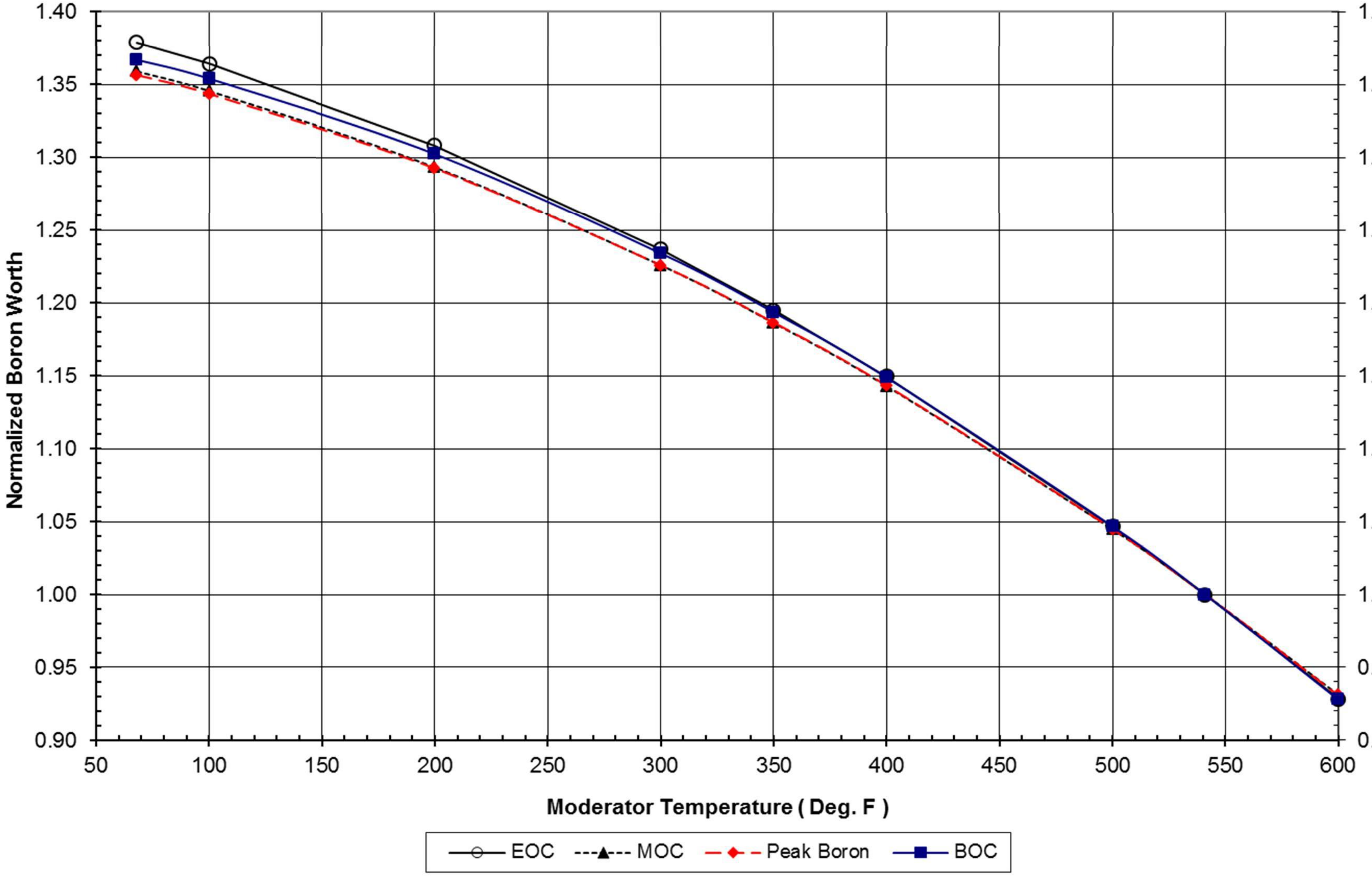
Boron Worth vs. Moderator Temperature,
Normalized to 541 °F at HZP CBC,
No Xenon and Equilibrium Samarium

Temp	**EFPD**=>	12.5	132	250	507
(Deg. F)	**PPM**=>	1209	1510	1368	601
68		1.3671	1.3567	1.3591	1.3791
100		1.3541	1.3437	1.3456	1.3645
200		1.3025	1.2927	1.2934	1.3083
300		1.2341	1.2259	1.2258	1.2366
350		1.1935	1.1866	1.1863	1.1950
400		1.1488	1.1433	1.1429	1.1494
500		1.0467	1.0449	1.0447	1.0466
541		1.0000	1.0000	1.0000	1.0000
600		0.9278	0.9307	0.9312	0.9283

WSES-3 Cycle-21 PDB Figure 1.4.1
HZP Inverse Boron Worth vs. Burnup
No Xenon and Equilibrium Samarium



WSES-3 Cycle-21 PDB Figure 1.4.2
Boron Worth vs. Tmod, Normalized to 541 Deg. F at HZP CBC
No Xenon and Equilibrium Samarium



Waterford 3

2017 RO NRC Exam

JOB PERFORMANCE MEASURE

A4

Gaseous Release Evaluation

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Meteorological conditions are evaluated for gaseous release from the GWM System.

Task Standard: Applicant concluded that a release is not permitted. The conclusion included the correct evaluation of wind speed, wind direction, and stability class.

References: OP-007-003, Gaseous Waste Management (rev 307)

Alternate Path: No Time Critical: No Validation Time: 7 min

K/A 2.3.11 Ability to control radiation releases Importance Rating 3.8
RO

Applicant: ______________________________

Time Start: __________________ Time Finish: __________________

Performance Time: __________________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ______________________________

____

____

Examiner: ______________________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- Attachment 11.5 of OP-007-003, Gaseous Waste Management (Handout 1)
- MET data (Handout 2)

Description:
The applicant will be provided information from the PMC for the applicable meteorological conditions. The data will be used to evaluate the flow chart in OP-007-003, Attachment 11.5.

READ TO APPLICANT

DIRECTION TO APPLICANT:

Each administrative JPM has a cue sheet with the instructions for that JPM. Each administrative JPM stands alone, and conditions from 1 JPM do not carry over to any other JPM. If you have any questions, raise your hand and I will come to your desk.

Provide all answers on the sheets provided.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

Examiner Note
Attachment 11.5, Meteorological Conditions Requirements, notes: Note 1 All parameters should be obtained from the 15 minute average values. Note 2 directs the use of 33 foot parameters from the primary or backup tower. Note 3 ΔT/50m may be obtained from the primary or backup tower 199-33' Delta T reading.

TASK ELEMENT 1	STANDARD
Evaluate 10 meter (33 foot) wind speed.	Concluded wind speed is ≥0.67 m/s and ≤3.35 m/s
Comment: Examiner Note: Applicant should use 2.68 or 2.75 m/s. The 199 foot reading (3.62 m/s) will conclude that there are no restrictions on the release without using the rest of the flowchart and result in JPM failure.	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 2	STANDARD
Evaluate 10 meter (33 foot) wind direction.	Concluded wind direction is ≥68 deg and ≤339 deg.
Comment: Examiner Note: Applicant should use 33 foot readings, 331.1 or 330.7 degrees. The 199 foot reading (314.5 deg) will also continue right through the flow chart.	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
Evaluate Pasquill Stability Class.	Concluded stability class F, and that the release is not permitted.
Comment: Examiner Note: Applicant should use a ΔT of 0.77 °C or 0.76 °C. Use of instantaneous values (0.72 or 0.73 ΔT/50m) would result in a Stability class E and JPM failure.	**<u>Critical</u>** **SAT / UNSAT**

END OF TASK

SIMULATOR OPERATOR INSTRUCTIONS

None.

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- The plant is in Mode 1
- Chemistry has requested a release of all 3 Gas Decay Tanks for planned maintenance
- Environmental conditions are as displayed on the METDATA handout

INITIATING CUE(S):

The CRS directs you to complete an evaluation of meteorological conditions for the release in accordance with OP-007-003, Gaseous Waste Management.

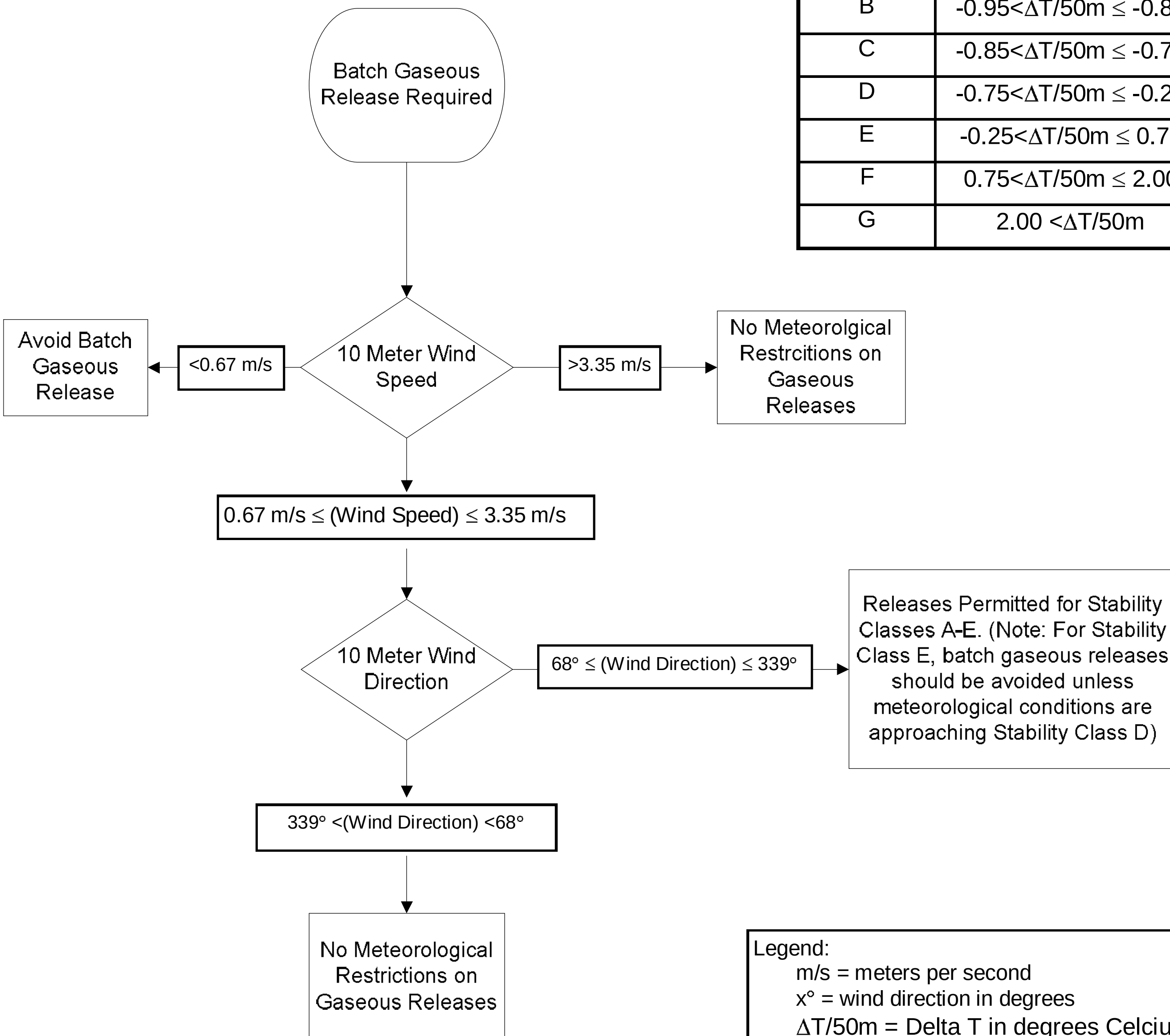
Document all work on OP-007-003, Attachment 11.5.

Release Permitted: Yes____ No____ (select one)

11.5 METEOROLOGICAL CONDITIONS REQUIREMENTS
[P11585]

Pasquill Stability Classes

Class	(ΔT °C/50m)
A	ΔT/50m ≤ -0.95
B	-0.95<ΔT/50m ≤ -0.85
C	-0.85<ΔT/50m ≤ -0.75
D	-0.75<ΔT/50m ≤ -0.25
E	-0.25<ΔT/50m ≤ 0.75
F	0.75<ΔT/50m ≤ 2.00
G	2.00 <ΔT/50m



Legend:
- m/s = meters per second
- x° = wind direction in degrees
- ΔT/50m = Delta T in degrees Celcius

Notes:
1. All parameters should be obtained from the 15 minute average values displayed on the PMC.
2. 10 meter wind speed and wind direction may be obtained from the primary or back-up tower 33' reading.
3. ΔT/50m may be obtained from the primary or back-up tower 199-33' Delta T reading.

A4 Applicant Handout 2

POINT ID	DESCRIPTION	CURRENT VALUE	UNITS	LOW ALARM /COUNTS	HIGH ALARM /SENSOR	QUAL
C48530	PRI TWR 33’ WIND DIR 15M RAVG	331.1	DEG	N/A	N/A	GOOD
C48616	BKUP TWR 33’ WIND DIR 15M RAVG	330.7	DEG	N/A	N/A	GOOD
C48531	PRI TWR 199’ WIND DIR 15M RAVG	314.5	DEG	N/A	N/A	GOOD
C48526	PRI TWR 33’ WIND SPEED 15M RAVG	2.68	M/S	N/A	N/A	GOOD
C48614	BKUP TWR 33’ WIND SPEED 15M RAVG	2.75	M/S	N/A	N/A	GOOD
C48527	PRI TWR 199’ WIND SPEED 15M RAVG	3.62	M/S	N/A	N/A	GOOD
C48528	PRI TWR 199-33’ DELTA T A 15M RAVG	.76	DEGC	N/A	N/A	GOOD
C48529	PRI TWR 199-33’ DELTA T B 15M RAVG	.77	DEGC	N/A	N/A	GOOD
C48615	BKUP TWR 199-33’ DELTA T 15M RAVG	.77	DEGC	N/A	N/A	GOOD
C48505	PRI TWR 33’ WIND SPEED	2.81	M/S	N/A	N/A	GOOD
C48507	PRI TWR 33’ WIND DIR	335.6	DEG	N/A	N/A	GOOD
C48509	PRI TWR 199-33’ DELTA T “A”	.81	DEGC	N/A	N/A	GOOD
C48605	BKUP TWR 33’ WIND SPEED	2.65	M/S	N/A	N/A	GOOD
C48506	PRI TWR 199’ WIND SPEED	3.05	M/S	N/A	N/A	GOOD
C48533	PRI TWR 199’ SIGMA THETA 15M RAVG	16.1	DEG	N/A	N/A	GOOD
C48510	PRI TWR 199-33’ DELTA T “B”	.72	DEGC	N/A	N/A	GOOD
C48607	BKUP TWR 199-33’ DELTA T	.73	DEGC	N/A	N/A	GOOD
C48511	PRI TWR 33’ AIR TEMP “A”	28.6	DEGC	4.44	N/A	GOOD
C48532	PRI TWR 33’ SIGMA THETA 15M RAVG	24.7	DEG	N/A	N/A	GOOD
C48617	BKUP TWR 33’ SIGMA THETA 15M RAVG	18.4	DEG	N/A	N/A	GOOD

REQUEST/APPROVAL PAGE

SAFETY RELATED PROCEDURE

Normal Review Class (check one):

☐ OSRC

☑ QUALIFIED REVIEWER

PROCEDURE NUMBER: OP-007-003		REVISION: 307

TITLE: Gaseous Waste Management

PROCEDURE OWNER (Position Title) : Operations Manager - Support

TERM (check one) : ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 11/10/2014

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ Revision ☐ Deletion ☐ New Procedure

DESCRIPTION AND JUSTIFICATION:

In Attachment 11.1, corrected component descriptions for GWM-2014A, GWM-7011A and GWM-7021A. These valves were added in the previous revision based on Equipment Database Descriptions. However, the field labeling was affected before the EDB descriptions were made and the procedure and the assigned EDB descriptions did not match with the field labels. The EDB descriptions have been updated to match the field labels and the procedure needs to be updated to match both. This change effects reference information and does not revise any plant operations or configurations. This change, therefore, meets Editorial Corrections criteria.

☐ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ Normal ☑ Editorial Correction (Revisions Only) ☐ Technical Verification (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES		PRINT NAME OR SIGNATURE	DATE
PREPARER		David R Voisin	11/6/2014
EC SUPERVISOR	Administrative Review and Approval	(sign)	11/6/14
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Operations [Field Walk-down]	Jacob MacArthur	11/6/2014
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐ PA Exclusion ☐	N/A	
TECHNICAL	Review ☐ Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐	N/A	
GROUP/DEPT. HEAD	Review ☐ Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐ Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS	Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Gas Decay Tank release may be initiated concurrent with Containment Purge provided the following conditions are met:

- Containment Purge is in progress and Containment Purge is not on a Batch Release
- If Containment Purge flow is interrupted or Plant Stack flow is changed, GDT release shall be secured

3.1.2 Additions to the Gas Surge Tank from the VCT, Gas Surge Header, and Containment Vent Header should not be made during GDT releases due to potential leakage of GDT Inlet valves. **[CR-WF3-1998-01291]**

3.1.3 This procedure contains inactivated equipment. The isolation boundaries are identified in Attachment 11.1, Gaseous Waste Management System Standby Valve Lineup.

3.2 LIMITATIONS

3.2.1 Minimize the amount of time Gas Surge Tank (GST) pressure >20 psig due to motor horsepower rating limits the maximum operating suction pressure.

3.2.2 Gas Decay Tank (GDT) pressure should be limited to a maximum of 340 psig.

3.2.3 The Gaseous Waste Management System may be shut down if the Reactor is cooled down and depressurized.

3.2.4 GDT Discharge Permits normally are written to discharge all GDTs simultaneously due to the potential of GDT inlet valve(s) to leak.

3.2.5 The in-service GDT Pressure should be maintained $\geq$15 psig in order for Chemistry to obtain a sample.

6.4 DISCHARGING GAS DECAY TANK
[P-13496]

Denote which Gas Decay Tank is being discharged (circle one):

A B C ALL

NOTE

GDT Discharge Permits normally are written to discharge all GDTs simultaneously due to the potential of GDT inlet valve(s) to leak.

CAUTION

ADDITIONS TO THE GAS SURGE TANK FROM THE VCT, GAS SURGE HEADER OR THE CONTAINMENT VENT HEADER SHOULD **NOT** BE MADE DURING GDT RELEASES DUE TO POTENTIAL LEAKAGE OF GDT INLET VALVES. **[CR-98-1291]**

CAUTION

GAS DECAY TANK RELEASE MAY BE INITIATED CONCURRENT WITH CONTAINMENT PURGE PROVIDED THE FOLLOWING CONDITIONS ARE MET:

- CONTAINMENT PURGE IS IN PROGRESS AND CONTAINMENT PURGE IS NOT ON A BATCH RELEASE
- IF CONTAINMENT PURGE FLOW IS INTERRUPTED OR PLANT STACK FLOW IS CHANGED, THEN GDT RELEASE SHALL BE SECURED

6.4.1 Verify a Gaseous Release Permit has been issued to release the Gas Decay Tank(s) (GDT), unless ALL of the following conditions exist:

- The GDT has been discharged under an approved release permit.
- A N_2 purge has been started following the release in preparation for another discharge to further reduce GDT activity or Hydrogen and Oxygen concentration.
- The GDT has NOT been placed in service

6.4.2 If discharging all GDTs, then have Chemistry verify the Waste Gas Analyzer Sample Pump is aligned to the VGCH.

NOTE

Successful performance of step 6.4.3 satisfies TRM Table 4.3-9, Source Check prior to release. **[P-2383]**

6.4.3 Perform a source check for the Gaseous Waste Discharge Radiation Monitor, PRM-IRE-0648, as follows:

NOTE

The C/S pushbutton backlight should illuminate on step 6.4.3.1.

6.4.3.1 Perform a source check in accordance with OP-004-001.

6.4.3.2 Verify monitor passes source check.

6.4.3.2.1 If not, then consult the Technical Requirements Manual 3/4 11.2 and contact Chemistry Department to perform two independent samples.

6.4.3.3 Upon completion of a successful source check, initial the appropriate line of the Gaseous Release Permit.

6.4.4 Refer to Attachment 11.5, Meteorological Conditions Requirements, to verify that proper meteorological conditions for release exist.

NOTE

SM/CRS permission signifies that the plant is in a condition that will allow for the discharge of the appropriate tank. **[P-25084]**

6.4.5 Obtain SM/CRS permission to discharge Gas Decay Tank(s) and document on Attachment 11.4, Gas Decay Tank Discharge Checklist, and Gaseous Release Permit.

6.4.6 Reset the Waste Gas Discharge Flow Integrator to Zero.

6.4.7 Perform Steps 1 through 19 of Attachment 11.4.

6.4.8 Open Waste Gas Discharge Flow Control Valve, GWM-309.

CAUTION

1. IF DISCHARGE ACTIVITY EXCEEDS THE GASEOUS RELEASE PERMIT SETPOINT THEN OP-901-413, WASTE GAS DISCHARGE HIGH RADIATION, SHALL BE ENTERED.
2. AT LEAST **ONE** RAB EXHAUST FAN SHALL BE OPERATING WHILE DISCHARGING.
3. THE RELEASE SHOULD BE TERMINATED IF METEOROLOGICAL CONDITIONS ARE OUTSIDE THE PERMISSIBLE LIMITS.
4. THE RELEASE SHALL BE TERMINATED IF THE IN-SERVICE GDT PRESSURE BEGINS TO DECREASE UNTIL ADDITIONS TO THE GAS SURGE HEADER HAVE BEEN SECURED. IF NO NEW GASES HAVE BEEN INTRODUCED AND A WR HAS BEEN WRITTEN ON THE LEAKING INLET VALVE, THEN DISCHARGING CAN CONTINUE.
5. IF DISCHARGING **ALL THREE** GDTs SIMULTANEOUSLY, THEN ADDITIONS TO THE GAS SURGE TANK FROM THE VCT, GAS SURGE HEADER OR THE CONTAINMENT VENT HEADER SHOULD **NOT** BE MADE DURING GDT RELEASES DUE TO POTENTIAL LEAKAGE OF GDT INLET VALVES. DISCHARGING ALL GDTS SIMULTANEOUSLY IS THE PREFERRED METHOD. **[CR-98-1291]**

6.4.9 If the Gaseous Waste Discharge Radiation Monitor, PRM-IRE-0648, is operable and sample flow has risen to >2 scfm as seen locally and documented on Attachment 11.4, then continue to throttle Open Waste Gas Discharge GWM-IFIT-0648 Outlet Isolation Valve, GWM-311, to establish desired flow within limit indicated on Gaseous Release Permit.

6.4.10 If Gaseous Waste Discharge Radiation Monitor, PRM-IRE-0648, is not operable, then commence discharging by Throttling Open Waste Gas Discharge GWM-IFIT-0648 Outlet Isolation Valve, GWM-311, to establish the desired flow rate within the limit indicated on the Gaseous Release Permit.

6.4.11 Record the 0-hour data readings on the Gaseous Release Permit.

NOTE

Successful performance of step 6.4.12 satisfies TRM Table 4.3-9 Channel Check.
[P-2390, P-2414]

6.4.12 Verify indication of GWM discharge flow using any of the following indications:

- GWM-IFRR-0648 Waste Gas Flow & Rad Recorder (CP-4)
- GWM-IFIT-0648 Waste Gas Flow Indic Transmitter (local)
- GWM-IFI-6712 Waste Gas Decay Tanks to Plant Vent Flow Indic (LCP-42A)
- PMC PID A41300 Gas to Stack Flow
- GWM-IFQI-0648 Waste Gas Flow (CP-4) counting upward

6.4.12.1 On the Gaseous Release Permit, initial for satisfactory performance of the Channel Check of GWM-IFIT-0648.

6.4.13 Verify discharge flow and activity are within the limits specified on the Gaseous Release Permit.

6.4.13.1 Record data at the required intervals on the Gaseous Release Permit.

6.4.14 If the Waste Gas Flow and Radiation Recorder, GWM-IFRR-0648, is out of service, then estimate the Waste Gas discharge flow every four hours by performing the following:

6.4.14.1 Multiply Gas Decay Tank (GDT) change in pressure by the conversion factor, 40.97 scf/psig.

6.4.14.2 Divide result in step 6.4.14.1 by the change in time.

6.4.14.3 Record results in step 6.4.14.2 on Technical Specification Addendum Logsheet.

6.4.14.4 Verification of results required on Technical Specification Addendum Logsheet.

6.4.15 When GDT(s) Pressure lowers to approximately 10 psig, then secure discharging by performing the following:

6.4.15.1 Depress Flow pushbutton on RM-11 or locally at Radiation Monitor to secure Sample Pump.

6.4.15.2 Close Waste Gas Discharge Flow Control Valve, GWM-309.

6.4.16 If purging of GDTs is necessary, then perform the following:

6.4.16.1 Close Waste Gas Discharge GWM-IFIT-0648 Outlet Isolation Valve GWM-311.

6.4.16.2 Open Gas Decay Tank Nitrogen Pressure Regulator Inlet Isolation Valve NG-226.

6.4.16.3 Open Gas Decay Tank Nitrogen Pressure Regulator Outlet Isolation Valve NG-229.

6.4.16.4 Open the following GDT N2 purge inlet for the tank being discharged:

- NG-230A(B)(C) Gas Decay Tank A(B)(C) Nitrogen Purge Inlet
- NG-236A(B)(C) Gas Decay Tank A(B)(C) NG Purge Inlet Manual Isolation

6.4.16.5 When desired pressure is reached in GDT A(B)(C), then Close the following:

- NG-226 Gas Decay Tank Nitrogen Pressure Regulator Inlet Isolation
- NG-229 Gas Decay Tank Nitrogen Pressure Regulator Outlet Isolation
- NG-230A(B)(C) Gas Decay Tank A(B)(C) Nitrogen Purge Inlet
- NG-236A(B)(C) Gas Decay Tank A(B)(C) NG Purge Inlet Manual Isolation

6.4.16.6 Open Waste Gas Discharge Flow Control Valve, GWM-309.

6.4.16.7 Start sample pump by pressing Flow pushbutton on RM-80 or locally and verify the following:

6.4.16.7.1 Flow pushbutton backlights

6.4.16.7.2 Pump ON light energizes (red)

6.4.16.7.3 Sample flow rises to >2 scfm as seen locally on Gaseous Waste Discharge Radiation Monitor, PRM-IFI-0648.

6.4.16.8 Throttle Open Waste Gas Discharge GWM-IFIT-0648 Outlet Isolation Valve, GWM-311, to establish desired flow within limit indicated on Gaseous Release Permit.

6.4.16.9 Document purge duration on Attachment 11.6, Nitrogen Purge Data.

6.4.16.10 Verify flow on Waste Gas Flow & Rad Recorder, GWM-IFRR-0648, deflects upscale to provide discharge flow indication.

6.4.16.11 <u>If</u> the Waste Gas Flow and Radiation Recorder, GWM-IFRR-0648, is out of service, <u>then</u> estimate the Waste Gas discharge flow <u>every</u> four hours by performing the following:

6.4.16.11.1 Multiply Gas Decay Tank (GDT) change in pressure by the conversion factor, 40.97 scf/psig.

6.4.16.11.2 Divide result in step 6.4.16.11.1 by the change in time.

6.4.16.11.3 Record results in step 6.4.16.11.2 on Tech Spec Addendum Logsheet.

6.4.16.11.4 Verification of results required on Tech Spec Addendum Logsheet.

6.4.16.12 Verify discharge flow <u>and</u> activity are within the limits specified on the Gaseous Release Permit.

6.4.16.13 <u>When</u> GDT(s) Pressure lowers to approximately 10 psig, <u>then</u> secure discharging by performing the following:

6.4.16.13.1 Secure Sample Pump in accordance with OP-004-001 or locally Depress the Flow Pushbutton at the Radiation Monitor.

6.4.16.13.2 Close Waste Gas Discharge Flow Control Valve, GWM-309.

6.4.16.14 Repeat Step 6.4.16 as necessary to lower hydrogen <u>and</u> oxygen concentrations to acceptable limits.

6.4.17 Complete steps 20-30 of Attachment 11.4.

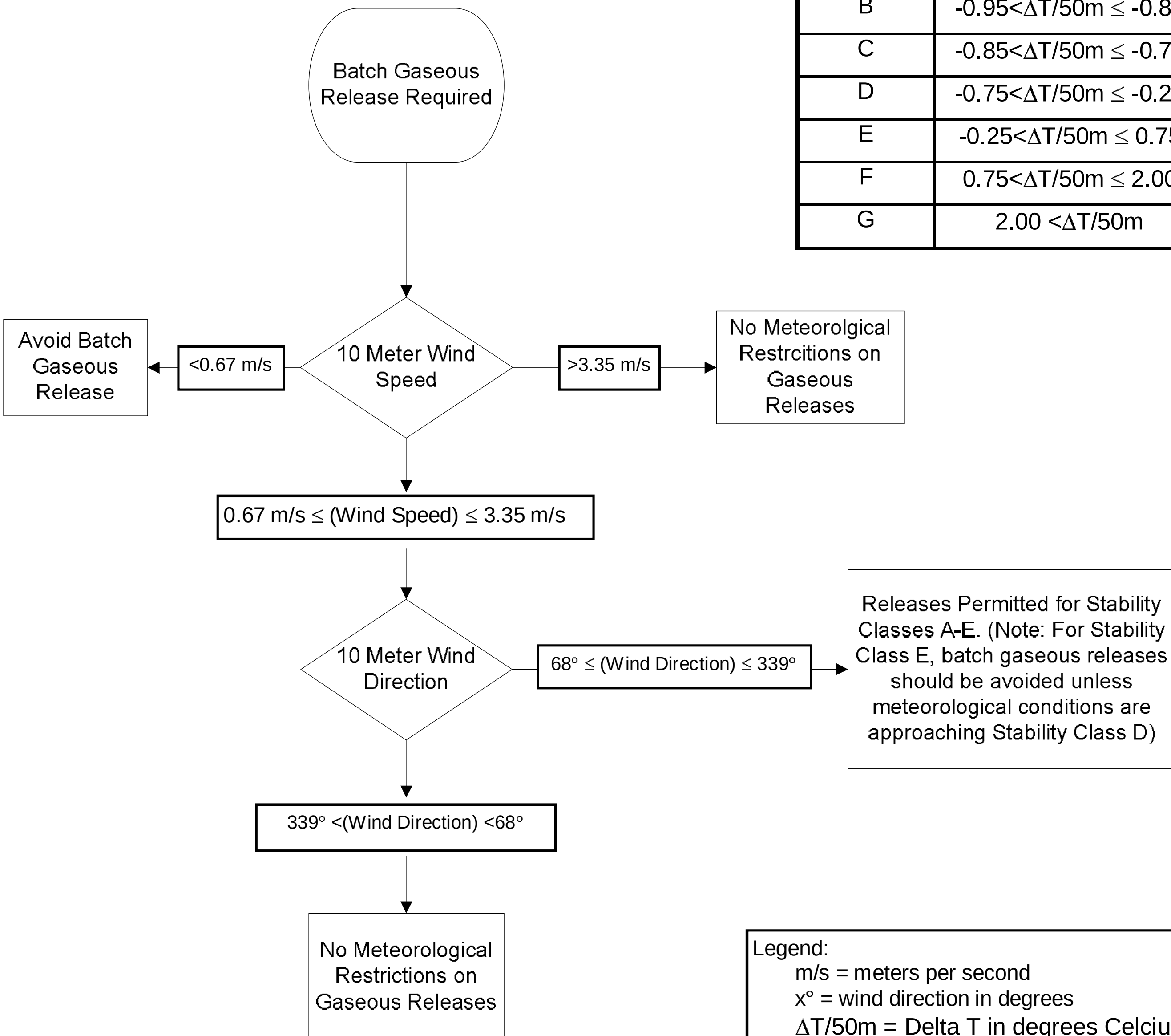
6.4.18 Drain the liquid from the discharged GDT(s) in accordance with section 6.6, Draining Liquid from Gas Decay Tank.

6.4.19 Complete the Gas Release Permit <u>and</u> forward to Chemistry.

11.5 METEOROLOGICAL CONDITIONS REQUIREMENTS

[P11585]

Pasquill Stability Classes	
Class	(ΔT °C/50m)
A	ΔT/50m ≤ -0.95
B	-0.95<ΔT/50m ≤ -0.85
C	-0.85<ΔT/50m ≤ -0.75
D	-0.75<ΔT/50m ≤ -0.25
E	-0.25<ΔT/50m ≤ 0.75
F	0.75<ΔT/50m ≤ 2.00
G	2.00 <ΔT/50m



Legend:
- m/s = meters per second
- x° = wind direction in degrees
- ΔT/50m = Delta T in degrees Celcius

Notes:

1. All parameters should be obtained from the 15 minute average values displayed on the PMC.
2. 10 meter wind speed and wind direction may be obtained from the primary or back-up tower 33' reading.
3. ΔT/50m may be obtained from the primary or back-up tower 199-33' Delta T reading.

Waterford 3

2017 SRO NRC Exam

JOB PERFORMANCE MEASURE

A5

Review Completed Surveillance for Approval

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Review and approve surveillance OP-903-117, Emergency Diesel Generator Fuel Oil Transfer Pump Operability Check.

Task Standard: Applicant's review discovered 3 errors, and the applicant correctly evaluated Tech Specs as identified in the key.

References: OP-903-117, Emergency Diesel Generator Fuel Oil Transfer Pump Operability Check (Rev 310)

Alternate Path: No   Time Critical: No   Validation Time: 20 mins.

K/A 2.1.23, Ability to perform specific system and integrated plant procedures during all modes of plant operation.   Importance Rating 4.4 SRO

Applicant: ______________________________

Time Start: __________________   Time Finish: __________________

Performance Time: __________________ minutes

Critical Time: N/A minutes

Performance Rating: SAT   UNSAT

Comments: ____

____

____

Examiner: ________________________________   Date: ________________

Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-903-117, Emergency Diesel Generator Fuel Oil Transfer Pump Operability Check (Applicant Handout)
- Personal computer or laptop (with wifi/LAN deactivated)
- Standard electronic references thumb drive (eCart)

Description:
The applicant will be given a completed OP-903-117, Attachment 10.1 for EDG Fuel Oil Transfer Pump A. The key indicates the errors that the applicant must identify. One of the errors will make EDG Fuel Oil Transfer Pump A inoperable. The applicant will be required to identify the correct Tech Spec.

READ TO APPLICANT

DIRECTION TO APPLICANT:

Each administrative JPM has a cue sheet with the instructions for that JPM. Each administrative JPM stands alone, and conditions from 1 JPM do not carry over to any other JPM. If you have any questions, raise your hand and I will come to your desk.

Provide all answers on the sheets provided.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

TASK ELEMENT 1	STANDARD
Review Attachment 10.1 for accuracy.	The following errors must be identified: • The vibration meter and probe are past their calibration dates. • Pump differential pressure was calculated incorrectly. The corrected pressure is below the low limit of 70.9 PSID. • The flow calculation (millivolt value) for EGF-109 A, Fuel Oil Transfer Pump A Discharge Check, was performed incorrectly. The corrected flow is greater than the required 30 gpm. (This is not critical) • Test Results should be checked as "Required Action".
Comment: Examiner Note: See Key	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 2	STANDARD
Determine applicable Tech Spec associated with EDG Fuel Oil Transfer Pump A being inoperable.	Tech Spec 3.8.1.1 b and d must be entered. Actions include: • Restore EDG A within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. • Restoration within 72 hours may be extended to 10 days if a temporary emergency diesel generator is verified available. • Complete OP-903-066, Electrical Breaker Alignment Check, within 1 hour, and at least every 8 hours thereafter. The following must be satisfied within 2 hours: • All required systems, subsystems, trains, components, and devices that depend on the remaining OPERABLE diesel generator as a source of emergency power must be OPERABLE • Emergency Feedwater Pump AB must be OPERABLE.
Comment:	**<u>Critical</u>** **SAT / UNSAT**

END OF TASK

SIMULATOR OPERATOR INSTRUCTIONS

None.

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- Emergency Diesel Generator A Fuel Oil Transfer Pump IST has been completed in accordance with OP-903-117, Emergency Diesel Generator Fuel Oil Transfer Pump Operability Check.
- The completed attachment for the surveillance has been reviewed and is ready for SM/CRS review.

INITIATING CUES:

- Review Attachment 10.1, Fuel Oil Transfer Pump IST Data.
- Document results and, if applicable, identify all Technical Specification actions on this cue sheet or on the handout provided.

JPM A5 Handout

10.1 FUEL OIL TRANSFER PUMP A IST DATA

STEP		
7.1.1	PERMISSION:___*C.R. Supervisor*_____*3/27/2017*___ (SM/CRS Signature) (Date/time)	WO NUMBER: _*52235391*____
	Reference Data Run (Check one) [ ] YES [*X*] NO	

STEP	INSTRUMENT	NUMBER	SCALE/CAL. RANGE*	CAL DUE DATE*
7.1.1	Fuel Oil Transfer Pump A Recirc Flow Indicator	EGF-IDPI-0638A	**N/A**	**N/A**
	Millivolt	PMC PID A60501	**N/A**	**N/A**
	Suction Press	*ODPT353.029*	*0-30*	*5/15/2017*
	Discharge Press	*ODPT353.004*	*0-200*	*7/10/2017*
	Vibration Meter	*MMMT359.002*	*20-2000 Hz*	*3/15/2017*
	Vibration Probe	*MMMT359.002*	*20-2000 Hz*	*3/15/2017*
	Stopwatch	*MMMT357.020*	*N/A*	*8/22/2017*

* May be N/A for plant installed instruments or plant monitoring computer points, if not applicable.

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

STEP	PARAMETER	POINT	DATA	PUMP ACCEPTANCE CRITERIA			
				ACCEPTABLE	ALERT HIGH	REQUIRED ACTION	
						LOW	HIGH
7.1.13	Recirc Differential Pressure (PSID)	EGFIDPI0638A	*56.0*	**55.5 -56.5**	**N/A**	**N/A**	**N/A**
	Inboard Bearing Vibration (IN/SEC)	3V	*0.019*	**V ≤ 0.080**	**0.080 < V ≤ 0.192**	**N/A**	**V > 0.192**
		3H	*0.031*	**V ≤ 0.068**	**0.068 < V ≤ 0.162**	**N/A**	**V > 0.162**
	Outboard Bearing Vibration (IN/SEC)	4V	*0.022*	**V ≤ 0.048**	**0.048 < V ≤ 0.114**	**N/A**	**V > 0.114**
		4H	*0.027*	**V ≤ 0.043**	**0.043 < V ≤ 0.102**	**N/A**	**V > 0.102**
	Disch Press (PSIG)	Test gage at EGF-110A	*84.1*	**N/A**	**N/A**	**N/A**	**N/A**
	Suction Press (PSIG)	Test gage at EGF-108A	*13.4*	**N/A**	**N/A**	**N/A**	**N/A**
7.1.13.1	Pump Differential Press (PSID)	Disch - Suct	*71.1*	**70.9 ≤ ΔP ≤ 86.5**	**N/A**	**ΔP < 70.9**	**ΔP > 86.5**

Fuel Oil Transfer Pump A IST Data (cont'd)

RESTORATION				
STEP	**COMPONENT**	**REQUIRED POSITION**	**PERFORMED BY (Initials)**	**IV BY (Initials)**
7.1.16.1	EGF-111A, FUEL OIL TRANSFER PUMP A DISCHARGE ISOLATION	LOCKED OPEN	*jg*	*cl*
7.1.17.1	EGF-1092A, FUEL OIL TRANSFER PUMP A RECIRC EGFIDPI0638A HP RT	CLOSED	*jg*	*cl*
	EGF-1093A, FUEL OIL TRANSFER PUMP A RECIRC EGFIDPI0638A LP RT	CLOSED	*jg*	*cl*
7.1.18.1	EGF-1091A, FUEL OIL TRANSFER PUMP A RECIRC ISOLATION	LOCKED OPEN	*jg*	*cl*
7.1.19.1.2	EGF-108A, Fuel Oil Transfer Pump A Suction PX Root	CLOSED	*jg*	*cl*
7.1.19.1.2	Test Instrument Removed	REMOVED	*jg*	*cl*
7.1.19.2.2	EGF-110A, Fuel Oil Transfer Pump A Discharge Drain	CLOSED	*jg*	*cl*
7.1.19.2.2	Test Instrument Removed	REMOVED	*jg*	*cl*

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

STEP	PARAMETER	POINT	DATA
7.1.23	Starting Millivolt Value	PID A60501	*7125*
7.1.26	Ending Millivolt Value	PID A60501	*8523*
7.1.26	Elapsed Time (Minutes)	Stopwatch	*1.4*

RESTORATION				
STEP	**COMPONENT**	**REQUIRED POSITION**	**PERFORMED BY (Initials)**	**IV BY (Initials)**
7.1.28.1	EGF-122A, EG A FEED TK OUTLET ISOL TO F.O. GRAVITY DRAIN HDR	LOCKED CLOSED	*jg*	*cl*
7.1.29.1	EGF-123A, EG A FUEL OIL INJECTOR DRAIN HEADER ISOLATION	LOCKED OPEN	*jg*	*cl*
	EGF-124A, EG A FUEL OIL INJECTOR DRAIN HEADER ISOLATION	LOCKED OPEN	*jg*	*cl*

STEP	ACTION	INITIAL
7.1.30	Instrument information recorded on Work Order.	*jg*

STEP		ACTION				DATA	
7.1.31.1	Millivolt =	End (Step 7.1.26) – Start (Step 7.1.23)	=	*8523* (End) - *7325* (Start)	=	*1198*	Change
7.1.31.2	Gals Pumped =	Millivolt Change / 18.1 mV / Gal	=	*1198* / 18.1	=	*66.2*	Gallons
7.1.31.3	FLOW =	Gals Pumped / Elapsed Time	=	*66.2* / *1.4*	=	*47.3*	GPM

STEP[1]	VALVE ACCEPTANCE CRITERIA	TEST RESULTS	INITIAL
7.1.32	Calculated Flow (Step 7.1.32.3) >30 GPM verifies operability of Fuel Oil Transfer Pump A Discharge Check, EGF-109A.	[*X*] SAT [ ] UNSAT [ ] N/A	*jg*

(1) May be N/A if <u>not</u> performing check valve performance monitoring.

STEP	**TEST RESULTS** (check one)	INITIAL
7.1.32	☒ **Acceptable** ☐ **Alert** (Submit Work Request to perform another Operability surveillance within six weeks <u>and</u> write a CR to double testing frequency. **[CR-WF3-2008-05882]**) WR No. ____________ CR No. ____________ ☐ **Required Action** (Declare pump Inoperable) (WR and CR must be initiated) WR No. ____________ CR No. ____________ ☐ **Reference Data Run** (Results to be evaluated by Programs Engineering)	*jg*

STEP	ACTION	INITIAL
7.1.35	Copy of IST Data submitted to P.E. IST Coordinator.	*jg*

REMARKS: *None*

Performed by: *Jack B. Good* (Signature) *3/27/2017* (Date)

IV by: *Cal Q. Lator* (Signature) *3/27/2017* (Date)

Independent Reviewed by: *S.T. Advisor* (Signature) *3/27/2017* (Date)

SM/CRS Review: ______ (Signature) ____/____ (Date/Time)

A5 KEY

10.1 FUEL OIL TRANSFER PUMP A IST DATA

STEP		
7.1.1	PERMISSION:___*C.R. Supervisor*_____*3/27/2017*___ (SM/CRS Signature) (Date/time)	WO NUMBER: _*52235391*____
	Reference Data Run (Check one) [ ] YES [*X*] NO	

STEP	INSTRUMENT	NUMBER	SCALE/CAL. RANGE*	CAL DUE DATE*
7.1.1	Fuel Oil Transfer Pump A Recirc Flow Indicator	EGF-IDPI-0638A	**N/A**	**N/A**
	Millivolt	PMC PID A60501	**N/A**	**N/A**
	Suction Press	***ODPT353.029***	***0-30***	***5/15/2017***
	Discharge Press	***ODPT353.004***	***0-200***	***7/10/2017***
	Vibration Meter	***MMMT359.002***	***20-2000 Hz***	***3/15/2017***
	Vibration Probe	***MMMT359.002***	***20-2000 Hz***	***3/15/2017***
	Stopwatch	***MMMT357.020***	***N/A***	***8/22/2017***

Past Due

* May be N/A for plant installed instruments or plant monitoring computer points, if not applicable.

A5 KEY

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

STEP	PARAMETER	POINT	DATA	PUMP ACCEPTANCE CRITERIA			
				ACCEPTABLE	ALERT HIGH	REQUIRED ACTION	
						LOW	HIGH
7.1.13	Recirc Differential Pressure (PSID)	EGFIDPI0638A	*56.0*	**55.5 -56.5**	**N/A**	**N/A**	**N/A**
	Inboard Bearing Vibration (IN/SEC)	3V	*0.019*	**V ≤ 0.080**	**0.080 < V ≤ 0.192**	**N/A**	**V > 0.192**
		3H	*0.031*	**V ≤ 0.068**	**0.068 < V ≤ 0.162**	**N/A**	**V > 0.162**
	Outboard Bearing Vibration (IN/SEC)	4V	*0.022*	**V ≤ 0.048**	**0.048 < V ≤ 0.114**	**N/A**	**V > 0.114**
		4H	*0.027*	**V ≤ 0.043**	**0.043 < V ≤ 0.102**	**N/A**	**V > 0.102**
	Disch Press (PSIG)	Test gage at EGF-110A	*84.1*	**N/A**	**N/A**	**N/A**	**N/A**
	Suction Press (PSIG)	Test gage at EGF-108A	*13.4*	**N/A**	**N/A**	**N/A**	**N/A**
7.1.13.1	Pump Differential Press (PSID)	Disch - Suct	*71.1*	**70.9 ≤ ΔP ≤ 86.5**	**N/A**	**ΔP < 70.9**	**ΔP > 86.5**

= 70.7
(Below Required Action Low Limit)

A5 KEY

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

RESTORATION				
STEP	**COMPONENT**	**REQUIRED POSITION**	**PERFORMED BY (Initials)**	**IV BY (Initials)**
7.1.16.1	EGF-111A, FUEL OIL TRANSFER PUMP A DISCHARGE ISOLATION	LOCKED OPEN	*jg*	*cl*
7.1.17.1	EGF-1092A, FUEL OIL TRANSFER PUMP A RECIRC EGFIDPI0638A HP RT	CLOSED	*jg*	*cl*
	EGF-1093A, FUEL OIL TRANSFER PUMP A RECIRC EGFIDPI0638A LP RT	CLOSED	*jg*	*cl*
7.1.18.1	EGF-1091A, FUEL OIL TRANSFER PUMP A RECIRC ISOLATION	LOCKED OPEN	*jg*	*cl*
7.1.19.1.2	EGF-108A, Fuel Oil Transfer Pump A Suction PX Root	CLOSED	*jg*	*cl*
7.1.19.1.2	Test Instrument Removed	REMOVED	*jg*	*cl*
7.1.19.2.2	EGF-110A, Fuel Oil Transfer Pump A Discharge Drain	CLOSED	*jg*	*cl*
7.1.19.2.2	Test Instrument Removed	REMOVED	*jg*	*cl*

A5 KEY

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

STEP	PARAMETER	POINT	DATA
7.1.23	Starting Millivolt Value	PID A60501	*7125*
7.1.26	Ending Millivolt Value	PID A60501	*8523*
7.1.26	Elapsed Time (Minutes)	Stopwatch	*1.4*

RESTORATION				
STEP	**COMPONENT**	**REQUIRED POSITION**	**PERFORMED BY (Initials)**	**IV BY (Initials)**
7.1.28.1	EGF-122A, EG A FEED TK OUTLET ISOL TO F.O. GRAVITY DRAIN HDR	LOCKED CLOSED	*jg*	*cl*
7.1.29.1	EGF-123A, EG A FUEL OIL INJECTOR DRAIN HEADER ISOLATION	LOCKED OPEN	*jg*	*cl*
	EGF-124A, EG A FUEL OIL INJECTOR DRAIN HEADER ISOLATION	LOCKED OPEN	*jg*	*cl*

STEP	ACTION	INITIAL
7.1.30	Instrument information recorded on Work Order.	*jg*

A5 KEY

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

= 7125
(Transposition error)

STEP				ACTION		DATA		
7.1.31.1	Millivolt =	End (Step 7.1.26) – Start (Step 7.1.23)	=	*8523* End - *7325* Start	=	*1198*	Change	= 1398
7.1.31.2	Gals Pumped =	Millivolt Change / 18.1 mV / Gal	=	*1198* / 18.1	=	*66.2*	Gallons	= 77.2
7.1.31.3	FLOW =	Gals Pumped / Elapsed Time	=	*66.2* / *1.4*	=	*47.3*	GPM	= 55.1+0.1

STEP(1)	VALVE ACCEPTANCE CRITERIA	TEST RESULTS	INITIAL
7.1.32	Calculated Flow (Step 7.1.32.3) >30 GPM verifies operability of Fuel Oil Transfer Pump A Discharge Check, EGF-109A.	[*X*] SAT [ ] UNSAT [ ] N/A	*jg*

(1) May be N/A if not performing check valve performance monitoring.

STEP	**TEST RESULTS** (check one)	INITIAL
7.1.32	☒ **Acceptable** ☐ **Alert** (Submit Work Request to perform another Operability surveillance within six weeks and write a CR to double testing frequency. **[CR-WF3-2008-05882]**) WR No. ____________ CR No. ____________ ☐ **Required Action** (Declare pump Inoperable) (WR and CR must be initiated) WR No. ____________ CR No. ____________ ☐ **Reference Data Run** (Results to be evaluated by Programs Engineering)	*jg*

A5 KEY

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

STEP	ACTION	INITIAL
7.1.35	Copy of IST Data submitted to P.E. IST Coordinator.	*jg*

REMARKS: *None* Fuel Oil Transfer Pump A inoperable

Performed by: *Jack B. Good* (Signature) *3/27/2017* (Date)

IV by: *Cal Q. Lator* (Signature) *3/27/2017* (Date)

Independent Reviewed by: *S.T. Advisor* (Signature) *3/27/2017* (Date)

SM/CRS Review: ______ (Signature) / (Date/Time)

REQUEST/APPROVAL PAGE

SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-903-117		REVISION: 310

TITLE: Emergency Diesel Generator Fuel Oil Transfer Pump Operability Check

PROCEDURE OWNER (Position Title): Operations Manager - Support

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 1/4/17

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

Removed any references to TS 6.5.8 which is being deleted and replaced it with the Waterford 3 Inservice Testing Program which are already equivalent terms.
These changes do not alter the intent of the procedure and merely serve to provide administrative guidance. This procedure change meets the criteria of an Editorial Correction.

☐ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			Nicole Blank	12/27/2016
EC SUPERVISOR	Administrative Review and Approval		(sign)	12/27/16
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐	PA Exclusion ☐	N/A	
TECHNICAL	Review ☐	Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐		N/A	
GROUP/DEPT. HEAD	Review ☐	Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Prior to operating pump, proper oil level shall be verified.

3.1.2 Prior to operating pump, pump suction pressure should be verified $\geq$ 5 PSIG.

3.1.3 Diesel fuel may cause skin irritation. Impervious gloves should be worn if skin contact is likely.

3.1.4 Prior to draining the A(B) Diesel Feed Tank back to the A(B) FOST, ensure that the cover of the manway on the roof of the tank is installed to prevent any splashing.

3.2 LIMITATIONS

3.2.1 This surveillance shall be performed quarterly or following maintenance, as required.

3.2.2 Data shall be taken from instruments and test points listed on the following Attachments:

- Attachment 10.1, Fuel Oil Transfer Pump A IST Data
- Attachment 10.2, Fuel Oil Transfer Pump B IST Data.

3.2.3 Where an instrument specified in this procedure is unavailable, a substitute instrument or M&TE may be used provided Programs Engineering has evaluated the substitution, confirmed that the substitute meets the requirements of the Inservice Testing Program, and that the location of the instrument does not create an unacceptable change in the test data. The evaluation shall be performed as an Engineering Request and should document the reason the required instrument is unavailable. The Engineering Request should be included with the completed surveillance.

3.2.4 Minimum run time of pump before taking IST readings is 2 minutes after pump conditions are as stable as the system permits.

3.2.5 Reference data shall be reestablished with SM/CRS permission and the concurrence of Programs Engineering.

3.2.6 Symmetrical damping devices or averaging techniques may be used to reduce instrument fluctuations. Hydraulic instruments may be damped by using gauge snubbers or by throttling small valves in instrument lines.

3.2.7 Upon completion of surveillance, data sheet shall be reviewed by SM/CRS and an Independent Reviewer. This review shall include the following, as a minimum, verification that correct range of operation was selected, according to acceptance criteria.

3.2.8 The following limitations apply to test instrument installation and removal for surveillance performance:

- Test instruments may be installed in preparation for surveillance performance with SM/CRS permission (prior to step direction). The duration test instruments are installed under this provision should be limited to maintain configuration control.
- Temporarily installed test instruments may be isolated and removed once all required data for the instrument has been obtained. Procedure steps verify restoration to a normal component configuration.

3.2.9 The fill limits for the Diesel Fuel Oil Storage Tanks are as follows:

Lower fill limit: **[TS 3.8.1]**

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,210 gallons (98.68% Full)
- Using EGF-ILI-6995A(B): 98.9%

Upper fill limit:

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,480 gallons (99.34% Full)
- Using EGF-ILI-6995A(B): 99.3%

3.2.10 Waterford 3 has implemented OM Code 2001 through 2003 as part of the 10 Year IST Upgrade, which includes a new Check Valve Condition Monitoring Program. This program changed the testing frequency of various check valves from quarterly to biennial. Check valves affected by the change have been identified with a note stating “May be N/A if not performing check valve performance monitoring”.

3.2.11 Emergency Diesel Generator fuel oil storage has very little margin to support the Design Basis Accident loadings for seven days. EC-24379 provides guidance on additional margin for Engineering and Operations to establish operability of the EDG in the event of a fuel oil leak.

6.0 ACCEPTANCE CRITERIA

6.1 Refer to applicable Attachments for Acceptance Criteria.

6.2 Pump and Valve IST Data in “Acceptable” or “Satisfactory” range requires no additional testing or maintenance.

6.3 Pump IST Data in "Alert" range requires the following actions;

- Initiate Work Request in accordance with EN-WM-100, Work Request (WR) Generation, Screening and Classification, to investigate possible pump performance degradation.
- Write a CR in accordance with EN-LI-101 to double testing frequency until cause of deviation is determined and condition corrected. **[CR-WF3-2008-05882]**
- Initiate Work Request in accordance with EN-WM-100 to perform another Operability surveillance within six weeks. **[CR-WF3-2008-05882]**

6.4 Pump IST Data in "Required Action" range requires the following actions:

- Declare pump inoperable until cause of deviation has been determined and condition corrected.
- Initiate a Work Request.
- Initiate a Condition Report.

6.5 When a pump test shows deviations outside of the acceptable range, the instruments involved may be recalibrated and the test rerun.

6.6 If a valve fails to exhibit the required change of obturator (disk, gate, plug, ball, etc.) position, then the following actions are required:

6.6.1 Declare valve inoperable immediately.

6.6.2 Initiate a condition report.

6.6.3 Initiate a Work Request, to correct any system/hardware deficiencies.

6.6.4 A retest showing acceptable performance shall be run following any required corrective action before the valve is returned to service.

6.7 If test was performed to establish new reference values, then deviations between the previous and new set of reference values shall be identified and verification that the new reference values represent acceptable component performance shall be documented in an evaluation, which shall be attached to the surveillance package.

7.0 PROCEDURE

7.1 FUEL OIL TRANSFER PUMP A CHECK

7.1.1 Document the following on Attachment 10.1, Fuel Oil Transfer Pump A IST Data:

- SM/CRS permission to perform test.
- If surveillance is being performed to establish reference data.
- Work Order number
- Test Instrument information

7.1.2 Place drip pans or absorbent material beneath test gage connection locations.

7.1.3 Verify test instrument(s) are installed as follows:

7.1.3.1 Verify test instrument installed at EGF-108A, Fuel Oil Transfer Pump A Suction PX Root.

7.1.3.1.1 Open EGF-108A, Fuel Oil Transfer Pump A Suction PX Root.

7.1.3.2 If Diesel Fuel Oil Storage Tank sampling will not be performed by Chemistry, then verify test instrument installed at EGF-110A, Fuel Oil Transfer Pump A Discharge Drain.

7.1.3.2.1 Open EGF-110A, Fuel Oil Transfer Pump A Discharge Drain.

7.1.4 Verify Fuel Oil Transfer Pump A lubrication is satisfactory.

7.1.5 Verify Fuel Oil Transfer Pump A suction pressure is $\geq$ 5 PSIG.

7.1.6 Place Fuel Oil Transfer Pump A Recirc Flow Indicator, EGF-IDPI-0638A, in service by Opening the following valves:

- EGF-1092A Fuel Oil Transfer Pump A Recirc EGFIDPI0638A HP RT.
- EGF-1093A Fuel Oil Transfer Pump A Recirc EGFIDPI0638A LP RT.

7.1.7 Verify Open Fuel Oil Transfer Pump A Recirc Isolation, EGF-1091A.

NOTE

When Fuel Oil Transfer Pump A Discharge Isolation, EGF-111A, is Closed, an operator should be stationed to Open EGF-111A, if Emergency Diesel Generator operation is required.

CAUTION

(1) CLOSING EGF-111A IN MODES 1-4 WILL REQUIRE ENTRY INTO TECHNICAL SPECIFICATIONS 3.8.1.1.

(2) CLOSING EGF-111A IN MODES 5-6 MAY REQUIRE ENTRY INTO TECHNICAL SPECIFICATIONS 3.8.1.2.

7.1.8 Unlock and Close Fuel Oil Transfer Pump A Discharge Isolation, EGF-111A.

7.1.9 Start Fuel Oil Transfer Pump A.

7.1.10 If Chemistry is taking a Fuel Oil Storage Tank Sample, then perform the following:

7.1.10.1 Run EDG A Fuel Oil System on recirc for ≥15 minutes.

7.1.10.2 When Chemistry personnel are ready for sample, then Throttle Fuel Oil Transfer Pump A Discharge Drain, EGF-110A.

7.1.10.3 When desired sample quantity has been obtained, then Close Fuel Oil Transfer Pump A Discharge Drain, EGF-110A.

7.1.10.4 Verify test instrument installed at Fuel Oil Transfer Pump A Discharge Drain, EGF-110A.

7.1.10.4.1 Open EGF-110A, Fuel Oil Transfer Pump A Discharge Drain.

CAUTION

MAINTAINING RECIRCULATION FLOW DIFFERENTIAL PRESSURE >50 PSID WILL ENSURE MINIMUM RECIRCULATION REQUIREMENTS (>10 GPM) FOR THE PUMP.

7.1.11 Throttle Close Fuel Oil Transfer Pump A Recirc Isolation, EGF-1091A, to maintain a differential pressure of 55.5 to 56.5 PSID as indicated on Fuel Oil Transfer Pump A Recirc Flow Indicator, EGF-IDPI-0638A.

7.1.12 If throttling small valves is necessary to reduce instrument fluctuations then Open and Close valve several times to verify that instrument is not isolated.

7.1.13 When Fuel Oil Transfer Pump A has operated for a minimum of 2 minutes at a differential pressure of 55.5 to 56.5 PSID, and pump conditions are as stable as the system permits, then record the following test data for Fuel Oil Transfer Pump A on Attachment 10.1:

- Recirc Differential Pressure EGF-IDPI-0638A
- Inboard Bearing Vibration Vibration equipment at Position 3V and 3H
- Outboard Bearing Vibration Vibration equipment at Position 4V and 4H
- Discharge Pressure Test gage at EGF-110A
- Suction Pressure Test gage at EGF-108A.

7.1.13.1 Calculate Fuel Oil Transfer Pump A DP by subtracting suction pressure from discharge pressure.

CAUTION

TO PREVENT OVERFLOWING FEED TANK A, DO NOT EXCEED 5.5 FEET (91.7%) LEVEL.

7.1.14 Slowly Open Fuel Oil Transfer Pump A Discharge Isolation, EGF-111A.

7.1.15 When Feed Tank A level rises by a minimum of 0.2 ft as indicated by Diesel Oil Feed Tank A Level Indicator, EGF-ILI-6903A on CP-1, or 3.5% locally at EDG A Control Panel, then stop Fuel Oil Transfer Pump A.

7.1.16 Lock Open Fuel Oil Transfer Pump A Discharge Isolation, EGF-111A.

7.1.16.1 Document final valve position on Attachment 10.1.

7.1.17 Remove Fuel Oil Transfer Pump A Recirc Differential Pressure Indicator, EGF-IDPI-0638A, from service by Closing the following valves:

- EGF-1092A Fuel Oil Transfer Pump A Recirc EGFIDPI0638A HP RT.
- EGF-1093A Fuel Oil Transfer Pump A Recirc EGFIDPI0638A LP RT.

7.1.17.1 Document final valve positions on Attachment 10.1.

7.1.18 Lock Open Fuel Oil Transfer Pump A Recirc Isolation, EGF-1091A.

7.1.18.1 Document final valve position on Attachment 10.1.

7.1.19 Test Instrument Removal.

7.1.19.1 Close EGF-108A, Fuel Oil Transfer Pump A Suction PX Root.

7.1.19.1.1 Remove Test Instrument.

7.1.19.1.2 Document Final valve position and instrument removal verification on Attachment 10.1

7.1.19.2. Close EGF-110A, Fuel Oil Transfer Pump A Discharge Drain

7.1.19.2.1 Remove Test Instrument.

7.1.19.2.2 Document Final valve position and instrument removal verification on Attachment 10.1

7.1.20 Verify Feed Tank A level is 4.3 ft (4.2 to 4.4 feet) as indicated by Diesel Oil Feed Tank A Level Indicator, EGF-ILI-6903A, on CP-1.

7.1.20.1 If required, then reduce Feed Tank A Level to 4.3 ft (4.2 to 4.4 feet) as follows:

7.1.20.1.1 Unlock and Close the following valves:

- EGF-123A EG A Fuel Oil Injector Drain Header Isolation
- EGF-124A EG A Fuel Oil Injector Drain Header Isolation.

CAUTION

PRIOR TO DRAINING THE A DIESEL FEED TANK BACK TO THE A FOST, ENSURE THAT THE COVER OF THE MANWAY ON THE ROOF OF THE TANK IS INSTALLED TO PREVENT ANY SPLASHING.

7.1.20.1.2 Open EG A Feed Tank Outlet Isol to F.O. Gravity Drain HDR, EGF-122A.

7.1.20.1.3 When Feed Tank A is at the desired level, then Close EG A Feed Tank Outlet Isol to F.O. Gravity Drain HDR, EGF-122A.

7.1.20.1.4 Open the following valves:

- EGF-123A EG A Fuel Oil Injector Drain Header Isolation
- EGF-124A EG A Fuel Oil Injector Drain Header Isolation.

CAUTION

TO PREVENT OVERFLOWING FEED TANK A, DO NOT EXCEED 5.5 FEET (91.7%) LEVEL.

7.1.21 Start Fuel Oil Transfer Pump A and wait approximately 5 seconds.

7.1.22 Simultaneously, display millivolt value for PMC PID A60501 and start timing.

7.1.23 Record PMC PID A60501 millivolt value displayed on Attachment 10.1.

7.1.24 When Feed Tank A level has raised by approximately 1 foot, as indicated on Diesel Oil Feed Tank A Level Indicator, EGF-ILI-6903A, on CP-1, then simultaneously display millivolt value for PMC PID A60501 and stop timing.

7.1.25 Stop Fuel Oil Transfer Pump A.

7.1.26 Record PMC PID A60501 millivolt value displayed and elapsed time on Attachment 10.1.

7.1.27 If necessary, perform following steps to restore Feed Tank A to desired level:

7.1.27.1 Close the following valves:

- EGF-123A EG A Fuel Oil Injector Drain Header Isolation
- EGF-124A EG A Fuel Oil Injector Drain Header Isolation.

CAUTION

PRIOR TO DRAINING THE A DIESEL FEED TANK BACK TO THE A FOST, ENSURE THAT THE COVER OF THE MANWAY ON THE ROOF OF THE TANK IS INSTALLED TO PREVENT ANY SPLASHING.

7.1.27.2 Open EG A Feed Tank Outlet Isol to F.O. Gravity Drain HDR, EGF-122A.

7.1.27.3 When Feed Tank A is at the desired level, then Close EG A Feed Tank Outlet Isol to F.O. Gravity Drain HDR, EGF-122A.

7.1.27.4 Open the following valves:

- EGF-123A EG A Fuel Oil Injector Drain Header Isolation
- EGF-124A EG A Fuel Oil Injector Drain Header Isolation.

7.1.28 Verify EG A Feed Tank Outlet Isol to F.O. Gravity Drain HDR, EGF-122A, Locked Closed.

7.1.28.1 Document final valve position on Attachment 10.1.

7.1.29 Verify the following valves Locked Open:

- EGF-123A EG A Fuel Oil Injector Drain Header Isolation
- EGF-124A EG A Fuel Oil Injector Drain Header Isolation.

7.1.29.1 Document final valve positions on Attachment 10.1.

7.1.30 Record instrument information on Work Order.

7.1.31 Perform the following and document results on Attachment 10.1:

7.1.31.1 Determine millivolt change by subtracting starting millivolt value (Step 7.1.23) from ending millivolt value (Step 7.1.26).

7.1.31.2 Calculate total gallons pumped by dividing millivolt change (Step 7.1.32.1) by 18.1 millivolts/gal.

7.1.31.3 Determine flowrate by dividing total gallons (Step 7.1.32.2) by elapsed time (Step 7.1.26).

NOTE

Fuel Oil Transfer Pump B Discharge Check, EGF-109A may be N/A if not performing check valve performance monitoring.

7.1.32 Compare test data with acceptance criteria to determine range of operation and record selected range on Attachment 10.1.

7.1.33 Submit Attachment 10.1 to Independent Reviewer and SM/CRS for review.

7.1.34 If this surveillance is being performed to establish reference data, then record new reference data information on Attachment 10.1, and submit to Programs Engineering IST Coordinator for evaluation and concurrence.

7.1.35 Submit copy of Attachment 10.1 to Programs Engineering IST Coordinator for trending purposes after Independent Reviewer or SM/CRS signoffs and document on Attachment 10.1.

8.0 AUTOMATIC FUNCTIONS

8.1 Fuel Oil Transfer Pump Auto Start on Low Feed Tank Level EGFILS6907-A(B).. 3.5 ft

8.2 Fuel Oil Transfer Pump Auto Stop EGFILS6908-A(B)................. 5.5 ft

10.1 FUEL OIL TRANSFER PUMP A IST DATA

STEP		
7.1.1	PERMISSION:______________________ (SM/CRS Signature) (Date/time)	WO NUMBER: ________________
	Reference Data Run (Check one) [ ] YES	[ ] NO

STEP	INSTRUMENT	NUMBER	SCALE/CAL. RANGE*	CAL DUE DATE*
7.1.1	Fuel Oil Transfer Pump A Recirc Flow Indicator	EGF-IDPI-0638A	N/A	N/A
	Millivolt	PMC PID A60501	N/A	N/A
	Suction Press			
	Discharge Press			
	Vibration Meter			
	Vibration Probe			
	Stopwatch			

* May be N/A for plant installed instruments or plant monitoring computer points, if not applicable.

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

				PUMP ACCEPTANCE CRITERIA			
				ACCEPTABLE	ALERT HIGH	REQUIRED ACTION	
STEP	PARAMETER	POINT	DATA			LOW	HIGH
7.1.13	Recirc Differential Pressure (PSID)	EGFIDPI0638A		**55.5 -56.5**	**N/A**	**N/A**	**N/A**
	Inboard Bearing Vibration (IN/SEC)	3V		**$V \leq 0.080$**	**$0.080 < V \leq 0.192$**	**N/A**	**$V > 0.192$**
		3H		**$V \leq 0.068$**	**$0.068 < V \leq 0.162$**	**N/A**	**$V > 0.162$**
	Outboard Bearing Vibration (IN/SEC)	4V		**$V \leq 0.048$**	**$0.048 < V \leq 0.114$**	**N/A**	**$V > 0.114$**
		4H		**$V \leq 0.043$**	**$0.043 < V \leq 0.102$**	**N/A**	**$V > 0.102$**
	Disch Press (PSIG)	Test gage at EGF-110A		**N/A**	**N/A**	**N/A**	**N/A**
	Suction Press (PSIG)	Test gage at EGF-108A		**N/A**	**N/A**	**N/A**	**N/A**
7.1.13.1	Pump Differential Press (PSID)	Disch - Suct		**$70.9 \leq \Delta P \leq 86.5$**	**N/A**	**$\Delta P < 70.9$**	**$\Delta P > 86.5$**

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

RESTORATION				
STEP	**COMPONENT**	**REQUIRED POSITION**	**PERFORMED BY (Initials)**	**IV BY (Initials)**
7.1.16.1	EGF-111A, FUEL OIL TRANSFER PUMP A DISCHARGE ISOLATION	LOCKED OPEN		
7.1.17.1	EGF-1092A, FUEL OIL TRANSFER PUMP A RECIRC EGFIDPI0638A HP RT	CLOSED		
	EGF-1093A, FUEL OIL TRANSFER PUMP A RECIRC EGFIDPI0638A LP RT	CLOSED		
7.1.18.1	EGF-1091A, FUEL OIL TRANSFER PUMP A RECIRC ISOLATION	LOCKED OPEN		
7.1.19.1.2	EGF-108A, Fuel Oil Transfer Pump A Suction PX Root	CLOSED		
7.1.19.1.2	Test Instrument Removed	REMOVED		
7.1.19.2.2	EGF-110A, Fuel Oil Transfer Pump A Discharge Drain	CLOSED		
7.1.19.2.2	Test Instrument Removed	REMOVED		

Fuel Oil Transfer Pump A IST Data (cont'd)

STEP	PARAMETER	POINT	DATA
7.1.23	Starting Millivolt Value	PID A60501	
7.1.26	Ending Millivolt Value	PID A60501	
7.1.26	Elapsed Time (Minutes)	Stopwatch	

RESTORATION				
STEP	**COMPONENT**	**REQUIRED POSITION**	**PERFORMED BY (Initials)**	**IV BY (Initials)**
7.1.28.1	EGF-122A, EG A FEED TK OUTLET ISOL TO F.O. GRAVITY DRAIN HDR	LOCKED CLOSED		
7.1.29.1	EGF-123A, EG A FUEL OIL INJECTOR DRAIN HEADER ISOLATION	LOCKED OPEN		
	EGF-124A, EG A FUEL OIL INJECTOR DRAIN HEADER ISOLATION	LOCKED OPEN		

STEP	ACTION	INITIAL
7.1.30	Instrument information recorded on Work Order.	

FUEL OIL TRANSFER PUMP A IST DATA (CONT'D)

STEP		ACTION				DATA
7.1.31.1	Millivolt =	End (Step 7.1.26) – Start (Step 7.1.23)	=	________ - ________ (End - Start)	=	Change
7.1.31.2	Gals Pumped =	Millivolt Change / 18.1 mV / Gal	=	________ / 18.1	=	Gallons
7.1.31.3	FLOW =	Gals Pumped / Elapsed Time	=	________	=	GPM

STEP[(1)]	VALVE ACCEPTANCE CRITERIA	TEST RESULTS	INITIAL
7.1.32	Calculated Flow (Step 7.1.32.3) >30 GPM verifies operability of Fuel Oil Transfer Pump A Discharge Check, EGF-109A.	[ ] SAT [ ] UNSAT [ ] N/A	

(1) May be N/A if not performing check valve performance monitoring.

STEP	TEST RESULTS (check one)	INITIAL
7.1.32	☐ **Acceptable** ☐ **Alert** (Submit Work Request to perform another Operability surveillance within six weeks and write a CR to double testing frequency. **[CR-WF3-2008-05882]**) WR No. ________ CR No. ________ ☐ **Required Action** (Declare pump Inoperable) (WR and CR must be initiated) WR No. ________ CR No. ________ ☐ **Reference Data Run** (Results to be evaluated by Programs Engineering)	

STEP	ACTION	INITIAL
7.1.35	Copy of IST Data submitted to P.E. IST Coordinator.	

REMARKS: ______________________________

Performed by: ______________________ (Signature) ____________ (Date)

IV by: ______________________ (Signature) ____________ (Date)

Independent Reviewed by: ______________________ (Signature) ____________ (Date)

SM/CRS Review: ______________________ (Signature) ______/______ (Date/Time)

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and

b. Two separate and independent diesel generators, each with:

1. Diesel oil feed tanks containing a minimum volume of 339 gallons of fuel, and

2. A separate diesel generator fuel oil storage tank, and

3. A separate fuel transfer pump.

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

ACTION:

a. With one offsite circuit of 3.8.1.1a inoperable, demonstrate the OPERABILITY of the remaining offsite A.C. circuit by performing Surveillance Requirement 4.8.1.1.1a within 1 hour and at least once per 8 hours thereafter. Restore the offsite A.C. circuit to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one diesel generator of 3.8.1.1b inoperable:

(1) Demonstrate the OPERABILITY of the remaining A.C. circuits by performing Surveillance Requirements 4.8.1.1.1a (separately for each offsite A.C. circuit) within 1 hour and at least once per 8 hours thereafter. If the diesel generator became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE diesel generator (unless it has been successfully tested in the last 24 hours) by performing Surveillance Requirement 4.8.1.1.2a.4 within 8 hours unless the absence of any potential common mode failure for the remaining diesel generator is demonstrated.

(2) Restore the diesel generator to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours, unless the following condition exists:

ACTION: (Continued)

(a) The requirement for restoration to OPERABLE status within 72 hours may be extended to 10 days if a temporary emergency diesel generator is verified available, and

(b) If at any time the temporary emergency diesel generator availability cannot be met, either restore the temporary emergency diesel generator to available status within 72 hours (not to exceed 10 days from the time the permanent plant EDG originally became inoperable), or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With one offsite A.C. circuit and one diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining offsite A.C. circuit by performing Surveillance Requirement 4.8.1.1.1a within 1 hour and at least once per 8 hours thereafter; and, if the diesel generator became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE diesel generator by performing Surveillance Requirement 4.8.1.1.2a.4 within 8 hours (unless it is already operating) unless the absence of any potential common mode failure for the remaining diesel generator is demonstrated. Restore at least one of the inoperable sources to OPERABLE status within 12 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore the other A.C. power source (offsite A.C. circuit or diesel generator) to OPERABLE status in accordance with the provisions of ACTION statement a or b, as appropriate, with the time requirement of that ACTION statement based on the time of initial loss of the remaining inoperable A.C. power source. A successful test of diesel generator OPERABILITY per Surveillance Requirement 4.8.1.1.2a.4 performed under this ACTION statement satisfies the diesel generator test requirement of ACTION statement a or b.

d. With one diesel generator inoperable, in addition to ACTION b. or c. above, verify that:

(1) All required systems, subsystems, trains, components, and devices that depend on the remaining OPERABLE diesel generator as a source of emergency power are also OPERABLE, and

(2) When in MODE 1, 2, or 3, the steam-driven emergency feed pump is OPERABLE.

If these conditions are not satisfied within 2 hours be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

LIMITING CONDITION FOR OPERATION

ACTION: (Continued)

e. With two of the above required offsite A.C. circuits inoperable, restore one of the inoperable offsite A.C. circuits to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours. Following restoration of one offsite A.C. circuit, follow ACTION statement a with the time requirement of that ACTION statement based on the time of initial loss of the remaining inoperable offsite A.C. circuit. A successful test of diesel generator OPERABILITY per Surveillance Requirement 4.8.1.1.2a.4 performed under this ACTION statement satisfies the diesel generator test requirement of ACTION statement a.

f. With two of the above required diesel generators inoperable, demonstrate the OPERABILITY of two offsite A.C. circuits by performing Surveillance Requirement 4.8.1.1.1a within 1 hour and at least once per 8 hours thereafter; restore one of the inoperable diesel generators to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Following restoration of one diesel generator, follow ACTION statement b with the time requirement of that ACTION statement based on the time of initial loss of the remaining inoperable diesel generator.

SURVEILLANCE REQUIREMENTS

4.8.1.1.1 Each of the above required independent circuits between the offsite transmission network and the onsite Class 1E distribution system shall be:

a. Determined OPERABLE at least once per 7 days by verifying correct breaker alignments, indicated power availablity, and

b. Demonstrated OPERABLE at least once per 18 months by transferring manually and automatically unit power supply from the normal circuit to the alternate circuit.

4.8.1.1.2 Each diesel generator shall be demonstrated OPERABLE*:

a. At least once per 31 days on a STAGGERED TEST BASIS by:

1. Verifying the fuel level in the diesel oil feed tank,

2. Deleted,

3. Verifying the fuel transfer pump can be started and transfers fuel from the storage system to the diesel oil feed tank,

4. Verifying the diesel starts**. The generator voltage and frequency shall be at least 3920 volts and 58.8 Hz in $\leq$ 10 seconds after the start signal. The steady state voltage and frequency shall be maintained at 4160 + 420, -240 volts and 60 ± 1.2 Hz. The diesel generator shall be started for this test by using one of the following signals:

a) Manual.

b) Simulated loss-of-offsite power by itself.

c) Simulated loss-of-offsite power in conjunction with an ESF actuation test signal.

d) An ESF actuation test signal by itself.

*All planned starts for the purpose of surveillance in this section may be preceded by a prelube period as recommended by the manufacturer.

**A modified diesel generator start involving idling and gradual acceleration to synchronous speed may be used for this surveillance requirement as recommended by the manufacturer. When modified start procedures are not used, the time, speed, voltage, and frequency tolerances of this surveillance requirement must be met.

5. Verifying the generator is synchronized, loaded to an indicated 4000-4400 Kw* in accordance with the manufacturer's recommendation and operates for at least an additional 60 minutes#, and

6. Verifying the diesel generator is aligned to provide standby power to the associated emergency busses.

b. At least once per 31 days and after each operation of the diesel where the period of operation was greater than or equal to 1 hour by checking for and removing accumulated water from the diesel oil feed tanks.

c. Deleted

*This band is meant as guidance to avoid routine overloading of the engine. Loads in excess of this band for special testing under direct monitoring of the manufacturer or momentary variation due to changing bus loads shall not invalidate the test.

#This surveillance requirement shall be preceded by and immediately follow without shutdown a successful performance of 4.8.1.1.2a.4 or 4.8.1.1.2d.

d. At least once per 184 days a diesel generator fast start test shall be performed in accordance with TS 4.8.1.1.2a.4. Performance of the 184 day fast start test satisfies the 31 day testing requirements specified in TS 4.8.1.1.2a.4.

e. At least once per 18 months by:

1. Verifying the generator capability to reject a load of greater than or equal to 498 kW while maintaining voltage at 4160 +420, -240 volts and frequency at 60 +4.5, -1.2 Hz.

2. Verifying the generator capability to reject a load of an indicated 4000-4400 kW without tripping. The generator voltage shall not exceed 5023 volts during and following the load rejection.

3. During shutdown, simulating a loss-of-offsite power by itself, and:

   a) Verifying deenergization of the emergency busses and load shedding from the emergency busses.

   b) Verifying the diesel starts on the auto-start signal, energizes the emergency busses and the permanently connected loads within 10 seconds after the auto-start signal, energizes the auto-connected shutdown loads through the load sequencer and operates for greater than or equal to 5 minutes while its generator is loaded with the shutdown loads. After energization, the steady-state voltage and frequency of the emergency busses shall be maintained at 4160 +420, -240 volts and 60 +1.2, -0.3 Hz during this test.

4. Verifying that on an SIAS actuation test signal (without loss-of-offsite power) the diesel generator starts on the auto-start signal and operates on standby for greater than or equal to 5 minutes. The steady-state generator voltage and frequency shall be 4160 +420, -240 volts and 60 ± 1.2 Hz within 10 seconds after the auto-start signal; the generator voltage and frequency shall be maintained within these limits during this test.

5. During shutdown, simulating a loss-of-offsite power in conjunction with an SIAS actuation test signal, and

   a) Verifying deenergization of the emergency busses and load shedding from the emergency busses.

   b) Verifying the diesel starts on the auto-start signal, energizes the emergency busses and the permanently connected loads within 10 seconds after the auto-start signal, energizes the auto-connected emergency loads through the load sequencer and operates for greater than or equal to 5 minutes. After energization, the steady-state voltage and frequency of the emergency busses shall be maintained at 4160 +420, -240 volts and 60 +1.2, -0.3 Hz during this test.

   c) Verifying that all automatic diesel generator trips, except engine overspeed and generator differential, are automatically bypassed upon loss of voltage on the emergency bus concurrent with a safety injection actuation signal.

6. Verifying the diesel generator operates for an interval of not less than 24 hours. During 2 hours of this test, the diesel generator shall be loaded to an indicated 4700 to 4900 Kw* and during 22 hours of this test, the diesel generator shall be loaded to an indicated 4000 to 4400 Kw.* The generator voltage and frequency shall be 4160 +420, -240 volts and 60 ± 1.2 Hz within 10 seconds after the start signal; the steady-state generator voltage and frequency shall be 4160 ± 420 volts and 60 +1.2, -0.3 Hz during this test. Within 5 minutes after completing this 24-hour test, perform Surveillance Requirement 4.8.1.1.2.a.4.**

7. During shutdown, verifying that the auto-connected loads and permanently connected loads to each diesel generator do not exceed the 2000-hour rating of 4400 kW.

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*This band is meant as guidance to avoid routine overloading of the engine. Loads in excess of this band for special testing under direct monitoring of the manufacturer or momentary variation due to changing bus loads shall not invalidate the test.

**If Surveillance Requirement 4.8.1.1.2.a.4 is not satisfactorily completed, it is not necessary to repeat the preceding 24-hour test. Instead, the diesel generator may be operated at an indicated 4000-4400 kw* for 2 hours or until internal operating temperatures have stabilized. Within 5 minutes of securing the diesel generator, perform Surveillance Requirement 4.8.1.1.2.a.4.

8. During shutdown, verifying the diesel generator's capability to:

   a) Synchronize with the offsite power source while the generator is loaded with its emergency loads upon a simulated restoration of offsite power,

   b) Transfer its loads to the offsite power source, and

   c) Be restored to its standby status.

9. During shutdown, verifying that with the diesel generator operating in a test mode (connected to its bus), a simulated safety injection signal overrides the test mode by (1) returning the diesel generator to standby operation and (2) automatically energizes the emergency loads with offsite power.

10. Verifying that each fuel transfer pump transfers fuel to its associated diesel oil feed tank by taking suction from the opposite train fuel oil storage tank via the installed cross connect.

11. During shutdown, verifying that the automatic load sequence timer is OPERABLE with the time of each load block within ±10% of the sequenced load block time.

12. Verifying that the following diesel generator lockout features prevent diesel generator starting only when required:

   a) turning gear engaged
   b) emergency stop
   c) loss of D.C. control power
   d) governor fuel oil linkage tripped

f. Deleted

g. At least once per 10 years or after any modifications which could affect diesel generator interdependence by starting the diesel generators simultaneously, during shutdown, and verifying that the diesel generators accelerate to at least 600 rpm (60 ± 1.2 Hz) in less than or equal to 10 seconds.

h. Deleted

Waterford 3

2017 SRO NRC Exam

JOB PERFORMANCE MEASURE

A6

Determine time to boil and containment closure requirements in accordance with OP-901-131, Shutdown Cooling Malfunction

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Determine time to boil and containment closure requirements in accordance with OP-901-131, Shutdown Cooling Malfunction

Task Standard: Determined RCS time to boil and containment closure requirements in accordance with OP-901-131, Shutdown Cooling Malfunction.

References: OP-901-131 (rev 304); OP-010-006 (rev 329); Tech Spec 3.9.4

Alternate Path: No Time Critical: No Validation Time: 25 min

K/A 2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation.

Importance Rating 4.4
SRO

Applicant: ____________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____________________

____

____

Examiner: ____________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-901-131, Shutdown Cooling Malfunction
- Personal computer or laptop (with wifi/LAN deactivated)
- Standard electronic references thumb drive (eCart)
- Handout (Time to Boil Tables) – Only if paper copy is requested

Description:
This JPM requires the applicant to determine the time the reactor has been shutdown, time for the RCS to boil, and containment closure requirements in accordance with OP-901-131, Shutdown Cooling Malfunction and OP-010-006, Outage Operations.

READ TO APPLICANT

DIRECTION TO APPLICANT:

Each administrative JPM has a cue sheet with the instructions for that JPM. Each administrative JPM stands alone, and conditions from 1 JPM do not carry over to any other JPM. If you have any questions, raise your hand and I will come to your desk.

Provide all answers on the sheets provided.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

Evaluator Note
The applicant should be able to make all determinations using the electronic copies of OP-901-131, Shutdown Cooling Malfunction and OP-010-006, Outage Operations. A Handout (Time to Boil Tables) is available should the applicant request a paper copy. Do not hand out unless the applicant requests the specific attachment.

TASK ELEMENT 1	STANDARD
Determined time after shutdown in days using information in the cue sheet.	17 days
Comment: Examiner note: The applicant must correctly determine time after shutdown as 17 days in order to determine the correct time to boil in Task Element 2, but it is not critical for the applicant to document the time after shutdown.	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
Determined RCS time to boil using tables on Attachment 2 of OP-901-131, Shutdown Cooling Malfunction.	34.3 minutes
Comment: Examiner note: This action is normally directed by OP-901-131, Section E2, step 10. The applicant will use time after shutdown, knowledge of RCS elevations (i.e. Top of Hot Leg = 15.13 FT), and data provided in the cue sheet to determine time to boil. The correct time is found on page 5 of Attachment 2 of OP-901-131, Shutdown Cooling Malfunction. Refer to answer key.	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
3. If in Mode 5, 6 or defueled, then complete Attachment 1: Containment Closure Checklist, within the required time constraints listed on Attachment 1: Containment Closure Checklist.	Determined that components/items in OP-901-131, Attachment 1 must be closed/secured within 34.3 minutes, which include: • Equipment Hatch • Escape Air Lock • Personnel Air Lock • All Containment Closure Impairments • Perturbation Log reviewed (not critical)
Comment: Examiner note: OP-901-131, Section E0, Step 3 directs the CRS to address Containment Closure. OP-901-131, Attachment 1, Containment Closure Checklist, directs the CRS to OP-010-006, Outage Operations, for specified time limits. The applicant may include additional information on OP-010-006, Att. 9.12, Containment Closure Requirements. Information on OP-010-006, Att. 9.12 is not critical. Perturbation Log entries do not affect containment closure and therefore also not critical.	**Critical** **SAT / UNSAT**

END OF TASK

SIMULATOR OPERATOR INSTRUCTIONS

None.

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- Today's date and time are 3/27/2017, 1300
- The reactor was shutdown on 3/10/2017 at 1300
- Plant is in Mode 5 for a refueling outage
- RCS Temperature is 110°F
- RCS Level is 15.13 FT and stable
- Core Alterations or load movements are <u>not</u> in progress
- Equipment Hatch is open
- Local leak rate testing (LLRT) of containment penetrations is in progress
- Temporary power to containment is aligned through the escape air lock
- A loss of Shutdown cooling has occurred and CETs become unavailable
- The crew has entered OP-901-131, Shutdown Cooling Malfunction

INITIATING CUE(S):

As the CRS, determine RCS time to boil <u>and</u> containment closure requirements including time limits, if any, in accordance with OP-901-131, Shutdown Cooling Malfunction.

Document the results on this cue sheet.

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL

Tem(F)	90	90	90	90	90	90	90	90	90
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	11.1	13.5	15.2	16.6	69.1	79.6	95.3	111.1	121.6
2.0	13.8	16.7	18.8	20.6	85.6	98.6	118.1	137.6	150.6
3.0	15.7	18.9	21.3	23.4	97.1	111.9	134.0	156.1	170.9
4.0	17.6	21.2	23.9	26.2	108.9	125.5	150.3	175.1	191.7
5.0	19.5	23.6	26.6	29.1	121.2	139.6	167.2	194.8	213.2
6.0	21.1	25.5	28.7	31.4	130.6	150.4	180.2	210.0	229.8
7.0	22.8	27.6	31.0	34.0	141.4	162.9	195.1	227.3	248.8
8.0	24.1	29.1	32.8	35.9	149.3	172.0	206.0	240.1	262.7
9.0	25.5	30.8	34.7	38.1	158.2	182.3	218.3	254.4	278.4
10.0	26.7	32.3	36.3	39.8	165.7	190.8	228.6	266.3	291.5
11.0	27.9	33.7	37.9	41.6	172.8	199.1	238.5	277.9	304.1
12.0	29.0	35.0	39.4	43.2	179.5	206.8	247.7	288.6	315.9
13.0	29.8	36.1	40.6	44.5	185.1	213.2	255.4	297.6	325.7
14.0	30.8	37.2	41.9	45.9	191.0	220.0	263.5	307.1	336.1
15.0	31.8	38.5	43.3	47.5	197.3	227.3	272.2	317.2	347.2
16.0	32.9	39.8	44.8	49.1	204.1	235.1	281.5	328.0	359.0
17.0	34.1	41.2	46.4	50.8	211.3	243.4	291.5	339.6	371.7
18.0	35.0	42.3	47.6	52.2	217.0	249.9	299.4	348.8	381.8
19.0	35.8	43.2	48.7	53.3	221.8	255.5	306.0	356.6	390.3
20.0	36.6	44.2	49.8	54.6	226.9	261.3	313.0	364.7	399.2
21.0	37.4	45.3	50.9	55.8	232.2	267.4	320.3	373.2	408.5
22.0	38.3	46.3	52.2	57.2	237.7	273.8	328.0	382.1	418.2
23.0	39.3	47.5	53.4	58.6	243.5	280.5	336.0	391.5	428.5
24.0	39.9	48.2	54.2	59.4	247.1	284.7	341.0	397.3	434.8
25.0	40.4	48.8	55.0	60.2	250.4	288.5	345.5	402.6	440.7
26.0	40.9	49.5	55.7	61.0	253.8	292.4	350.2	408.1	446.6
27.0	41.5	50.2	56.5	61.9	257.3	296.4	355.0	413.7	452.7
28.0	42.1	50.9	57.2	62.7	260.9	300.5	360.0	419.4	459.0
29.0	42.7	51.6	58.1	63.6	264.6	304.8	365.1	425.3	465.5
30.0	43.3	52.3	58.9	64.5	268.4	309.1	370.3	431.4	472.2
31.0	43.9	53.1	59.7	65.5	272.3	313.6	375.7	437.7	479.0
32.0	44.6	53.9	60.6	66.4	276.3	318.2	381.2	444.1	486.1
33.0	45.2	54.7	61.5	67.4	280.4	323.0	386.9	450.8	493.4
34.0	45.9	55.5	62.5	68.5	284.7	327.9	392.8	457.6	500.9
35.0	46.6	56.3	63.4	69.5	289.1	333.0	398.8	464.7	508.6
36.0	47.3	57.2	64.4	70.6	293.6	338.2	405.1	472.0	516.6
37.0	48.1	58.1	65.4	71.7	298.3	343.6	411.5	479.5	524.8
38.0	48.9	59.1	66.5	72.9	303.1	349.1	418.2	487.2	533.3
39.0	49.7	60.0	67.6	74.1	308.1	354.8	425.0	495.2	542.0
40.0	50.5	61.1	68.7	75.3	313.2	360.8	432.1	503.5	551.1
41.0	51.4	62.1	69.9	76.6	318.5	366.9	439.5	512.1	560.4
42.0	52.3	63.2	71.1	77.9	324.0	373.2	447.1	520.9	570.1
43.0	53.2	64.3	72.3	79.3	329.7	379.8	454.9	530.1	580.2
44.0	54.1	65.4	73.6	80.7	335.6	386.6	463.1	539.6	590.5
45.0	55.1	66.6	75.0	82.2	341.8	393.7	471.5	549.4	601.3
46.0	56.1	67.9	76.4	83.7	348.1	401.0	480.3	559.6	612.5
47.0	56.8	68.6	77.3	84.7	352.2	405.7	485.9	566.2	619.7
48.0	57.3	69.3	78.0	85.4	355.3	409.3	490.2	571.2	625.1
49.0	57.8	69.9	78.7	86.2	358.5	412.9	494.6	576.3	630.7
50.0	58.3	70.5	79.4	87.0	361.7	416.6	499.0	581.5	636.4
51.0	58.9	71.1	80.1	87.8	365.0	420.4	503.6	586.7	642.2
52.0	59.4	71.8	80.8	88.6	368.3	424.3	508.2	592.1	648.1
53.0	59.9	72.5	81.6	89.4	371.7	428.2	512.9	597.6	654.1
54.0	60.5	73.1	82.3	90.2	375.2	432.2	517.7	603.2	660.2

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	90	90	90	90	90	90	90	90	90
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
55.0	61.1	73.8	83.1	91.1	378.7	436.3	522.6	608.9	666.4
56.0	61.7	74.5	83.9	92.0	382.3	440.4	527.5	614.7	672.7
57.0	62.3	75.2	84.7	92.8	386.0	444.7	532.6	620.6	679.2
58.0	62.9	76.0	85.5	93.7	389.8	449.0	537.8	626.6	685.8
59.0	63.5	76.7	86.4	94.7	393.6	453.4	543.1	632.7	692.5
60.0	64.1	77.5	87.2	95.6	397.5	457.9	548.4	639.0	699.4
61.0	64.7	78.3	88.1	96.5	401.5	462.4	553.9	645.4	706.4
62.0	65.4	79.0	89.0	97.5	405.5	467.1	559.5	651.9	713.5
63.0	66.1	79.8	89.9	98.5	409.6	471.9	565.2	658.5	720.8
64.0	66.7	80.7	90.8	99.5	413.9	476.7	571.0	665.3	728.2
65.0	67.4	81.5	91.8	100.6	418.2	481.7	577.0	672.3	735.8
66.0	68.1	82.4	92.7	101.6	422.6	486.8	583.0	679.3	743.5
67.0	68.9	83.2	93.7	102.7	427.1	491.9	589.2	686.5	751.4
68.0	69.6	84.1	94.7	103.8	431.7	497.2	595.6	693.9	759.5
69.0	70.4	85.1	95.7	104.9	436.3	502.6	602.0	701.5	767.7
70.0	71.0	85.8	96.6	105.8	440.0	506.9	607.2	707.4	774.3
71.0	71.4	86.3	97.2	106.5	442.9	510.2	611.2	712.1	779.4
72.0	71.9	86.9	97.8	107.2	445.9	513.6	615.2	716.8	784.5
73.0	72.4	87.5	98.5	107.9	448.8	517.0	619.3	721.6	789.8
74.0	72.9	88.1	99.1	108.7	451.9	520.5	623.5	726.4	795.1
75.0	73.4	88.7	99.8	109.4	454.9	524.0	627.7	731.3	800.4
76.0	73.9	89.3	100.5	110.1	458.0	527.6	631.9	736.3	805.9
77.0	74.4	89.9	101.2	110.9	461.1	531.2	636.3	741.3	811.4
78.0	74.9	90.5	101.9	111.7	464.3	534.9	640.7	746.5	817.0
79.0	75.4	91.1	102.6	112.4	467.6	538.6	645.1	751.6	822.7
80.0	75.9	91.8	103.3	113.2	470.8	542.3	649.6	756.9	828.4
81.0	76.5	92.4	104.0	114.0	474.1	546.2	654.2	762.2	834.2
82.0	77.0	93.1	104.8	114.8	477.5	550.0	658.8	767.6	840.2
83.0	77.6	93.7	105.5	115.7	480.9	554.0	663.5	773.1	846.2
84.0	78.1	94.4	106.3	116.5	484.4	557.9	668.3	778.7	852.2
85.0	78.7	95.1	107.0	117.3	487.9	562.0	673.2	784.3	858.4
86.0	79.3	95.8	107.8	118.2	491.4	566.1	678.1	790.0	864.7
87.0	79.8	96.5	108.6	119.1	495.1	570.3	683.0	795.8	871.0
88.0	80.4	97.2	109.4	119.9	498.7	574.5	688.1	801.7	877.5
89.0	81.0	97.9	110.2	120.8	502.4	578.8	693.2	807.7	884.0
90.0	81.6	98.7	111.1	121.7	506.2	583.1	698.5	813.8	890.7
91.0	82.3	99.4	111.9	122.7	510.1	587.5	703.7	820.0	897.4
92.0	82.9	100.2	112.8	123.6	513.9	592.0	709.1	826.2	904.3
93.0	83.4	100.9	113.5	124.4	517.4	596.0	713.9	831.8	910.4
94.0	83.9	101.4	114.1	125.1	520.2	599.2	717.7	836.3	915.3
95.0	84.3	101.9	114.8	125.8	523.0	602.5	721.6	840.8	920.2
96.0	84.8	102.5	115.4	126.5	525.9	605.7	725.6	845.4	925.3
97.0	85.3	103.1	116.0	127.2	528.7	609.1	729.5	850.0	930.3
98.0	85.7	103.6	116.7	127.9	531.7	612.4	733.5	854.7	935.4
99.0	86.2	104.2	117.3	128.6	534.6	615.8	737.6	859.4	940.6
100.0	86.7	104.8	118.0	129.3	537.6	619.2	741.7	864.2	945.9

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	100	100	100	100	100	100	100	100	100
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	10.2	12.3	13.9	15.2	63.3	72.9	87.3	101.8	111.4
2.0	12.7	15.3	17.2	18.9	78.4	90.3	108.2	126.1	138.0
3.0	14.4	17.3	19.5	21.4	89.0	102.5	122.8	143.0	156.6
4.0	16.1	19.5	21.9	24.0	99.8	115.0	137.7	160.5	175.6
5.0	17.9	21.6	24.4	26.7	111.0	127.9	153.2	178.5	195.3
6.0	19.3	23.3	26.3	28.8	119.7	137.8	165.1	192.4	210.6
7.0	20.9	25.3	28.4	31.2	129.6	149.2	178.7	208.3	227.9
8.0	22.1	26.7	30.0	32.9	136.8	157.6	188.8	220.0	240.8
9.0	23.4	28.3	31.8	34.9	145.0	167.0	200.0	233.1	255.1
10.0	24.5	29.6	33.3	36.5	151.8	174.9	209.4	244.0	267.1
11.0	25.5	30.9	34.8	38.1	158.4	182.4	218.5	254.6	278.7
12.0	26.5	32.1	36.1	39.6	164.5	189.5	227.0	264.5	289.4
13.0	27.4	33.1	37.2	40.8	169.6	195.4	234.0	272.7	298.4
14.0	28.2	34.1	38.4	42.1	175.0	201.6	241.5	281.4	308.0
15.0	29.2	35.3	39.7	43.5	180.8	208.3	249.5	290.7	318.1
16.0	30.2	36.5	41.0	45.0	187.0	215.4	258.0	300.6	329.0
17.0	31.2	37.7	42.5	46.6	193.6	223.0	267.1	311.2	340.6
18.0	32.1	38.8	43.6	47.8	198.8	229.0	274.3	319.6	349.8
19.0	32.8	39.6	44.6	48.9	203.3	234.1	280.4	326.7	357.6
20.0	33.5	40.5	45.6	50.0	207.9	239.5	286.8	334.2	365.8
21.0	34.3	41.5	46.7	51.2	212.7	245.0	293.5	342.0	374.3
22.0	35.1	42.5	47.8	52.4	217.8	250.9	300.5	350.1	383.2
23.0	36.0	43.5	49.0	53.7	223.1	257.0	307.9	358.7	392.6
24.0	36.5	44.2	49.7	54.5	226.5	260.9	312.5	364.0	398.4
25.0	37.0	44.7	50.4	55.2	229.5	264.3	316.6	368.9	403.8
26.0	37.5	45.3	51.0	55.9	232.6	267.9	320.9	373.9	409.2
27.0	38.0	46.0	51.7	56.7	235.8	271.6	325.3	379.0	414.9
28.0	38.6	46.6	52.5	57.5	239.1	275.4	329.8	384.3	420.6
29.0	39.1	47.3	53.2	58.3	242.4	279.3	334.5	389.7	426.6
30.0	39.7	47.9	54.0	59.2	245.9	283.3	339.3	395.3	432.7
31.0	40.2	48.6	54.8	60.0	249.5	287.4	344.2	401.1	439.0
32.0	40.8	49.4	55.6	60.9	253.2	291.6	349.3	407.0	445.4
33.0	41.4	50.1	56.4	61.8	256.9	296.0	354.5	413.1	452.1
34.0	42.1	50.9	57.2	62.7	260.8	300.5	359.9	419.3	458.9
35.0	42.7	51.6	58.1	63.7	264.9	305.1	365.4	425.8	466.0
36.0	43.4	52.5	59.0	64.7	269.0	309.9	371.2	432.5	473.3
37.0	44.1	53.3	60.0	65.7	273.3	314.8	377.1	439.3	480.9
38.0	44.8	54.1	60.9	66.8	277.7	319.9	383.2	446.4	488.6
39.0	45.5	55.0	62.0	67.9	282.3	325.2	389.5	453.8	496.7
40.0	46.3	56.0	63.0	69.0	287.0	330.6	396.0	461.4	505.0
41.0	47.1	56.9	64.1	70.2	291.9	336.2	402.7	469.2	513.5
42.0	47.9	57.9	65.2	71.4	296.9	342.0	409.7	477.3	522.4
43.0	48.7	58.9	66.3	72.7	302.1	348.0	416.9	485.7	531.6
44.0	49.6	60.0	67.5	74.0	307.5	354.3	424.3	494.4	541.1
45.0	50.5	61.1	68.7	75.3	313.2	360.7	432.1	503.4	551.0
46.0	51.5	62.2	70.0	76.7	319.0	367.4	440.1	512.8	561.2
47.0	52.1	62.9	70.8	77.6	322.7	371.7	445.3	518.8	567.8
48.0	52.5	63.5	71.5	78.3	325.6	375.0	449.2	523.4	572.8
49.0	53.0	64.0	72.1	79.0	328.5	378.4	453.2	528.0	577.9
50.0	53.5	64.6	72.7	79.7	331.4	381.8	457.3	532.8	583.1
51.0	53.9	65.2	73.4	80.4	334.4	385.2	461.4	537.6	588.4
52.0	54.4	65.8	74.1	81.2	337.5	388.8	465.7	542.6	593.8
53.0	54.9	66.4	74.8	81.9	340.6	392.4	470.0	547.6	599.3
54.0	55.5	67.0	75.5	82.7	343.8	396.0	474.4	552.7	604.9
55.0	56.0	67.7	76.2	83.5	347.1	399.8	478.8	557.9	610.6
56.0	56.5	68.3	76.9	84.3	350.4	403.6	483.4	563.2	616.4

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	100	100	100	100	100	100	100	100	100
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	57.1	69.0	77.6	85.1	353.7	407.5	488.0	568.6	622.4
58.0	57.6	69.6	78.4	85.9	357.2	411.4	492.8	574.2	628.4
59.0	58.2	70.3	79.2	86.8	360.7	415.4	497.6	579.8	634.6
60.0	58.8	71.0	79.9	87.6	364.2	419.5	502.5	585.5	640.8
61.0	59.3	71.7	80.7	88.5	367.9	423.7	507.6	591.4	647.2
62.0	59.9	72.4	81.5	89.4	371.6	428.0	512.7	597.3	653.8
63.0	60.6	73.2	82.4	90.3	375.4	432.4	517.9	603.4	660.4
64.0	61.2	73.9	83.2	91.2	379.2	436.8	523.2	609.6	667.2
65.0	61.8	74.7	84.1	92.2	383.2	441.4	528.7	616.0	674.2
66.0	62.5	75.5	85.0	93.1	387.2	446.0	534.2	622.5	681.3
67.0	63.1	76.3	85.9	94.1	391.3	450.8	539.9	629.1	688.5
68.0	63.8	77.1	86.8	95.1	395.5	455.6	545.7	635.8	695.9
69.0	64.5	78.0	87.7	96.2	399.8	460.6	551.7	642.8	703.5
70.0	65.0	78.6	88.5	97.0	403.2	464.5	556.3	648.2	709.5
71.0	65.5	79.1	89.1	97.6	405.9	467.5	560.0	652.5	714.1
72.0	65.9	79.7	89.7	98.3	408.6	470.6	563.7	656.8	718.9
73.0	66.3	80.2	90.3	98.9	411.3	473.8	567.5	661.2	723.6
74.0	66.8	80.7	90.9	99.6	414.1	476.9	571.3	665.6	728.5
75.0	67.2	81.3	91.5	100.3	416.8	480.2	575.1	670.1	733.4
76.0	67.7	81.8	92.1	101.0	419.7	483.4	579.1	674.7	738.4
77.0	68.2	82.4	92.7	101.6	422.6	486.7	583.0	679.3	743.5
78.0	68.6	83.0	93.4	102.3	425.5	490.1	587.0	684.0	748.6
79.0	69.1	83.5	94.0	103.1	428.4	493.5	591.1	688.7	753.8
80.0	69.6	84.1	94.7	103.8	431.4	497.0	595.2	693.5	759.1
81.0	70.1	84.7	95.3	104.5	434.5	500.5	599.4	698.4	764.4
82.0	70.6	85.3	96.0	105.2	437.5	504.0	603.7	703.4	769.8
83.0	71.1	85.9	96.7	106.0	440.7	507.6	608.0	708.4	775.3
84.0	71.6	86.5	97.4	106.8	443.8	511.3	612.4	713.5	780.9
85.0	72.1	87.2	98.1	107.5	447.1	515.0	616.8	718.7	786.6
86.0	72.6	87.8	98.8	108.3	450.3	518.7	621.3	723.9	792.3
87.0	73.2	88.4	99.6	109.1	453.6	522.5	625.9	729.2	798.1
88.0	73.7	89.1	100.3	109.9	457.0	526.4	630.5	734.6	804.1
89.0	74.3	89.8	101.0	110.7	460.4	530.3	635.2	740.1	810.1
90.0	74.8	90.4	101.8	111.6	463.9	534.3	640.0	745.7	816.1
91.0	75.4	91.1	102.6	112.4	467.4	538.4	644.8	751.3	822.3
92.0	76.0	91.8	103.4	113.3	470.9	542.5	649.8	757.1	828.6
93.0	76.5	92.4	104.1	114.0	474.1	546.1	654.1	762.2	834.2
94.0	76.9	92.9	104.6	114.7	476.7	549.1	657.7	766.3	838.7
95.0	77.3	93.4	105.2	115.3	479.2	552.0	661.2	770.4	843.2
96.0	77.7	93.9	105.8	115.9	481.9	555.0	664.8	774.6	847.8
97.0	78.2	94.5	106.3	116.5	484.5	558.1	668.5	778.9	852.5
98.0	78.6	95.0	106.9	117.2	487.2	561.2	672.2	783.1	857.1
99.0	79.0	95.5	107.5	117.8	489.9	564.3	675.9	787.5	861.9
100.0	79.5	96.0	108.1	118.5	492.6	567.4	679.6	791.9	866.7

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	110	110	110	110	110	110	110	110	110
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	9.3	11.2	12.6	13.8	57.5	66.3	79.4	92.5	101.2
2.0	11.5	13.9	15.6	17.1	71.3	82.1	98.3	114.6	125.4
3.0	13.0	15.8	17.8	19.5	80.9	93.1	111.6	130.0	142.3
4.0	14.6	17.7	19.9	21.8	90.7	104.5	125.2	145.8	159.6
5.0	16.3	19.7	22.1	24.3	100.9	116.2	139.2	162.2	177.5
6.0	17.6	21.2	23.9	26.2	108.8	125.3	150.1	174.8	191.3
7.0	19.0	23.0	25.8	28.3	117.7	135.6	162.4	189.3	207.1
8.0	20.1	24.3	27.3	29.9	124.4	143.2	171.6	199.9	218.8
9.0	21.3	25.7	28.9	31.7	131.8	151.8	181.8	211.8	231.8
10.0	22.3	26.9	30.3	33.2	138.0	158.9	190.3	221.8	242.7
11.0	23.2	28.1	31.6	34.6	143.9	165.8	198.6	231.4	253.3
12.0	24.1	29.2	32.8	36.0	149.5	172.2	206.3	240.3	263.0
13.0	24.9	30.1	33.8	37.1	154.1	177.5	212.7	247.8	271.2
14.0	25.7	31.0	34.9	38.3	159.1	183.2	219.5	255.7	279.9
15.0	26.5	32.0	36.1	39.5	164.3	189.3	226.7	264.1	289.1
16.0	27.4	33.1	37.3	40.9	169.9	195.7	234.5	273.2	299.0
17.0	28.4	34.3	38.6	42.3	175.9	202.7	242.7	282.8	309.5
18.0	29.2	35.2	39.7	43.5	180.7	208.1	249.3	290.5	317.9
19.0	29.8	36.0	40.5	44.4	184.7	212.8	254.9	296.9	325.0
20.0	30.5	36.8	41.5	45.5	188.9	217.6	260.7	303.7	332.4
21.0	31.2	37.7	42.4	46.5	193.3	222.7	266.7	310.8	340.1
22.0	31.9	38.6	43.5	47.6	197.9	228.0	273.1	318.2	348.3
23.0	32.7	39.5	44.5	48.8	202.8	233.6	279.8	326.0	356.8
24.0	33.2	40.1	45.2	49.5	205.8	237.1	284.0	330.8	362.1
25.0	33.7	40.7	45.8	50.2	208.6	240.2	287.7	335.3	366.9
26.0	34.1	41.2	46.4	50.9	211.4	243.5	291.6	339.8	371.9
27.0	34.6	41.8	47.0	51.6	214.3	246.8	295.6	344.5	377.0
28.0	35.1	42.4	47.7	52.3	217.3	250.3	299.8	349.3	382.3
29.0	35.6	43.0	48.4	53.0	220.3	253.8	304.0	354.2	387.7
30.0	36.1	43.6	49.1	53.8	223.5	257.4	308.3	359.3	393.2
31.0	36.6	44.2	49.8	54.5	226.7	261.2	312.8	364.5	398.9
32.0	37.1	44.9	50.5	55.4	230.1	265.0	317.4	369.8	404.8
33.0	37.7	45.5	51.3	56.2	233.5	269.0	322.2	375.4	410.8
34.0	38.3	46.2	52.0	57.0	237.1	273.1	327.1	381.1	417.1
35.0	38.8	46.9	52.8	57.9	240.7	277.3	332.1	387.0	423.5
36.0	39.5	47.7	53.7	58.8	244.5	281.6	337.3	393.0	430.1
37.0	40.1	48.4	54.5	59.8	248.4	286.1	342.7	399.3	437.0
38.0	40.7	49.2	55.4	60.7	252.4	290.7	348.2	405.7	444.1
39.0	41.4	50.0	56.3	61.7	256.5	295.5	353.9	412.4	451.4
40.0	42.1	50.9	57.3	62.8	260.8	300.4	359.9	419.3	458.9
41.0	42.8	51.7	58.2	63.8	265.3	305.5	366.0	426.4	466.7
42.0	43.5	52.6	59.2	64.9	269.8	310.8	372.3	433.8	474.8
43.0	44.3	53.6	60.3	66.1	274.6	316.3	378.8	441.4	483.1
44.0	45.1	54.5	61.4	67.2	279.5	322.0	385.6	449.3	491.8
45.0	45.9	55.5	62.5	68.5	284.6	327.8	392.7	457.5	500.7
46.0	46.8	56.5	63.6	69.7	289.9	333.9	399.9	466.0	510.0
47.0	47.3	57.2	64.4	70.6	293.3	337.8	404.6	471.5	516.0
48.0	47.7	57.7	65.0	71.2	295.9	340.8	408.2	475.6	520.6
49.0	48.2	58.2	65.5	71.8	298.5	343.9	411.9	479.9	525.2
50.0	48.6	58.7	66.1	72.5	301.2	347.0	415.6	484.2	529.9
51.0	49.0	59.3	66.7	73.1	303.9	350.1	419.3	488.6	534.8
52.0	49.5	59.8	67.3	73.8	306.7	353.3	423.2	493.1	539.7
53.0	50.0	60.4	68.0	74.5	309.6	356.6	427.1	497.6	544.7
54.0	50.4	60.9	68.6	75.2	312.5	359.9	431.1	502.3	549.7
55.0	50.9	61.5	69.2	75.9	315.4	363.3	435.2	507.0	554.9
56.0	51.4	62.1	69.9	76.6	318.4	366.8	439.3	511.8	560.2

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	110	110	110	110	110	110	110	110	110
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	51.9	62.7	70.6	77.3	321.5	370.3	443.5	516.8	565.6
58.0	52.4	63.3	71.3	78.1	324.6	373.9	447.8	521.8	571.1
59.0	52.9	63.9	72.0	78.9	327.8	377.5	452.2	526.9	576.7
60.0	53.4	64.6	72.7	79.6	331.0	381.3	456.7	532.1	582.4
61.0	53.9	65.2	73.4	80.4	334.3	385.1	461.3	537.4	588.2
62.0	54.5	65.9	74.1	81.2	337.7	389.0	465.9	542.8	594.1
63.0	55.0	66.5	74.9	82.1	341.1	392.9	470.7	548.4	600.2
64.0	55.6	67.2	75.7	82.9	344.6	397.0	475.5	554.0	606.4
65.0	56.2	67.9	76.4	83.8	348.2	401.1	480.5	559.8	612.7
66.0	56.8	68.6	77.2	84.7	351.9	405.3	485.5	565.7	619.1
67.0	57.4	69.4	78.1	85.6	355.6	409.7	490.7	571.7	625.7
68.0	58.0	70.1	78.9	86.5	359.5	414.1	495.9	577.8	632.4
69.0	58.6	70.9	79.8	87.4	363.4	418.6	501.3	584.1	639.3
70.0	59.1	71.5	80.4	88.2	366.5	422.1	505.6	589.1	644.7
71.0	59.5	71.9	81.0	88.7	368.9	424.9	508.9	593.0	649.0
72.0	59.9	72.4	81.5	89.3	371.3	427.7	512.3	596.9	653.3
73.0	60.3	72.9	82.1	89.9	373.8	430.6	515.7	600.9	657.6
74.0	60.7	73.4	82.6	90.5	376.3	433.4	519.2	604.9	662.1
75.0	61.1	73.9	83.2	91.1	378.8	436.4	522.7	609.0	666.5
76.0	61.5	74.4	83.7	91.8	381.4	439.3	526.2	613.1	671.1
77.0	62.0	74.9	84.3	92.4	384.0	442.3	529.8	617.3	675.7
78.0	62.4	75.4	84.9	93.0	386.7	445.4	533.5	621.6	680.3
79.0	62.8	75.9	85.5	93.7	389.4	448.5	537.2	625.9	685.0
80.0	63.3	76.5	86.1	94.3	392.1	451.6	541.0	630.3	689.8
81.0	63.7	77.0	86.7	95.0	394.8	454.8	544.8	634.7	694.7
82.0	64.2	77.6	87.3	95.7	397.6	458.0	548.6	639.2	699.6
83.0	64.6	78.1	87.9	96.4	400.5	461.3	552.5	643.8	704.6
84.0	65.1	78.7	88.5	97.0	403.4	464.6	556.5	648.4	709.7
85.0	65.6	79.2	89.2	97.7	406.3	468.0	560.6	653.1	714.8
86.0	66.0	79.8	89.8	98.5	409.2	471.4	564.6	657.9	720.0
87.0	66.5	80.4	90.5	99.2	412.3	474.9	568.8	662.7	725.3
88.0	67.0	81.0	91.2	99.9	415.3	478.4	573.0	667.6	730.7
89.0	67.5	81.6	91.8	100.7	418.4	482.0	577.3	672.6	736.2
90.0	68.0	82.2	92.5	101.4	421.6	485.6	581.6	677.7	741.7
91.0	68.5	82.8	93.2	102.2	424.8	489.3	586.0	682.8	747.3
92.0	69.1	83.5	94.0	103.0	428.0	493.0	590.5	688.0	753.0
93.0	69.5	84.0	94.6	103.7	430.9	496.3	594.5	692.6	758.1
94.0	69.9	84.5	95.1	104.2	433.2	499.0	597.7	696.4	762.2
95.0	70.3	84.9	95.6	104.8	435.5	501.7	600.9	700.1	766.3
96.0	70.7	85.4	96.1	105.4	437.9	504.4	604.2	704.0	770.5
97.0	71.1	85.9	96.7	105.9	440.3	507.2	607.5	707.8	774.7
98.0	71.4	86.3	97.2	106.5	442.7	510.0	610.8	711.7	779.0
99.0	71.8	86.8	97.7	107.1	445.2	512.8	614.2	715.7	783.3
100.0	72.2	87.3	98.3	107.7	447.7	515.7	617.6	719.6	787.6

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	120	120	120	120	120	120	120	120	120
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after									
Shutdown	Time To	Time To	Time To	Time To	Time To	Time To	Time To	Time To	Time To
(days)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)
1.0	8.4	10.1	11.4	12.5	51.8	59.6	71.4	83.2	91.1
2.0	10.4	12.5	14.1	15.4	64.1	73.9	88.5	103.1	112.8
3.0	11.7	14.2	16.0	17.5	72.8	83.8	100.4	117.0	128.0
4.0	13.2	15.9	17.9	19.6	81.6	94.0	112.6	131.2	143.6
5.0	14.7	17.7	19.9	21.9	90.8	104.6	125.3	146.0	159.7
6.0	15.8	19.1	21.5	23.6	97.9	112.7	135.0	157.3	172.2
7.0	17.1	20.7	23.3	25.5	105.9	122.0	146.2	170.3	186.4
8.0	18.1	21.8	24.6	26.9	111.9	128.9	154.4	179.9	196.9
9.0	19.1	23.1	26.0	28.5	118.6	136.6	163.6	190.6	208.6
10.0	20.0	24.2	27.3	29.9	124.1	143.0	171.3	199.6	218.4
11.0	20.9	25.3	28.4	31.2	129.5	149.2	178.7	208.2	227.9
12.0	21.7	26.2	29.5	32.4	134.5	155.0	185.6	216.3	236.7
13.0	22.4	27.1	30.5	33.4	138.7	159.8	191.4	223.0	244.0
14.0	23.1	27.9	31.4	34.4	143.1	164.9	197.5	230.1	251.8
15.0	23.9	28.8	32.5	35.6	147.9	170.3	204.0	237.7	260.1
16.0	24.7	29.8	33.6	36.8	152.9	176.1	211.0	245.8	269.0
17.0	25.6	30.9	34.8	38.1	158.3	182.4	218.4	254.5	278.5
18.0	26.2	31.7	35.7	39.1	162.6	187.3	224.3	261.4	286.1
19.0	26.8	32.4	36.5	40.0	166.2	191.5	229.3	267.2	292.4
20.0	27.4	33.2	37.3	40.9	170.0	195.8	234.6	273.3	299.1
21.0	28.1	33.9	38.2	41.9	174.0	200.4	240.0	279.7	306.1
22.0	28.8	34.7	39.1	42.9	178.1	205.2	245.7	286.3	313.4
23.0	29.5	35.6	40.1	43.9	182.5	210.2	251.8	293.3	321.0
24.0	29.9	36.1	40.7	44.6	185.2	213.3	255.5	297.7	325.8
25.0	30.3	36.6	41.2	45.2	187.7	216.2	258.9	301.7	330.2
26.0	30.7	37.1	41.8	45.8	190.2	219.1	262.4	305.8	334.6
27.0	31.1	37.6	42.3	46.4	192.8	222.1	266.0	310.0	339.2
28.0	31.6	38.1	42.9	47.0	195.5	225.2	269.7	314.3	344.0
29.0	32.0	38.7	43.5	47.7	198.3	228.4	273.5	318.7	348.8
30.0	32.5	39.2	44.2	48.4	201.1	231.6	277.5	323.3	353.8
31.0	32.9	39.8	44.8	49.1	204.0	235.0	281.5	328.0	359.0
32.0	33.4	40.4	45.5	49.8	207.0	238.5	285.6	332.8	364.2
33.0	33.9	41.0	46.1	50.6	210.1	242.0	289.9	337.8	369.7
34.0	34.4	41.6	46.8	51.3	213.3	245.7	294.3	342.9	375.3
35.0	35.0	42.3	47.6	52.1	216.6	249.5	298.8	348.2	381.1
36.0	35.5	42.9	48.3	52.9	220.0	253.4	303.5	353.6	387.1
37.0	36.1	43.6	49.1	53.8	223.5	257.4	308.4	359.3	393.2
38.0	36.7	44.3	49.9	54.7	227.1	261.6	313.3	365.1	399.6
39.0	37.3	45.0	50.7	55.6	230.8	265.9	318.5	371.1	406.1
40.0	37.9	45.8	51.5	56.5	234.7	270.3	323.8	377.3	412.9
41.0	38.5	46.6	52.4	57.4	238.7	274.9	329.3	383.7	419.9
42.0	39.2	47.4	53.3	58.4	242.8	279.7	335.0	390.3	427.2
43.0	39.9	48.2	54.3	59.5	247.1	284.6	340.9	397.2	434.7
44.0	40.6	49.1	55.2	60.5	251.5	289.7	347.0	404.3	442.5
45.0	41.3	50.0	56.2	61.6	256.1	295.0	353.3	411.7	450.6
46.0	42.1	50.9	57.3	62.8	260.9	300.5	359.9	419.3	458.9
47.0	42.6	51.5	57.9	63.5	263.9	304.0	364.1	424.2	464.3
48.0	43.0	51.9	58.5	64.1	266.2	306.7	367.3	428.0	468.4
49.0	43.4	52.4	59.0	64.6	268.6	309.4	370.6	431.8	472.6
50.0	43.8	52.9	59.5	65.2	271.0	312.2	373.9	435.7	476.9
51.0	44.2	53.4	60.1	65.8	273.5	315.0	377.3	439.7	481.2
52.0	44.6	53.8	60.6	66.4	276.0	317.9	380.8	443.7	485.6
53.0	45.0	54.3	61.2	67.0	278.6	320.9	384.3	447.8	490.1
54.0	45.4	54.9	61.7	67.7	281.2	323.9	387.9	452.0	494.7
55.0	45.8	55.4	62.3	68.3	283.8	326.9	391.6	456.2	499.3
56.0	46.3	55.9	62.9	69.0	286.5	330.0	395.3	460.6	504.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	120	120	120	120	120	120	120	120	120
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	46.7	56.4	63.5	69.6	289.3	333.2	399.1	465.0	508.9
58.0	47.2	57.0	64.1	70.3	292.1	336.4	403.0	469.5	513.9
59.0	47.6	57.5	64.8	71.0	294.9	339.7	406.9	474.1	518.9
60.0	48.1	58.1	65.4	71.7	297.9	343.1	410.9	478.8	524.0
61.0	48.6	58.7	66.1	72.4	300.8	346.5	415.1	483.6	529.3
62.0	49.1	59.3	66.7	73.1	303.9	350.0	419.2	488.5	534.6
63.0	49.6	59.9	67.4	73.9	307.0	353.6	423.5	493.5	540.1
64.0	50.1	60.5	68.1	74.6	310.1	357.2	427.9	498.5	545.6
65.0	50.6	61.1	68.8	75.4	313.4	361.0	432.3	503.7	551.3
66.0	51.1	61.8	69.5	76.2	316.7	364.7	436.9	509.0	557.1
67.0	51.7	62.4	70.3	77.0	320.0	368.6	441.5	514.4	563.0
68.0	52.2	63.1	71.0	77.8	323.5	372.6	446.3	520.0	569.1
69.0	52.8	63.8	71.8	78.7	327.0	376.6	451.1	525.6	575.3
70.0	53.2	64.3	72.4	79.4	329.8	379.8	455.0	530.1	580.2
71.0	53.6	64.8	72.9	79.9	331.9	382.3	457.9	533.6	584.0
72.0	53.9	65.2	73.4	80.4	334.1	384.9	461.0	537.1	587.8
73.0	54.3	65.6	73.9	80.9	336.4	387.4	464.1	540.7	591.8
74.0	54.7	66.1	74.4	81.5	338.6	390.0	467.2	544.3	595.7
75.0	55.0	66.5	74.9	82.0	340.9	392.7	470.3	548.0	599.8
76.0	55.4	67.0	75.4	82.6	343.2	395.3	473.5	551.7	603.8
77.0	55.8	67.4	75.9	83.2	345.6	398.0	476.8	555.5	608.0
78.0	56.2	67.9	76.4	83.7	347.9	400.8	480.1	559.3	612.2
79.0	56.6	68.4	76.9	84.3	350.4	403.6	483.4	563.2	616.4
80.0	57.0	68.8	77.5	84.9	352.8	406.4	486.8	567.1	620.7
81.0	57.4	69.3	78.0	85.5	355.3	409.3	490.2	571.1	625.1
82.0	57.8	69.8	78.6	86.1	357.8	412.2	493.7	575.2	629.5
83.0	58.2	70.3	79.1	86.7	360.4	415.1	497.2	579.3	634.0
84.0	58.6	70.8	79.7	87.3	363.0	418.1	500.8	583.5	638.6
85.0	59.0	71.3	80.3	88.0	365.6	421.1	504.4	587.7	643.2
86.0	59.5	71.8	80.9	88.6	368.3	424.2	508.1	592.0	647.9
87.0	59.9	72.4	81.5	89.3	371.0	427.3	511.8	596.3	652.7
88.0	60.3	72.9	82.1	89.9	373.7	430.5	515.6	600.8	657.5
89.0	60.8	73.5	82.7	90.6	376.5	433.7	519.5	605.2	662.4
90.0	61.2	74.0	83.3	91.3	379.3	437.0	523.4	609.8	667.4
91.0	61.7	74.6	83.9	92.0	382.2	440.3	527.3	614.4	672.5
92.0	62.2	75.1	84.6	92.7	385.1	443.6	531.4	619.1	677.6
93.0	62.6	75.6	85.1	93.3	387.7	446.6	534.9	623.3	682.1
94.0	62.9	76.0	85.6	93.8	389.8	449.0	537.8	626.6	685.8
95.0	63.3	76.5	86.1	94.3	391.9	451.4	540.7	630.0	689.5
96.0	63.6	76.9	86.5	94.8	394.1	453.9	543.7	633.4	693.3
97.0	64.0	77.3	87.0	95.3	396.2	456.4	546.7	636.9	697.1
98.0	64.3	77.7	87.5	95.9	398.4	458.9	549.7	640.4	700.9
99.0	64.7	78.2	88.0	96.4	400.6	461.4	552.7	644.0	704.8
100.0	65.0	78.6	88.5	96.9	402.8	464.0	555.8	647.6	708.7

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	130	130	130	130	130	130	130	130	130
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	7.4	9.0	10.1	11.1	46.0	53.0	63.5	74.0	81.0
2.0	9.2	11.1	12.5	13.7	57.0	65.7	78.7	91.7	100.3
3.0	10.4	12.6	14.2	15.6	64.7	74.5	89.3	104.0	113.8
4.0	11.7	14.2	15.9	17.5	72.6	83.6	100.1	116.7	127.7
5.0	13.0	15.8	17.7	19.4	80.7	93.0	111.4	129.8	142.0
6.0	14.1	17.0	19.1	20.9	87.0	100.2	120.0	139.9	153.1
7.0	15.2	18.4	20.7	22.7	94.2	108.5	129.9	151.4	165.7
8.0	16.1	19.4	21.9	23.9	99.5	114.6	137.3	159.9	175.0
9.0	17.0	20.6	23.2	25.4	105.4	121.4	145.4	169.4	185.4
10.0	17.8	21.5	24.2	26.6	110.4	127.1	152.3	177.4	194.2
11.0	18.6	22.5	25.3	27.7	115.2	132.6	158.9	185.1	202.6
12.0	19.3	23.3	26.3	28.8	119.6	137.8	165.0	192.3	210.4
13.0	19.9	24.1	27.1	29.7	123.3	142.0	170.1	198.2	216.9
14.0	20.6	24.8	27.9	30.6	127.3	146.6	175.6	204.5	223.9
15.0	21.2	25.7	28.9	31.6	131.5	151.4	181.4	211.3	231.3
16.0	22.0	26.5	29.9	32.7	135.9	156.6	187.6	218.5	239.2
17.0	22.7	27.5	30.9	33.9	140.7	162.1	194.2	226.2	247.6
18.0	23.3	28.2	31.8	34.8	144.6	166.5	199.4	232.4	254.3
19.0	23.9	28.8	32.5	35.6	147.8	170.2	203.9	237.5	260.0
20.0	24.4	29.5	33.2	36.4	151.1	174.1	208.5	242.9	265.9
21.0	25.0	30.2	34.0	37.2	154.7	178.1	213.4	248.6	272.1
22.0	25.6	30.9	34.8	38.1	158.4	182.4	218.5	254.5	278.6
23.0	26.2	31.7	35.6	39.0	162.2	186.9	223.8	260.8	285.4
24.0	26.6	32.1	36.2	39.6	164.6	189.6	227.1	264.7	289.7
25.0	26.9	32.6	36.6	40.2	166.8	192.2	230.2	268.2	293.5
26.0	27.3	33.0	37.1	40.7	169.1	194.8	233.3	271.8	297.5
27.0	27.7	33.5	37.7	41.3	171.4	197.5	236.5	275.6	301.6
28.0	28.1	33.9	38.2	41.8	173.8	200.2	239.8	279.4	305.8
29.0	28.5	34.4	38.7	42.4	176.3	203.0	243.2	283.3	310.1
30.0	28.9	34.9	39.3	43.0	178.8	205.9	246.7	287.4	314.5
31.0	29.3	35.4	39.8	43.7	181.4	208.9	250.2	291.6	319.1
32.0	29.7	35.9	40.4	44.3	184.1	212.0	253.9	295.9	323.8
33.0	30.2	36.5	41.0	45.0	186.8	215.2	257.7	300.3	328.6
34.0	30.6	37.0	41.7	45.6	189.6	218.4	261.6	304.8	333.6
35.0	31.1	37.6	42.3	46.4	192.6	221.8	265.7	309.5	338.8
36.0	31.6	38.2	43.0	47.1	195.6	225.3	269.8	314.4	344.1
37.0	32.1	38.8	43.6	47.8	198.7	228.9	274.1	319.4	349.6
38.0	32.6	39.4	44.3	48.6	201.9	232.6	278.6	324.6	355.2
39.0	33.1	40.1	45.1	49.4	205.2	236.4	283.1	329.9	361.1
40.0	33.7	40.7	45.8	50.2	208.7	240.3	287.9	335.4	367.1
41.0	34.3	41.4	46.6	51.1	212.2	244.4	292.8	341.1	373.3
42.0	34.9	42.1	47.4	52.0	215.9	248.6	297.8	347.0	379.8
43.0	35.5	42.9	48.2	52.9	219.7	253.0	303.1	353.1	386.5
44.0	36.1	43.6	49.1	53.8	223.6	257.6	308.5	359.4	393.4
45.0	36.8	44.4	50.0	54.8	227.7	262.2	314.1	366.0	400.5
46.0	37.5	45.3	50.9	55.8	231.9	267.1	319.9	372.8	408.0
47.0	37.9	45.8	51.5	56.5	234.6	270.3	323.7	377.1	412.8
48.0	38.2	46.2	52.0	57.0	236.7	272.6	326.6	380.5	416.4
49.0	38.6	46.6	52.5	57.5	238.8	275.1	329.5	383.9	420.1
50.0	38.9	47.0	52.9	58.0	241.0	277.6	332.4	387.3	423.9
51.0	39.3	47.5	53.4	58.5	243.1	280.1	335.5	390.8	427.8
52.0	39.6	47.9	53.9	59.1	245.4	282.6	338.5	394.4	431.7
53.0	40.0	48.3	54.4	59.6	247.6	285.3	341.7	398.1	435.7
54.0	40.4	48.8	54.9	60.2	250.0	287.9	344.9	401.8	439.8
55.0	40.8	49.2	55.4	60.7	252.3	290.6	348.1	405.6	443.9
56.0	41.1	49.7	55.9	61.3	254.7	293.4	351.4	409.4	448.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	130	130	130	130	130	130	130	130	130
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	41.5	50.2	56.5	61.9	257.2	296.2	354.8	413.4	452.4
58.0	41.9	50.7	57.0	62.5	259.7	299.1	358.2	417.4	456.8
59.0	42.3	51.2	57.6	63.1	262.2	302.0	361.8	421.5	461.3
60.0	42.8	51.7	58.2	63.7	264.8	305.0	365.3	425.7	465.9
61.0	43.2	52.2	58.7	64.4	267.4	308.1	369.0	429.9	470.5
62.0	43.6	52.7	59.3	65.0	270.1	311.2	372.7	434.2	475.3
63.0	44.1	53.3	59.9	65.7	272.9	314.3	376.5	438.7	480.1
64.0	44.5	53.8	60.6	66.4	275.7	317.6	380.4	443.2	485.1
65.0	45.0	54.4	61.2	67.1	278.6	320.9	384.3	447.8	490.1
66.0	45.5	54.9	61.8	67.8	281.5	324.3	388.4	452.5	495.3
67.0	45.9	55.5	62.5	68.5	284.5	327.7	392.5	457.3	500.5
68.0	46.4	56.1	63.2	69.2	287.6	331.2	396.7	462.2	505.9
69.0	46.9	56.7	63.8	70.0	290.7	334.8	401.0	467.3	511.4
70.0	47.3	57.2	64.4	70.6	293.2	337.7	404.5	471.2	515.8
71.0	47.7	57.6	64.8	71.0	295.1	339.9	407.1	474.3	519.1
72.0	48.0	58.0	65.2	71.5	297.0	342.2	409.8	477.5	522.6
73.0	48.3	58.4	65.7	72.0	299.0	344.4	412.5	480.7	526.1
74.0	48.6	58.7	66.1	72.5	301.0	346.7	415.3	483.9	529.6
75.0	48.9	59.1	66.6	73.0	303.1	349.1	418.1	487.2	533.2
76.0	49.3	59.5	67.0	73.4	305.1	351.5	421.0	490.5	536.8
77.0	49.6	60.0	67.5	74.0	307.2	353.9	423.8	493.8	540.5
78.0	50.0	60.4	67.9	74.5	309.3	356.3	426.8	497.2	544.2
79.0	50.3	60.8	68.4	75.0	311.5	358.8	429.7	500.7	548.0
80.0	50.7	61.2	68.9	75.5	313.7	361.3	432.7	504.2	551.8
81.0	51.0	61.6	69.4	76.0	315.9	363.8	435.8	507.7	555.7
82.0	51.4	62.1	69.9	76.6	318.1	366.4	438.9	511.3	559.6
83.0	51.7	62.5	70.4	77.1	320.4	369.0	442.0	515.0	563.6
84.0	52.1	63.0	70.9	77.7	322.7	371.7	445.2	518.7	567.7
85.0	52.5	63.4	71.4	78.2	325.0	374.4	448.4	522.5	571.8
86.0	52.9	63.9	71.9	78.8	327.4	377.1	451.7	526.3	576.0
87.0	53.3	64.4	72.4	79.4	329.8	379.9	455.0	530.1	580.2
88.0	53.7	64.8	73.0	80.0	332.2	382.7	458.4	534.1	584.5
89.0	54.1	65.3	73.5	80.6	334.7	385.6	461.8	538.0	588.9
90.0	54.5	65.8	74.1	81.2	337.2	388.5	465.3	542.1	593.3
91.0	54.9	66.3	74.6	81.8	339.8	391.4	468.8	546.2	597.8
92.0	55.3	66.8	75.2	82.4	342.4	394.4	472.4	550.4	602.4
93.0	55.7	67.3	75.7	83.0	344.7	397.0	475.6	554.1	606.4
94.0	56.0	67.6	76.1	83.4	346.6	399.2	478.1	557.1	609.7
95.0	56.3	68.0	76.5	83.9	348.4	401.3	480.7	560.1	613.0
96.0	56.6	68.4	76.9	84.3	350.3	403.5	483.3	563.1	616.3
97.0	56.9	68.7	77.4	84.8	352.2	405.7	486.0	566.2	619.7
98.0	57.2	69.1	77.8	85.3	354.2	408.0	488.7	569.3	623.1
99.0	57.5	69.5	78.2	85.7	356.1	410.2	491.4	572.5	626.6
100.0	57.8	69.9	78.7	86.2	358.1	412.5	494.1	575.7	630.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	140	140	140	140	140	140	140	140	140
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	6.5	7.9	8.9	9.7	40.3	46.4	55.6	64.8	70.9
2.0	8.1	9.7	11.0	12.0	49.9	57.5	68.9	80.3	87.8
3.0	9.2	11.1	12.4	13.6	56.6	65.3	78.2	91.1	99.7
4.0	10.3	12.4	14.0	15.3	63.6	73.2	87.7	102.2	111.8
5.0	11.4	13.8	15.5	17.0	70.7	81.4	97.5	113.6	124.3
6.0	12.3	14.9	16.7	18.3	76.2	87.8	105.1	122.5	134.0
7.0	13.3	16.1	18.1	19.9	82.5	95.0	113.8	132.6	145.1
8.0	14.1	17.0	19.1	21.0	87.1	100.3	120.2	140.0	153.3
9.0	14.9	18.0	20.3	22.2	92.3	106.3	127.3	148.4	162.4
10.0	15.6	18.9	21.2	23.3	96.6	111.3	133.3	155.3	170.0
11.0	16.3	19.7	22.2	24.3	100.8	116.1	139.1	162.1	177.4
12.0	16.9	20.4	23.0	25.2	104.7	120.6	144.5	168.3	184.2
13.0	17.4	21.1	23.7	26.0	108.0	124.4	149.0	173.6	190.0
14.0	18.0	21.8	24.5	26.8	111.4	128.3	153.7	179.1	196.0
15.0	18.6	22.5	25.3	27.7	115.1	132.6	158.8	185.0	202.5
16.0	19.2	23.2	26.2	28.7	119.0	137.1	164.2	191.3	209.4
17.0	19.9	24.1	27.1	29.7	123.2	142.0	170.0	198.1	216.8
18.0	20.5	24.7	27.8	30.5	126.6	145.8	174.6	203.5	222.7
19.0	20.9	25.3	28.4	31.2	129.4	149.0	178.5	208.0	227.6
20.0	21.4	25.8	29.1	31.9	132.3	152.4	182.6	212.7	232.8
21.0	21.9	26.4	29.8	32.6	135.4	156.0	186.8	217.7	238.3
22.0	22.4	27.1	30.5	33.4	138.7	159.7	191.3	222.9	243.9
23.0	23.0	27.7	31.2	34.2	142.1	163.6	196.0	228.3	249.9
24.0	23.3	28.1	31.7	34.7	144.2	166.1	198.9	231.7	253.6
25.0	23.6	28.5	32.1	35.2	146.1	168.3	201.6	234.8	257.0
26.0	23.9	28.9	32.5	35.7	148.1	170.6	204.3	238.0	260.5
27.0	24.3	29.3	33.0	36.1	150.1	172.9	207.1	241.3	264.1
28.0	24.6	29.7	33.4	36.6	152.2	175.3	210.0	244.6	267.7
29.0	24.9	30.1	33.9	37.2	154.3	177.8	212.9	248.1	271.5
30.0	25.3	30.6	34.4	37.7	156.6	180.3	216.0	251.6	275.4
31.0	25.7	31.0	34.9	38.2	158.8	182.9	219.1	255.3	279.4
32.0	26.0	31.5	35.4	38.8	161.2	185.6	222.3	259.1	283.5
33.0	26.4	31.9	35.9	39.4	163.6	188.4	225.7	262.9	287.8
34.0	26.8	32.4	36.5	40.0	166.1	191.3	229.1	266.9	292.1
35.0	27.2	32.9	37.0	40.6	168.6	194.2	232.6	271.0	296.6
36.0	27.7	33.4	37.6	41.2	171.3	197.3	236.3	275.3	301.3
37.0	28.1	34.0	38.2	41.9	174.0	200.4	240.0	279.7	306.1
38.0	28.6	34.5	38.8	42.6	176.8	203.6	243.9	284.2	311.0
39.0	29.0	35.1	39.5	43.3	179.7	207.0	247.9	288.9	316.1
40.0	29.5	35.7	40.1	44.0	182.7	210.5	252.1	293.7	321.4
41.0	30.0	36.3	40.8	44.7	185.8	214.0	256.3	298.7	326.9
42.0	30.5	36.9	41.5	45.5	189.0	217.7	260.8	303.8	332.5
43.0	31.1	37.6	42.3	46.3	192.3	221.6	265.4	309.2	338.4
44.0	31.6	38.2	43.0	47.1	195.8	225.5	270.1	314.7	344.4
45.0	32.2	38.9	43.8	48.0	199.4	229.6	275.0	320.5	350.7
46.0	32.8	39.6	44.6	48.9	203.1	233.9	280.1	326.4	357.2
47.0	33.2	40.1	45.1	49.5	205.4	236.6	283.4	330.2	361.4
48.0	33.5	40.5	45.5	49.9	207.3	238.7	285.9	333.2	364.6
49.0	33.8	40.8	45.9	50.4	209.1	240.9	288.5	336.1	367.9
50.0	34.1	41.2	46.4	50.8	211.0	243.0	291.1	339.2	371.2
51.0	34.4	41.6	46.8	51.3	212.9	245.2	293.7	342.2	374.6
52.0	34.7	41.9	47.2	51.7	214.9	247.5	296.4	345.4	378.0
53.0	35.0	42.3	47.6	52.2	216.9	249.8	299.2	348.6	381.5
54.0	35.4	42.7	48.1	52.7	218.9	252.1	302.0	351.8	385.1
55.0	35.7	43.1	48.5	53.2	220.9	254.5	304.8	355.1	388.7
56.0	36.0	43.5	49.0	53.7	223.0	256.9	307.7	358.5	392.4

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	140	140	140	140	140	140	140	140	140
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	36.4	44.0	49.5	54.2	225.2	259.4	310.7	362.0	396.2
58.0	36.7	44.4	50.0	54.7	227.4	261.9	313.7	365.5	400.0
59.0	37.1	44.8	50.4	55.3	229.6	264.5	316.8	369.1	403.9
60.0	37.5	45.3	50.9	55.8	231.9	267.1	319.9	372.7	407.9
61.0	37.8	45.7	51.5	56.4	234.2	269.8	323.1	376.4	412.0
62.0	38.2	46.2	52.0	57.0	236.6	272.5	326.4	380.2	416.2
63.0	38.6	46.7	52.5	57.5	239.0	275.3	329.7	384.1	420.4
64.0	39.0	47.1	53.0	58.1	241.4	278.1	333.1	388.1	424.7
65.0	39.4	47.6	53.6	58.7	243.9	281.0	336.5	392.1	429.1
66.0	39.8	48.1	54.2	59.4	246.5	283.9	340.1	396.2	433.7
67.0	40.3	48.6	54.7	60.0	249.1	287.0	343.7	400.4	438.3
68.0	40.7	49.2	55.3	60.6	251.8	290.0	347.4	404.7	443.0
69.0	41.1	49.7	55.9	61.3	254.5	293.2	351.2	409.1	447.8
70.0	41.5	50.1	56.4	61.8	256.7	295.7	354.2	412.6	451.6
71.0	41.8	50.4	56.8	62.2	258.4	297.6	356.5	415.3	454.6
72.0	42.0	50.8	57.1	62.6	260.1	299.6	358.8	418.1	457.6
73.0	42.3	51.1	57.5	63.0	261.8	301.6	361.2	420.9	460.6
74.0	42.6	51.5	57.9	63.5	263.6	303.6	363.7	423.7	463.7
75.0	42.9	51.8	58.3	63.9	265.4	305.7	366.1	426.6	466.9
76.0	43.2	52.2	58.7	64.3	267.2	307.8	368.6	429.5	470.0
77.0	43.5	52.5	59.1	64.8	269.0	309.9	371.1	432.4	473.3
78.0	43.8	52.9	59.5	65.2	270.9	312.0	373.7	435.4	476.5
79.0	44.1	53.2	59.9	65.7	272.7	314.2	376.3	438.4	479.8
80.0	44.4	53.6	60.3	66.1	274.7	316.4	378.9	441.5	483.2
81.0	44.7	54.0	60.8	66.6	276.6	318.6	381.6	444.6	486.6
82.0	45.0	54.4	61.2	67.1	278.6	320.8	384.3	447.7	490.0
83.0	45.3	54.8	61.6	67.5	280.5	323.1	387.0	450.9	493.5
84.0	45.7	55.2	62.1	68.0	282.6	325.5	389.8	454.2	497.1
85.0	46.0	55.6	62.5	68.5	284.6	327.8	392.6	457.5	500.7
86.0	46.3	56.0	63.0	69.0	286.7	330.2	395.5	460.8	504.3
87.0	46.7	56.4	63.5	69.5	288.8	332.6	398.4	464.2	508.0
88.0	47.0	56.8	63.9	70.1	290.9	335.1	401.4	467.6	511.8
89.0	47.4	57.2	64.4	70.6	293.1	337.6	404.4	471.1	515.6
90.0	47.7	57.7	64.9	71.1	295.3	340.1	407.4	474.7	519.5
91.0	48.1	58.1	65.4	71.6	297.5	342.7	410.5	478.3	523.4
92.0	48.4	58.5	65.9	72.2	299.8	345.3	413.6	481.9	527.4
93.0	48.8	58.9	66.3	72.7	301.8	347.7	416.4	485.2	531.0
94.0	49.0	59.2	66.7	73.1	303.5	349.5	418.7	487.8	533.9
95.0	49.3	59.6	67.0	73.5	305.1	351.4	420.9	490.4	536.7
96.0	49.6	59.9	67.4	73.9	306.8	353.3	423.2	493.1	539.7
97.0	49.8	60.2	67.8	74.3	308.4	355.3	425.5	495.8	542.6
98.0	50.1	60.5	68.1	74.7	310.1	357.2	427.9	498.5	545.6
99.0	50.4	60.9	68.5	75.1	311.9	359.2	430.2	501.3	548.6
100.0	50.7	61.2	68.9	75.5	313.6	361.2	432.6	504.1	551.7

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	110	**110**	110	110	110	110	110	110	110
Level	Mid-Loop	**Top-HL**	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	9.3	11.2	12.6	13.8	57.5	66.3	79.4	92.5	101.2
2.0	11.5	13.9	15.6	17.1	71.3	82.1	98.3	114.6	125.4
3.0	13.0	15.8	17.8	19.5	80.9	93.1	111.6	130.0	142.3
4.0	14.6	17.7	19.9	21.8	90.7	104.5	125.2	145.8	159.6
5.0	16.3	19.7	22.1	24.3	100.9	116.2	139.2	162.2	177.5
6.0	17.6	21.2	23.9	26.2	108.8	125.3	150.1	174.8	191.3
7.0	19.0	23.0	25.8	28.3	117.7	135.6	162.4	189.3	207.1
8.0	20.1	24.3	27.3	29.9	124.4	143.2	171.6	199.9	218.8
9.0	21.3	25.7	28.9	31.7	131.8	151.8	181.8	211.8	231.8
10.0	22.3	26.9	30.3	33.2	138.0	158.9	190.3	221.8	242.7
11.0	23.2	28.1	31.6	34.6	143.9	165.8	198.6	231.4	253.3
12.0	24.1	29.2	32.8	36.0	149.5	172.2	206.3	240.3	263.0
13.0	24.9	30.1	33.8	37.1	154.1	177.5	212.7	247.8	271.2
14.0	25.7	31.0	34.9	38.3	159.1	183.2	219.5	255.7	279.9
15.0	26.5	32.0	36.1	39.5	164.3	189.3	226.7	264.1	289.1
16.0	27.4	33.1	37.3	40.9	169.9	195.7	234.5	273.2	299.0
17.0	28.4	**34.3**	38.6	42.3	175.9	202.7	242.7	282.8	309.5
18.0	29.2	35.2	39.7	43.5	180.7	208.1	249.3	290.5	317.9
19.0	29.8	36.0	40.5	44.4	184.7	212.8	254.9	296.9	325.0
20.0	30.5	36.8	41.5	45.5	188.9	217.6	260.7	303.7	332.4
21.0	31.2	37.7	42.4	46.5	193.3	222.7	266.7	310.8	340.1
22.0	31.9	38.6	43.5	47.6	197.9	228.0	273.1	318.2	348.3
23.0	32.7	39.5	44.5	48.8	202.8	233.6	279.8	326.0	356.8
24.0	33.2	40.1	45.2	49.5	205.8	237.1	284.0	330.8	362.1
25.0	33.7	40.7	45.8	50.2	208.6	240.2	287.7	335.3	366.9
26.0	34.1	41.2	46.4	50.9	211.4	243.5	291.6	339.8	371.9
27.0	34.6	41.8	47.0	51.6	214.3	246.8	295.6	344.5	377.0
28.0	35.1	42.4	47.7	52.3	217.3	250.3	299.8	349.3	382.3
29.0	35.6	43.0	48.4	53.0	220.3	253.8	304.0	354.2	387.7
30.0	36.1	43.6	49.1	53.8	223.5	257.4	308.3	359.3	393.2
31.0	36.6	44.2	49.8	54.5	226.7	261.2	312.8	364.5	398.9
32.0	37.1	44.9	50.5	55.4	230.1	265.0	317.4	369.8	404.8
33.0	37.7	45.5	51.3	56.2	233.5	269.0	322.2	375.4	410.8
34.0	38.3	46.2	52.0	57.0	237.1	273.1	327.1	381.1	417.1
35.0	38.8	46.9	52.8	57.9	240.7	277.3	332.1	387.0	423.5
36.0	39.5	47.7	53.7	58.8	244.5	281.6	337.3	393.0	430.1
37.0	40.1	48.4	54.5	59.8	248.4	286.1	342.7	399.3	437.0
38.0	40.7	49.2	55.4	60.7	252.4	290.7	348.2	405.7	444.1
39.0	41.4	50.0	56.3	61.7	256.5	295.5	353.9	412.4	451.4
40.0	42.1	50.9	57.3	62.8	260.8	300.4	359.9	419.3	458.9
41.0	42.8	51.7	58.2	63.8	265.3	305.5	366.0	426.4	466.7
42.0	43.5	52.6	59.2	64.9	269.8	310.8	372.3	433.8	474.8
43.0	44.3	53.6	60.3	66.1	274.6	316.3	378.8	441.4	483.1
44.0	45.1	54.5	61.4	67.2	279.5	322.0	385.6	449.3	491.8
45.0	45.9	55.5	62.5	68.5	284.6	327.8	392.7	457.5	500.7
46.0	46.8	56.5	63.6	69.7	289.9	333.9	399.9	466.0	510.0
47.0	47.3	57.2	64.4	70.6	293.3	337.8	404.6	471.5	516.0
48.0	47.7	57.7	65.0	71.2	295.9	340.8	408.2	475.6	520.6
49.0	48.2	58.2	65.5	71.8	298.5	343.9	411.9	479.9	525.2
50.0	48.6	58.7	66.1	72.5	301.2	347.0	415.6	484.2	529.9
51.0	49.0	59.3	66.7	73.1	303.9	350.1	419.3	488.6	534.8
52.0	49.5	59.8	67.3	73.8	306.7	353.3	423.2	493.1	539.7
53.0	50.0	60.4	68.0	74.5	309.6	356.6	427.1	497.6	544.7
54.0	50.4	60.9	68.6	75.2	312.5	359.9	431.1	502.3	549.7
55.0	50.9	61.5	69.2	75.9	315.4	363.3	435.2	507.0	554.9
56.0	51.4	62.1	69.9	76.6	318.4	366.8	439.3	511.8	560.2

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CONTINUOUS USE

E SUBSEQUENT OPERATOR ACTIONS

E_0 GENERAL

PLACEKEEPER
START DONE

1. At SM/CRS discretion, sound the Station Alarm and announce the following twice: ☐ ☐

   "ATTENTION STATION PERSONNEL, ATTENTION STATION PERSONNEL, A SHUTDOWN COOLING MALFUNCTION HAS OCCURRED. ALL UNNECESSARY PERSONNEL EVACUATE CONTAINMENT."

2. Advise the Shift Manager to refer to EP-001-001, RECOGNITION AND CLASSIFICATION OF EMERGENCY CONDITIONS. ☐ ☐

CAUTION

ATTACHMENT 1: CONTAINMENT CLOSURE CHECKLIST, SPECIFIES ACTIONS THAT MAY HAVE TO BE PERFORMED BEFORE THE CALCULATED RCS TIME TO BOIL, WITHIN 30 MINUTES, 1.0 HR, 1.5 HRS, OR 4 HRS. **[SOER 09-01 Recommendation #11]**

3. If in Mode 5, 6 or defueled, then complete Attachment 1: Containment Closure Checklist, within the required time constraints listed on Attachment 1: Containment Closure Checklist. ☐ ☐

4. IF EITHER of the following occurs, THEN verify ALL available Containment Fan Coolers running: ☐ ☐

   - Core Exit Thermocouples >195°F

   OR

   - IF CETs NOT available AND RCS temperature >195°F as determined by Attachment 2: Calculated RCS Time to Boil.

E0 GENERAL (Cont'd)

PLACEKEEPER
START DONE

5. IF RCS temperature is approaching 140° F AND Shutdown Cooling Purification Letdown Heat Exchanger Bypass Valve SI-424 is open, THEN at SM/CRS discretion perform one or both of the following as necessary to avoid damaging CVC ion exchanger resin: ☐ ☐

- Perform OP-009-005 section 6.15 Securing Alternate Shutdown Cooling Purification.
- Place Ion Exchanger Bypass, CVC-140, to BYPASS

6. IF Plant is in Mode 4, THEN go to Subprocedure E_4. System Malfunction in Mode 4. ☐ ☐

CAUTION

LEVEL INSTRUMENTATION MAY BE INACCURATE WHEN BULK BOILING EXISTS IN RCS DUE TO HIGH STEAM VELOCITY IN THE SURGE LINE.

7. IF in lowered inventory condition, THEN refer to Attachment 3: Estimated Times for Core Uncovery During lowered Inventory. ☐ ☐

8. IF Refueling Level Indicating System (RLIS) is in service, THEN locally close the following RLIS isolation valves: ☐ ☐
   - REFLG WTR LO LVL STA ISOL VLV (RC 1054)
   - PRESSURIZER VENT VLV (RC 318).

9. IF RCS inventory is unexpectedly dropping, THEN go to Subprocedure E_1. System Leakage. ☐

11. IF Component Cooling Water is lost to operating Shutdown Cooling Train, THEN go to Subprocedure E_3. Loss of Shutdown Cooling Heat Removal Capability. ☐

E0 GENERAL (Cont'd)

PLACEKEEPER
START DONE

12. IF RCS level is stable ≥13.46 feet AND ANY of the following occur, THEN go to Subprocedure E_2. Loss of Shutdown Cooling Flow: ☐

- Operating LPSI Pump trips
- Closure of any Shutdown Cooling Suction Isolation valve on operating LPSI Pump
- Cavitation/Air binding of LPSI Pump as indicated by ANY of the following:
  - Dropping OR erratic ammeter indication
  - Dropping OR erratic Shutdown Cooling flow
  - Steady low flow AND amperage less than expected for system configuration
  - Local observation

E2. Loss of Shutdown Cooling Flow

CAUTION

DO NOT START LPSI PUMP UNLESS PROPERLY VENTED.

PLACEKEEPER
START DONE

1. IF ANY Shutdown Cooling Loop Suction Isolation valves close on the operating Shutdown Cooling train, THEN perform the following: ☐ ☐

   1.1 Stop affected LPSI Pump. ☐

   1.2 Start standby Shutdown Cooling Train in accordance with OP-009-005, SHUTDOWN COOLING SYSTEM. ☐

2. IF ONE LPSI Pump was operating AND tripped, THEN place standby Shutdown Cooling Train in service in accordance with OP-009-005, SHUTDOWN COOLING SYSTEM. ☐ ☐

3. IF BOTH LPSI Pumps are operating AND ONE trips, THEN control RCS temperature using in service Shutdown Cooling Train. ☐ ☐

4. Locally vent LPSI Pump suction piping until all air is removed. ☐ ☐

5. IF the loss of Shutdown Cooling flow is the result of a loss of electric power, THEN implement one of the following concurrently with this procedure: ☐ ☐
   - OP-901-310, LOSS OF 4160 VOLT SAFETY BUS A
   - OP-901-311, LOSS OF 4160 VOLT SAFETY BUS B
   - OP-902-005, STATION BLACKOUT RECOVERY

6. IF ANY of the following LPSI Pump cavitation/Air binding indications occur, THEN stop affected LPSI Pump: ☐ ☐
   - Dropping OR erratic ammeter indication
   - Dropping OR erratic Shutdown Cooling flow
   - Steady low flow AND amperage less than expected for system configuration
   - Local observation

E2. LOSS OF SHUTDOWN COOLING FLOW (CONT'D)

CAUTION

(1) IF RCS IS OPEN FOR MAINTENANCE, THEN FILLING MAY RESULT IN DISCHARGE FROM OPENING. THIS COULD ENDANGER PERSONNEL IN OR AROUND OPENINGS. CLOSED RCS IMPLIES NO MAJOR OPENINGS THAT WOULD PREVENT FILLING RCS HOT LEG. RCS IS CONSIDERED CLOSED WITH RCP SEAL REMOVED.

(2) IF STEAM VOIDS ARE PRESENT IN THE RCS OR SDC PIPING, THEN MAKEUP SHOULD BE PERFORMED SLOWLY TO MINIMIZE WATER HAMMER CONCERNS.

	PLACEKEEPER START	PLACEKEEPER DONE
7. IF RCS makeup is required, THEN perform the following:	☐	☐
7.1 For Shutdown Cooling Train A:		
a. Start B Train HPSI Pump.	☐	☐
b. Close HPSI HEADER ORIFICE BYPASS valve (SI 219B).	☐	☐
c. Open HOT LEG 2 INJECTION ISOLATION valve (SI 502B).	☐	☐
d. Throttle the following valves as necessary to restore inventory: • HPSI COLD LEG INJECTION 1A (SI 225B) • HPSI COLD LEG INJECTION 1B (SI 226B) • HPSI COLD LEG INJECTION 2A (SI 227B) • HPSI COLD LEG INJECTION 2B (SI 228B) • HOT LEG 2 INJ FLOW CONTROL (SI 506B)	☐	☐
OR		
7.2 For Shutdown Cooling Train B:	☐	☐
a. Start A Train HPSI Pump.		☐
b. Close HPSI HEADER ORIFICE BYPASS valve (SI 219A).		☐

E_2. LOSS OF SHUTDOWN COOLING FLOW (CONT'D)

PLACEKEEPER
START DONE

c. Open HOT LEG 1 INJECTION ISOLATION valve (SI 502A). ☐

d. Throttle the following valves as necessary to restore inventory: ☐
- HPSI COLD LEG INJECTION 1A (SI 225A)
- HPSI COLD LEG INJECTION 1B (SI 226A)
- HPSI COLD LEG INJECTION 2A (SI 227A)
- HPSI COLD LEG INJECTION 2B (SI 228A)
- HOT LEG 1 INJ FLOW CONTROL (SI 506A)

8. Restore AND maintain RCS level $\geq$15.13 feet, top of RCS Hot Leg. ☐ ☐

9. IF EITHER of the following can NOT be maintained, THEN go to Subprocedure E_1. System Leakage. ☐ ☐

   - RCS temperature <190°F AND RCS level $\geq$13.46 feet, RCS Hot Leg Centerline

   OR

   - RCS level $\geq$15.13 feet, top of Hot Leg.

10. Monitor RCS Hot Leg for saturation conditions AND determine RCS heatup rate using EITHER: ☐ ☐

    - CETs

    OR

    - IF CETs NOT available, THEN refer to Attachment 2: Calculated RCS Time to Boil.

11. Restore Shutdown Cooling as follows: ☐ ☐

    11.1 IF LPSI Pump to be started was secured due to cavitation, THEN locally vent LPSI Pump suction piping. ☐

    11.2 Place intact Shutdown Cooling Train in service in accordance with OP-009-005, SHUTDOWN COOLING SYSTEM. ☐

    11.3 Locally continue to vent LPSI Pump suction piping until all air is removed. ☐

E2. LOSS OF SHUTDOWN COOLING FLOW (CONT'D)

NOTE

If RCS is open and no Steam Generator is available, then RCS cooling is provided by steaming out of opening and makeup water from HPSI or LPSI Pumps.

	PLACEKEEPER START	DONE
12. IF EITHER Steam Generator is available AND Shutdown Cooling flow can NOT be restored, THEN perform the following:	☐	☐
12.1 Provide a feed path for ONE OR BOTH available Steam Generators using EITHER Condensate Pumps, Auxiliary Feedwater Pumps, OR Emergency Feedwater Pumps.		☐
12.2 Provide a steaming path for ONE OR BOTH available Steam Generators using EITHER Atmospheric Dump valve OR Steam Bypass Control System.		
12.3 IF steaming is not possible, THEN feed AND bleed ONE OR BOTH Steam Generators using EITHER of the following:		☐

- Condensate Pump with Blowdown System in accordance with OP-003-003, CONDENSATE, AND OP-003-010, STEAM GENERATOR BLOWDOWN

OR

- Auxiliary Feedwater with Blowdown System in accordance with OP-003-035, AUXILIARY FEEDWATER, AND OP-003-010, STEAM GENERATOR BLOWDOWN

OR

- Emergency Feedwater with Blowdown System in accordance with OP-009-003, EMERGENCY FEEDWATER, AND OP-003-010, STEAM GENERATOR BLOWDOWN.

	START	DONE
13. WHEN Shutdown Cooling flow is restored, THEN secure operating HPSI Pump(s) as follows:	☐	☐
13.1 With Shutdown Cooling Train A in service:		
a. Stop B Train HPSI Pump.	☐	☐

E2. LOSS OF SHUTDOWN COOLING FLOW (CONT'D)

PLACEKEEPER
START DONE

b. Close the following valves: ☐
- HPSI COLD LEG INJECTION 1A (SI 225B)
- HPSI COLD LEG INJECTION 1B (SI 226B)
- HPSI COLD LEG INJECTION 2A (SI 227B)
- HPSI COLD LEG INJECTION 2B (SI 228B)
- HOT LEG 2 INJECTION ISOLATION (SI 502B)
- HOT LEG 2 INJ FLOW CONTROL (SI 506B)

c. Open HPSI HEADER ORIFICE BYPASS valve (SI 219B). ☐

d. Open the following valves: ☐
- SI PUMPS TRAIN B UPSTREAM (SI 120B)
- SI PUMPS TRAIN B DOWNSTREAM (SI 121B)

OR

13.2 With Shutdown Cooling Train B in service: ☐ ☐

a. Stop A Train HPSI Pump. ☐

b. Close the following valves: ☐
- HPSI COLD LEG INJECTION 1A (SI 225A)
- HPSI COLD LEG INJECTION 1B (SI 226A)
- HPSI COLD LEG INJECTION 2A (SI 227A)
- HPSI COLD LEG INJECTION 2B (SI 228A)
- HOT LEG 1 INJECTION ISOLATION (SI 502A)
- HOT LEG 1 INJ FLOW CONTROL (SI 506A)

c. Open HPSI HEADER ORIFICE BYPASS valve (SI 219A). ☐

d. Open the following valves: ☐
- SI PUMPS TRAIN A UPSTREAM (SI 120A)
- SI PUMPS TRAIN A DOWNSTREAM (SI 121A)

14. Align Containment Cooling Fans in accordance with OP-008-003, CONTAINMENT COOLING SYSTEM. ☐ ☐

END

ATTACHMENT 1: CONTAINMENT CLOSURE CHECKLIST

COMPONENT / ITEM	VERIFY	INITIAL	DATE/TIME
Equipment Hatch	Closed before the calculated RCS time to boil and within the time limit specified in OP-010-006 **[SOER 09-01 Recommendation #11]**		
Escape Air Lock	Closed before the calculated RCS time to boil and within the time limit specified in OP-010-006 **[SOER 09-01 Recommendation #11]**		
Personnel Air Lock	Closed before the calculated RCS time to boil and within the time limit specified in OP-010-006 **[SOER 09-01 Recommendation #11]**		
Containment Closure Impairment Log	Closed before the calculated RCS time to boil and within the time limit specified in OP-010-006 **[SOER 09-01 Recommendation #11]**		
RCS Perturbation Log (OP-001-003)	Reviewed		

Attachment 1: Containment Closure Checklist (Continued)

Remarks: ____

Completed by: ______________________
Signature Date / Time

SM/CRS Review: ______________________
Signature Date / Time

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL

Tem(F)	90	90	90	90	90	90	90	90	90
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	11.1	13.5	15.2	16.6	69.1	79.6	95.3	111.1	121.6
2.0	13.8	16.7	18.8	20.6	85.6	98.6	118.1	137.6	150.6
3.0	15.7	18.9	21.3	23.4	97.1	111.9	134.0	156.1	170.9
4.0	17.6	21.2	23.9	26.2	108.9	125.5	150.3	175.1	191.7
5.0	19.5	23.6	26.6	29.1	121.2	139.6	167.2	194.8	213.2
6.0	21.1	25.5	28.7	31.4	130.6	150.4	180.2	210.0	229.8
7.0	22.8	27.6	31.0	34.0	141.4	162.9	195.1	227.3	248.8
8.0	24.1	29.1	32.8	35.9	149.3	172.0	206.0	240.1	262.7
9.0	25.5	30.8	34.7	38.1	158.2	182.3	218.3	254.4	278.4
10.0	26.7	32.3	36.3	39.8	165.7	190.8	228.6	266.3	291.5
11.0	27.9	33.7	37.9	41.6	172.8	199.1	238.5	277.9	304.1
12.0	29.0	35.0	39.4	43.2	179.5	206.8	247.7	288.6	315.9
13.0	29.8	36.1	40.6	44.5	185.1	213.2	255.4	297.6	325.7
14.0	30.8	37.2	41.9	45.9	191.0	220.0	263.5	307.1	336.1
15.0	31.8	38.5	43.3	47.5	197.3	227.3	272.2	317.2	347.2
16.0	32.9	39.8	44.8	49.1	204.1	235.1	281.5	328.0	359.0
17.0	34.1	41.2	46.4	50.8	211.3	243.4	291.5	339.6	371.7
18.0	35.0	42.3	47.6	52.2	217.0	249.9	299.4	348.8	381.8
19.0	35.8	43.2	48.7	53.3	221.8	255.5	306.0	356.6	390.3
20.0	36.6	44.2	49.8	54.6	226.9	261.3	313.0	364.7	399.2
21.0	37.4	45.3	50.9	55.8	232.2	267.4	320.3	373.2	408.5
22.0	38.3	46.3	52.2	57.2	237.7	273.8	328.0	382.1	418.2
23.0	39.3	47.5	53.4	58.6	243.5	280.5	336.0	391.5	428.5
24.0	39.9	48.2	54.2	59.4	247.1	284.7	341.0	397.3	434.8
25.0	40.4	48.8	55.0	60.2	250.4	288.5	345.5	402.6	440.7
26.0	40.9	49.5	55.7	61.0	253.8	292.4	350.2	408.1	446.6
27.0	41.5	50.2	56.5	61.9	257.3	296.4	355.0	413.7	452.7
28.0	42.1	50.9	57.2	62.7	260.9	300.5	360.0	419.4	459.0
29.0	42.7	51.6	58.1	63.6	264.6	304.8	365.1	425.3	465.5
30.0	43.3	52.3	58.9	64.5	268.4	309.1	370.3	431.4	472.2
31.0	43.9	53.1	59.7	65.5	272.3	313.6	375.7	437.7	479.0
32.0	44.6	53.9	60.6	66.4	276.3	318.2	381.2	444.1	486.1
33.0	45.2	54.7	61.5	67.4	280.4	323.0	386.9	450.8	493.4
34.0	45.9	55.5	62.5	68.5	284.7	327.9	392.8	457.6	500.9
35.0	46.6	56.3	63.4	69.5	289.1	333.0	398.8	464.7	508.6
36.0	47.3	57.2	64.4	70.6	293.6	338.2	405.1	472.0	516.6
37.0	48.1	58.1	65.4	71.7	298.3	343.6	411.5	479.5	524.8
38.0	48.9	59.1	66.5	72.9	303.1	349.1	418.2	487.2	533.3
39.0	49.7	60.0	67.6	74.1	308.1	354.8	425.0	495.2	542.0
40.0	50.5	61.1	68.7	75.3	313.2	360.8	432.1	503.5	551.1
41.0	51.4	62.1	69.9	76.6	318.5	366.9	439.5	512.1	560.4
42.0	52.3	63.2	71.1	77.9	324.0	373.2	447.1	520.9	570.1
43.0	53.2	64.3	72.3	79.3	329.7	379.8	454.9	530.1	580.2
44.0	54.1	65.4	73.6	80.7	335.6	386.6	463.1	539.6	590.5
45.0	55.1	66.6	75.0	82.2	341.8	393.7	471.5	549.4	601.3
46.0	56.1	67.9	76.4	83.7	348.1	401.0	480.3	559.6	612.5
47.0	56.8	68.6	77.3	84.7	352.2	405.7	485.9	566.2	619.7
48.0	57.3	69.3	78.0	85.4	355.3	409.3	490.2	571.2	625.1
49.0	57.8	69.9	78.7	86.2	358.5	412.9	494.6	576.3	630.7
50.0	58.3	70.5	79.4	87.0	361.7	416.6	499.0	581.5	636.4
51.0	58.9	71.1	80.1	87.8	365.0	420.4	503.6	586.7	642.2
52.0	59.4	71.8	80.8	88.6	368.3	424.3	508.2	592.1	648.1
53.0	59.9	72.5	81.6	89.4	371.7	428.2	512.9	597.6	654.1
54.0	60.5	73.1	82.3	90.2	375.2	432.2	517.7	603.2	660.2

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	90	90	90	90	90	90	90	90	90
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
55.0	61.1	73.8	83.1	91.1	378.7	436.3	522.6	608.9	666.4
56.0	61.7	74.5	83.9	92.0	382.3	440.4	527.5	614.7	672.7
57.0	62.3	75.2	84.7	92.8	386.0	444.7	532.6	620.6	679.2
58.0	62.9	76.0	85.5	93.7	389.8	449.0	537.8	626.6	685.8
59.0	63.5	76.7	86.4	94.7	393.6	453.4	543.1	632.7	692.5
60.0	64.1	77.5	87.2	95.6	397.5	457.9	548.4	639.0	699.4
61.0	64.7	78.3	88.1	96.5	401.5	462.4	553.9	645.4	706.4
62.0	65.4	79.0	89.0	97.5	405.5	467.1	559.5	651.9	713.5
63.0	66.1	79.8	89.9	98.5	409.6	471.9	565.2	658.5	720.8
64.0	66.7	80.7	90.8	99.5	413.9	476.7	571.0	665.3	728.2
65.0	67.4	81.5	91.8	100.6	418.2	481.7	577.0	672.3	735.8
66.0	68.1	82.4	92.7	101.6	422.6	486.8	583.0	679.3	743.5
67.0	68.9	83.2	93.7	102.7	427.1	491.9	589.2	686.5	751.4
68.0	69.6	84.1	94.7	103.8	431.7	497.2	595.6	693.9	759.5
69.0	70.4	85.1	95.7	104.9	436.3	502.6	602.0	701.5	767.7
70.0	71.0	85.8	96.6	105.8	440.0	506.9	607.2	707.4	774.3
71.0	71.4	86.3	97.2	106.5	442.9	510.2	611.2	712.1	779.4
72.0	71.9	86.9	97.8	107.2	445.9	513.6	615.2	716.8	784.5
73.0	72.4	87.5	98.5	107.9	448.8	517.0	619.3	721.6	789.8
74.0	72.9	88.1	99.1	108.7	451.9	520.5	623.5	726.4	795.1
75.0	73.4	88.7	99.8	109.4	454.9	524.0	627.7	731.3	800.4
76.0	73.9	89.3	100.5	110.1	458.0	527.6	631.9	736.3	805.9
77.0	74.4	89.9	101.2	110.9	461.1	531.2	636.3	741.3	811.4
78.0	74.9	90.5	101.9	111.7	464.3	534.9	640.7	746.5	817.0
79.0	75.4	91.1	102.6	112.4	467.6	538.6	645.1	751.6	822.7
80.0	75.9	91.8	103.3	113.2	470.8	542.3	649.6	756.9	828.4
81.0	76.5	92.4	104.0	114.0	474.1	546.2	654.2	762.2	834.2
82.0	77.0	93.1	104.8	114.8	477.5	550.0	658.8	767.6	840.2
83.0	77.6	93.7	105.5	115.7	480.9	554.0	663.5	773.1	846.2
84.0	78.1	94.4	106.3	116.5	484.4	557.9	668.3	778.7	852.2
85.0	78.7	95.1	107.0	117.3	487.9	562.0	673.2	784.3	858.4
86.0	79.3	95.8	107.8	118.2	491.4	566.1	678.1	790.0	864.7
87.0	79.8	96.5	108.6	119.1	495.1	570.3	683.0	795.8	871.0
88.0	80.4	97.2	109.4	119.9	498.7	574.5	688.1	801.7	877.5
89.0	81.0	97.9	110.2	120.8	502.4	578.8	693.2	807.7	884.0
90.0	81.6	98.7	111.1	121.7	506.2	583.1	698.5	813.8	890.7
91.0	82.3	99.4	111.9	122.7	510.1	587.5	703.7	820.0	897.4
92.0	82.9	100.2	112.8	123.6	513.9	592.0	709.1	826.2	904.3
93.0	83.4	100.9	113.5	124.4	517.4	596.0	713.9	831.8	910.4
94.0	83.9	101.4	114.1	125.1	520.2	599.2	717.7	836.3	915.3
95.0	84.3	101.9	114.8	125.8	523.0	602.5	721.6	840.8	920.2
96.0	84.8	102.5	115.4	126.5	525.9	605.7	725.6	845.4	925.3
97.0	85.3	103.1	116.0	127.2	528.7	609.1	729.5	850.0	930.3
98.0	85.7	103.6	116.7	127.9	531.7	612.4	733.5	854.7	935.4
99.0	86.2	104.2	117.3	128.6	534.6	615.8	737.6	859.4	940.6
100.0	86.7	104.8	118.0	129.3	537.6	619.2	741.7	864.2	945.9

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	100	100	100	100	100	100	100	100	100
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	10.2	12.3	13.9	15.2	63.3	72.9	87.3	101.8	111.4
2.0	12.7	15.3	17.2	18.9	78.4	90.3	108.2	126.1	138.0
3.0	14.4	17.3	19.5	21.4	89.0	102.5	122.8	143.0	156.6
4.0	16.1	19.5	21.9	24.0	99.8	115.0	137.7	160.5	175.6
5.0	17.9	21.6	24.4	26.7	111.0	127.9	153.2	178.5	195.3
6.0	19.3	23.3	26.3	28.8	119.7	137.8	165.1	192.4	210.6
7.0	20.9	25.3	28.4	31.2	129.6	149.2	178.7	208.3	227.9
8.0	22.1	26.7	30.0	32.9	136.8	157.6	188.8	220.0	240.8
9.0	23.4	28.3	31.8	34.9	145.0	167.0	200.0	233.1	255.1
10.0	24.5	29.6	33.3	36.5	151.8	174.9	209.4	244.0	267.1
11.0	25.5	30.9	34.8	38.1	158.4	182.4	218.5	254.6	278.7
12.0	26.5	32.1	36.1	39.6	164.5	189.5	227.0	264.5	289.4
13.0	27.4	33.1	37.2	40.8	169.6	195.4	234.0	272.7	298.4
14.0	28.2	34.1	38.4	42.1	175.0	201.6	241.5	281.4	308.0
15.0	29.2	35.3	39.7	43.5	180.8	208.3	249.5	290.7	318.1
16.0	30.2	36.5	41.0	45.0	187.0	215.4	258.0	300.6	329.0
17.0	31.2	37.7	42.5	46.6	193.6	223.0	267.1	311.2	340.6
18.0	32.1	38.8	43.6	47.8	198.8	229.0	274.3	319.6	349.8
19.0	32.8	39.6	44.6	48.9	203.3	234.1	280.4	326.7	357.6
20.0	33.5	40.5	45.6	50.0	207.9	239.5	286.8	334.2	365.8
21.0	34.3	41.5	46.7	51.2	212.7	245.0	293.5	342.0	374.3
22.0	35.1	42.5	47.8	52.4	217.8	250.9	300.5	350.1	383.2
23.0	36.0	43.5	49.0	53.7	223.1	257.0	307.9	358.7	392.6
24.0	36.5	44.2	49.7	54.5	226.5	260.9	312.5	364.0	398.4
25.0	37.0	44.7	50.4	55.2	229.5	264.3	316.6	368.9	403.8
26.0	37.5	45.3	51.0	55.9	232.6	267.9	320.9	373.9	409.2
27.0	38.0	46.0	51.7	56.7	235.8	271.6	325.3	379.0	414.9
28.0	38.6	46.6	52.5	57.5	239.1	275.4	329.8	384.3	420.6
29.0	39.1	47.3	53.2	58.3	242.4	279.3	334.5	389.7	426.6
30.0	39.7	47.9	54.0	59.2	245.9	283.3	339.3	395.3	432.7
31.0	40.2	48.6	54.8	60.0	249.5	287.4	344.2	401.1	439.0
32.0	40.8	49.4	55.6	60.9	253.2	291.6	349.3	407.0	445.4
33.0	41.4	50.1	56.4	61.8	256.9	296.0	354.5	413.1	452.1
34.0	42.1	50.9	57.2	62.7	260.8	300.5	359.9	419.3	458.9
35.0	42.7	51.6	58.1	63.7	264.9	305.1	365.4	425.8	466.0
36.0	43.4	52.5	59.0	64.7	269.0	309.9	371.2	432.5	473.3
37.0	44.1	53.3	60.0	65.7	273.3	314.8	377.1	439.3	480.9
38.0	44.8	54.1	60.9	66.8	277.7	319.9	383.2	446.4	488.6
39.0	45.5	55.0	62.0	67.9	282.3	325.2	389.5	453.8	496.7
40.0	46.3	56.0	63.0	69.0	287.0	330.6	396.0	461.4	505.0
41.0	47.1	56.9	64.1	70.2	291.9	336.2	402.7	469.2	513.5
42.0	47.9	57.9	65.2	71.4	296.9	342.0	409.7	477.3	522.4
43.0	48.7	58.9	66.3	72.7	302.1	348.0	416.9	485.7	531.6
44.0	49.6	60.0	67.5	74.0	307.5	354.3	424.3	494.4	541.1
45.0	50.5	61.1	68.7	75.3	313.2	360.7	432.1	503.4	551.0
46.0	51.5	62.2	70.0	76.7	319.0	367.4	440.1	512.8	561.2
47.0	52.1	62.9	70.8	77.6	322.7	371.7	445.3	518.8	567.8
48.0	52.5	63.5	71.5	78.3	325.6	375.0	449.2	523.4	572.8
49.0	53.0	64.0	72.1	79.0	328.5	378.4	453.2	528.0	577.9
50.0	53.5	64.6	72.7	79.7	331.4	381.8	457.3	532.8	583.1
51.0	53.9	65.2	73.4	80.4	334.4	385.2	461.4	537.6	588.4
52.0	54.4	65.8	74.1	81.2	337.5	388.8	465.7	542.6	593.8
53.0	54.9	66.4	74.8	81.9	340.6	392.4	470.0	547.6	599.3
54.0	55.5	67.0	75.5	82.7	343.8	396.0	474.4	552.7	604.9
55.0	56.0	67.7	76.2	83.5	347.1	399.8	478.8	557.9	610.6
56.0	56.5	68.3	76.9	84.3	350.4	403.6	483.4	563.2	616.4

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	100	100	100	100	100	100	100	100	100
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	57.1	69.0	77.6	85.1	353.7	407.5	488.0	568.6	622.4
58.0	57.6	69.6	78.4	85.9	357.2	411.4	492.8	574.2	628.4
59.0	58.2	70.3	79.2	86.8	360.7	415.4	497.6	579.8	634.6
60.0	58.8	71.0	79.9	87.6	364.2	419.5	502.5	585.5	640.8
61.0	59.3	71.7	80.7	88.5	367.9	423.7	507.6	591.4	647.2
62.0	59.9	72.4	81.5	89.4	371.6	428.0	512.7	597.3	653.8
63.0	60.6	73.2	82.4	90.3	375.4	432.4	517.9	603.4	660.4
64.0	61.2	73.9	83.2	91.2	379.2	436.8	523.2	609.6	667.2
65.0	61.8	74.7	84.1	92.2	383.2	441.4	528.7	616.0	674.2
66.0	62.5	75.5	85.0	93.1	387.2	446.0	534.2	622.5	681.3
67.0	63.1	76.3	85.9	94.1	391.3	450.8	539.9	629.1	688.5
68.0	63.8	77.1	86.8	95.1	395.5	455.6	545.7	635.8	695.9
69.0	64.5	78.0	87.7	96.2	399.8	460.6	551.7	642.8	703.5
70.0	65.0	78.6	88.5	97.0	403.2	464.5	556.3	648.2	709.5
71.0	65.5	79.1	89.1	97.6	405.9	467.5	560.0	652.5	714.1
72.0	65.9	79.7	89.7	98.3	408.6	470.6	563.7	656.8	718.9
73.0	66.3	80.2	90.3	98.9	411.3	473.8	567.5	661.2	723.6
74.0	66.8	80.7	90.9	99.6	414.1	476.9	571.3	665.6	728.5
75.0	67.2	81.3	91.5	100.3	416.8	480.2	575.1	670.1	733.4
76.0	67.7	81.8	92.1	101.0	419.7	483.4	579.1	674.7	738.4
77.0	68.2	82.4	92.7	101.6	422.6	486.7	583.0	679.3	743.5
78.0	68.6	83.0	93.4	102.3	425.5	490.1	587.0	684.0	748.6
79.0	69.1	83.5	94.0	103.1	428.4	493.5	591.1	688.7	753.8
80.0	69.6	84.1	94.7	103.8	431.4	497.0	595.2	693.5	759.1
81.0	70.1	84.7	95.3	104.5	434.5	500.5	599.4	698.4	764.4
82.0	70.6	85.3	96.0	105.2	437.5	504.0	603.7	703.4	769.8
83.0	71.1	85.9	96.7	106.0	440.7	507.6	608.0	708.4	775.3
84.0	71.6	86.5	97.4	106.8	443.8	511.3	612.4	713.5	780.9
85.0	72.1	87.2	98.1	107.5	447.1	515.0	616.8	718.7	786.6
86.0	72.6	87.8	98.8	108.3	450.3	518.7	621.3	723.9	792.3
87.0	73.2	88.4	99.6	109.1	453.6	522.5	625.9	729.2	798.1
88.0	73.7	89.1	100.3	109.9	457.0	526.4	630.5	734.6	804.1
89.0	74.3	89.8	101.0	110.7	460.4	530.3	635.2	740.1	810.1
90.0	74.8	90.4	101.8	111.6	463.9	534.3	640.0	745.7	816.1
91.0	75.4	91.1	102.6	112.4	467.4	538.4	644.8	751.3	822.3
92.0	76.0	91.8	103.4	113.3	470.9	542.5	649.8	757.1	828.6
93.0	76.5	92.4	104.1	114.0	474.1	546.1	654.1	762.2	834.2
94.0	76.9	92.9	104.6	114.7	476.7	549.1	657.7	766.3	838.7
95.0	77.3	93.4	105.2	115.3	479.2	552.0	661.2	770.4	843.2
96.0	77.7	93.9	105.8	115.9	481.9	555.0	664.8	774.6	847.8
97.0	78.2	94.5	106.3	116.5	484.5	558.1	668.5	778.9	852.5
98.0	78.6	95.0	106.9	117.2	487.2	561.2	672.2	783.1	857.1
99.0	79.0	95.5	107.5	117.8	489.9	564.3	675.9	787.5	861.9
100.0	79.5	96.0	108.1	118.5	492.6	567.4	679.6	791.9	866.7

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	110	110	110	110	110	110	110	110	110
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	9.3	11.2	12.6	13.8	57.5	66.3	79.4	92.5	101.2
2.0	11.5	13.9	15.6	17.1	71.3	82.1	98.3	114.6	125.4
3.0	13.0	15.8	17.8	19.5	80.9	93.1	111.6	130.0	142.3
4.0	14.6	17.7	19.9	21.8	90.7	104.5	125.2	145.8	159.6
5.0	16.3	19.7	22.1	24.3	100.9	116.2	139.2	162.2	177.5
6.0	17.6	21.2	23.9	26.2	108.8	125.3	150.1	174.8	191.3
7.0	19.0	23.0	25.8	28.3	117.7	135.6	162.4	189.3	207.1
8.0	20.1	24.3	27.3	29.9	124.4	143.2	171.6	199.9	218.8
9.0	21.3	25.7	28.9	31.7	131.8	151.8	181.8	211.8	231.8
10.0	22.3	26.9	30.3	33.2	138.0	158.9	190.3	221.8	242.7
11.0	23.2	28.1	31.6	34.6	143.9	165.8	198.6	231.4	253.3
12.0	24.1	29.2	32.8	36.0	149.5	172.2	206.3	240.3	263.0
13.0	24.9	30.1	33.8	37.1	154.1	177.5	212.7	247.8	271.2
14.0	25.7	31.0	34.9	38.3	159.1	183.2	219.5	255.7	279.9
15.0	26.5	32.0	36.1	39.5	164.3	189.3	226.7	264.1	289.1
16.0	27.4	33.1	37.3	40.9	169.9	195.7	234.5	273.2	299.0
17.0	28.4	34.3	38.6	42.3	175.9	202.7	242.7	282.8	309.5
18.0	29.2	35.2	39.7	43.5	180.7	208.1	249.3	290.5	317.9
19.0	29.8	36.0	40.5	44.4	184.7	212.8	254.9	296.9	325.0
20.0	30.5	36.8	41.5	45.5	188.9	217.6	260.7	303.7	332.4
21.0	31.2	37.7	42.4	46.5	193.3	222.7	266.7	310.8	340.1
22.0	31.9	38.6	43.5	47.6	197.9	228.0	273.1	318.2	348.3
23.0	32.7	39.5	44.5	48.8	202.8	233.6	279.8	326.0	356.8
24.0	33.2	40.1	45.2	49.5	205.8	237.1	284.0	330.8	362.1
25.0	33.7	40.7	45.8	50.2	208.6	240.2	287.7	335.3	366.9
26.0	34.1	41.2	46.4	50.9	211.4	243.5	291.6	339.8	371.9
27.0	34.6	41.8	47.0	51.6	214.3	246.8	295.6	344.5	377.0
28.0	35.1	42.4	47.7	52.3	217.3	250.3	299.8	349.3	382.3
29.0	35.6	43.0	48.4	53.0	220.3	253.8	304.0	354.2	387.7
30.0	36.1	43.6	49.1	53.8	223.5	257.4	308.3	359.3	393.2
31.0	36.6	44.2	49.8	54.5	226.7	261.2	312.8	364.5	398.9
32.0	37.1	44.9	50.5	55.4	230.1	265.0	317.4	369.8	404.8
33.0	37.7	45.5	51.3	56.2	233.5	269.0	322.2	375.4	410.8
34.0	38.3	46.2	52.0	57.0	237.1	273.1	327.1	381.1	417.1
35.0	38.8	46.9	52.8	57.9	240.7	277.3	332.1	387.0	423.5
36.0	39.5	47.7	53.7	58.8	244.5	281.6	337.3	393.0	430.1
37.0	40.1	48.4	54.5	59.8	248.4	286.1	342.7	399.3	437.0
38.0	40.7	49.2	55.4	60.7	252.4	290.7	348.2	405.7	444.1
39.0	41.4	50.0	56.3	61.7	256.5	295.5	353.9	412.4	451.4
40.0	42.1	50.9	57.3	62.8	260.8	300.4	359.9	419.3	458.9
41.0	42.8	51.7	58.2	63.8	265.3	305.5	366.0	426.4	466.7
42.0	43.5	52.6	59.2	64.9	269.8	310.8	372.3	433.8	474.8
43.0	44.3	53.6	60.3	66.1	274.6	316.3	378.8	441.4	483.1
44.0	45.1	54.5	61.4	67.2	279.5	322.0	385.6	449.3	491.8
45.0	45.9	55.5	62.5	68.5	284.6	327.8	392.7	457.5	500.7
46.0	46.8	56.5	63.6	69.7	289.9	333.9	399.9	466.0	510.0
47.0	47.3	57.2	64.4	70.6	293.3	337.8	404.6	471.5	516.0
48.0	47.7	57.7	65.0	71.2	295.9	340.8	408.2	475.6	520.6
49.0	48.2	58.2	65.5	71.8	298.5	343.9	411.9	479.9	525.2
50.0	48.6	58.7	66.1	72.5	301.2	347.0	415.6	484.2	529.9
51.0	49.0	59.3	66.7	73.1	303.9	350.1	419.3	488.6	534.8
52.0	49.5	59.8	67.3	73.8	306.7	353.3	423.2	493.1	539.7
53.0	50.0	60.4	68.0	74.5	309.6	356.6	427.1	497.6	544.7
54.0	50.4	60.9	68.6	75.2	312.5	359.9	431.1	502.3	549.7
55.0	50.9	61.5	69.2	75.9	315.4	363.3	435.2	507.0	554.9
56.0	51.4	62.1	69.9	76.6	318.4	366.8	439.3	511.8	560.2

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	110	110	110	110	110	110	110	110	110
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	51.9	62.7	70.6	77.3	321.5	370.3	443.5	516.8	565.6
58.0	52.4	63.3	71.3	78.1	324.6	373.9	447.8	521.8	571.1
59.0	52.9	63.9	72.0	78.9	327.8	377.5	452.2	526.9	576.7
60.0	53.4	64.6	72.7	79.6	331.0	381.3	456.7	532.1	582.4
61.0	53.9	65.2	73.4	80.4	334.3	385.1	461.3	537.4	588.2
62.0	54.5	65.9	74.1	81.2	337.7	389.0	465.9	542.8	594.1
63.0	55.0	66.5	74.9	82.1	341.1	392.9	470.7	548.4	600.2
64.0	55.6	67.2	75.7	82.9	344.6	397.0	475.5	554.0	606.4
65.0	56.2	67.9	76.4	83.8	348.2	401.1	480.5	559.8	612.7
66.0	56.8	68.6	77.2	84.7	351.9	405.3	485.5	565.7	619.1
67.0	57.4	69.4	78.1	85.6	355.6	409.7	490.7	571.7	625.7
68.0	58.0	70.1	78.9	86.5	359.5	414.1	495.9	577.8	632.4
69.0	58.6	70.9	79.8	87.4	363.4	418.6	501.3	584.1	639.3
70.0	59.1	71.5	80.4	88.2	366.5	422.1	505.6	589.1	644.7
71.0	59.5	71.9	81.0	88.7	368.9	424.9	508.9	593.0	649.0
72.0	59.9	72.4	81.5	89.3	371.3	427.7	512.3	596.9	653.3
73.0	60.3	72.9	82.1	89.9	373.8	430.6	515.7	600.9	657.6
74.0	60.7	73.4	82.6	90.5	376.3	433.4	519.2	604.9	662.1
75.0	61.1	73.9	83.2	91.1	378.8	436.4	522.7	609.0	666.5
76.0	61.5	74.4	83.7	91.8	381.4	439.3	526.2	613.1	671.1
77.0	62.0	74.9	84.3	92.4	384.0	442.3	529.8	617.3	675.7
78.0	62.4	75.4	84.9	93.0	386.7	445.4	533.5	621.6	680.3
79.0	62.8	75.9	85.5	93.7	389.4	448.5	537.2	625.9	685.0
80.0	63.3	76.5	86.1	94.3	392.1	451.6	541.0	630.3	689.8
81.0	63.7	77.0	86.7	95.0	394.8	454.8	544.8	634.7	694.7
82.0	64.2	77.6	87.3	95.7	397.6	458.0	548.6	639.2	699.6
83.0	64.6	78.1	87.9	96.4	400.5	461.3	552.5	643.8	704.6
84.0	65.1	78.7	88.5	97.0	403.4	464.6	556.5	648.4	709.7
85.0	65.6	79.2	89.2	97.7	406.3	468.0	560.6	653.1	714.8
86.0	66.0	79.8	89.8	98.5	409.2	471.4	564.6	657.9	720.0
87.0	66.5	80.4	90.5	99.2	412.3	474.9	568.8	662.7	725.3
88.0	67.0	81.0	91.2	99.9	415.3	478.4	573.0	667.6	730.7
89.0	67.5	81.6	91.8	100.7	418.4	482.0	577.3	672.6	736.2
90.0	68.0	82.2	92.5	101.4	421.6	485.6	581.6	677.7	741.7
91.0	68.5	82.8	93.2	102.2	424.8	489.3	586.0	682.8	747.3
92.0	69.1	83.5	94.0	103.0	428.0	493.0	590.5	688.0	753.0
93.0	69.5	84.0	94.6	103.7	430.9	496.3	594.5	692.6	758.1
94.0	69.9	84.5	95.1	104.2	433.2	499.0	597.7	696.4	762.2
95.0	70.3	84.9	95.6	104.8	435.5	501.7	600.9	700.1	766.3
96.0	70.7	85.4	96.1	105.4	437.9	504.4	604.2	704.0	770.5
97.0	71.1	85.9	96.7	105.9	440.3	507.2	607.5	707.8	774.7
98.0	71.4	86.3	97.2	106.5	442.7	510.0	610.8	711.7	779.0
99.0	71.8	86.8	97.7	107.1	445.2	512.8	614.2	715.7	783.3
100.0	72.2	87.3	98.3	107.7	447.7	515.7	617.6	719.6	787.6

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	120	120	120	120	120	120	120	120	120
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after									
Shutdown	Time To	Time To	Time To	Time To	Time To	Time To	Time To	Time To	Time To
(days)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)	Boil (min)
1.0	8.4	10.1	11.4	12.5	51.8	59.6	71.4	83.2	91.1
2.0	10.4	12.5	14.1	15.4	64.1	73.9	88.5	103.1	112.8
3.0	11.7	14.2	16.0	17.5	72.8	83.8	100.4	117.0	128.0
4.0	13.2	15.9	17.9	19.6	81.6	94.0	112.6	131.2	143.6
5.0	14.7	17.7	19.9	21.9	90.8	104.6	125.3	146.0	159.7
6.0	15.8	19.1	21.5	23.6	97.9	112.7	135.0	157.3	172.2
7.0	17.1	20.7	23.3	25.5	105.9	122.0	146.2	170.3	186.4
8.0	18.1	21.8	24.6	26.9	111.9	128.9	154.4	179.9	196.9
9.0	19.1	23.1	26.0	28.5	118.6	136.6	163.6	190.6	208.6
10.0	20.0	24.2	27.3	29.9	124.1	143.0	171.3	199.6	218.4
11.0	20.9	25.3	28.4	31.2	129.5	149.2	178.7	208.2	227.9
12.0	21.7	26.2	29.5	32.4	134.5	155.0	185.6	216.3	236.7
13.0	22.4	27.1	30.5	33.4	138.7	159.8	191.4	223.0	244.0
14.0	23.1	27.9	31.4	34.4	143.1	164.9	197.5	230.1	251.8
15.0	23.9	28.8	32.5	35.6	147.9	170.3	204.0	237.7	260.1
16.0	24.7	29.8	33.6	36.8	152.9	176.1	211.0	245.8	269.0
17.0	25.6	30.9	34.8	38.1	158.3	182.4	218.4	254.5	278.5
18.0	26.2	31.7	35.7	39.1	162.6	187.3	224.3	261.4	286.1
19.0	26.8	32.4	36.5	40.0	166.2	191.5	229.3	267.2	292.4
20.0	27.4	33.2	37.3	40.9	170.0	195.8	234.6	273.3	299.1
21.0	28.1	33.9	38.2	41.9	174.0	200.4	240.0	279.7	306.1
22.0	28.8	34.7	39.1	42.9	178.1	205.2	245.7	286.3	313.4
23.0	29.5	35.6	40.1	43.9	182.5	210.2	251.8	293.3	321.0
24.0	29.9	36.1	40.7	44.6	185.2	213.3	255.5	297.7	325.8
25.0	30.3	36.6	41.2	45.2	187.7	216.2	258.9	301.7	330.2
26.0	30.7	37.1	41.8	45.8	190.2	219.1	262.4	305.8	334.6
27.0	31.1	37.6	42.3	46.4	192.8	222.1	266.0	310.0	339.2
28.0	31.6	38.1	42.9	47.0	195.5	225.2	269.7	314.3	344.0
29.0	32.0	38.7	43.5	47.7	198.3	228.4	273.5	318.7	348.8
30.0	32.5	39.2	44.2	48.4	201.1	231.6	277.5	323.3	353.8
31.0	32.9	39.8	44.8	49.1	204.0	235.0	281.5	328.0	359.0
32.0	33.4	40.4	45.5	49.8	207.0	238.5	285.6	332.8	364.2
33.0	33.9	41.0	46.1	50.6	210.1	242.0	289.9	337.8	369.7
34.0	34.4	41.6	46.8	51.3	213.3	245.7	294.3	342.9	375.3
35.0	35.0	42.3	47.6	52.1	216.6	249.5	298.8	348.2	381.1
36.0	35.5	42.9	48.3	52.9	220.0	253.4	303.5	353.6	387.1
37.0	36.1	43.6	49.1	53.8	223.5	257.4	308.4	359.3	393.2
38.0	36.7	44.3	49.9	54.7	227.1	261.6	313.3	365.1	399.6
39.0	37.3	45.0	50.7	55.6	230.8	265.9	318.5	371.1	406.1
40.0	37.9	45.8	51.5	56.5	234.7	270.3	323.8	377.3	412.9
41.0	38.5	46.6	52.4	57.4	238.7	274.9	329.3	383.7	419.9
42.0	39.2	47.4	53.3	58.4	242.8	279.7	335.0	390.3	427.2
43.0	39.9	48.2	54.3	59.5	247.1	284.6	340.9	397.2	434.7
44.0	40.6	49.1	55.2	60.5	251.5	289.7	347.0	404.3	442.5
45.0	41.3	50.0	56.2	61.6	256.1	295.0	353.3	411.7	450.6
46.0	42.1	50.9	57.3	62.8	260.9	300.5	359.9	419.3	458.9
47.0	42.6	51.5	57.9	63.5	263.9	304.0	364.1	424.2	464.3
48.0	43.0	51.9	58.5	64.1	266.2	306.7	367.3	428.0	468.4
49.0	43.4	52.4	59.0	64.6	268.6	309.4	370.6	431.8	472.6
50.0	43.8	52.9	59.5	65.2	271.0	312.2	373.9	435.7	476.9
51.0	44.2	53.4	60.1	65.8	273.5	315.0	377.3	439.7	481.2
52.0	44.6	53.8	60.6	66.4	276.0	317.9	380.8	443.7	485.6
53.0	45.0	54.3	61.2	67.0	278.6	320.9	384.3	447.8	490.1
54.0	45.4	54.9	61.7	67.7	281.2	323.9	387.9	452.0	494.7
55.0	45.8	55.4	62.3	68.3	283.8	326.9	391.6	456.2	499.3
56.0	46.3	55.9	62.9	69.0	286.5	330.0	395.3	460.6	504.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	120	120	120	120	120	120	120	120	120
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	46.7	56.4	63.5	69.6	289.3	333.2	399.1	465.0	508.9
58.0	47.2	57.0	64.1	70.3	292.1	336.4	403.0	469.5	513.9
59.0	47.6	57.5	64.8	71.0	294.9	339.7	406.9	474.1	518.9
60.0	48.1	58.1	65.4	71.7	297.9	343.1	410.9	478.8	524.0
61.0	48.6	58.7	66.1	72.4	300.8	346.5	415.1	483.6	529.3
62.0	49.1	59.3	66.7	73.1	303.9	350.0	419.2	488.5	534.6
63.0	49.6	59.9	67.4	73.9	307.0	353.6	423.5	493.5	540.1
64.0	50.1	60.5	68.1	74.6	310.1	357.2	427.9	498.5	545.6
65.0	50.6	61.1	68.8	75.4	313.4	361.0	432.3	503.7	551.3
66.0	51.1	61.8	69.5	76.2	316.7	364.7	436.9	509.0	557.1
67.0	51.7	62.4	70.3	77.0	320.0	368.6	441.5	514.4	563.0
68.0	52.2	63.1	71.0	77.8	323.5	372.6	446.3	520.0	569.1
69.0	52.8	63.8	71.8	78.7	327.0	376.6	451.1	525.6	575.3
70.0	53.2	64.3	72.4	79.4	329.8	379.8	455.0	530.1	580.2
71.0	53.6	64.8	72.9	79.9	331.9	382.3	457.9	533.6	584.0
72.0	53.9	65.2	73.4	80.4	334.1	384.9	461.0	537.1	587.8
73.0	54.3	65.6	73.9	80.9	336.4	387.4	464.1	540.7	591.8
74.0	54.7	66.1	74.4	81.5	338.6	390.0	467.2	544.3	595.7
75.0	55.0	66.5	74.9	82.0	340.9	392.7	470.3	548.0	599.8
76.0	55.4	67.0	75.4	82.6	343.2	395.3	473.5	551.7	603.8
77.0	55.8	67.4	75.9	83.2	345.6	398.0	476.8	555.5	608.0
78.0	56.2	67.9	76.4	83.7	347.9	400.8	480.1	559.3	612.2
79.0	56.6	68.4	76.9	84.3	350.4	403.6	483.4	563.2	616.4
80.0	57.0	68.8	77.5	84.9	352.8	406.4	486.8	567.1	620.7
81.0	57.4	69.3	78.0	85.5	355.3	409.3	490.2	571.1	625.1
82.0	57.8	69.8	78.6	86.1	357.8	412.2	493.7	575.2	629.5
83.0	58.2	70.3	79.1	86.7	360.4	415.1	497.2	579.3	634.0
84.0	58.6	70.8	79.7	87.3	363.0	418.1	500.8	583.5	638.6
85.0	59.0	71.3	80.3	88.0	365.6	421.1	504.4	587.7	643.2
86.0	59.5	71.8	80.9	88.6	368.3	424.2	508.1	592.0	647.9
87.0	59.9	72.4	81.5	89.3	371.0	427.3	511.8	596.3	652.7
88.0	60.3	72.9	82.1	89.9	373.7	430.5	515.6	600.8	657.5
89.0	60.8	73.5	82.7	90.6	376.5	433.7	519.5	605.2	662.4
90.0	61.2	74.0	83.3	91.3	379.3	437.0	523.4	609.8	667.4
91.0	61.7	74.6	83.9	92.0	382.2	440.3	527.3	614.4	672.5
92.0	62.2	75.1	84.6	92.7	385.1	443.6	531.4	619.1	677.6
93.0	62.6	75.6	85.1	93.3	387.7	446.6	534.9	623.3	682.1
94.0	62.9	76.0	85.6	93.8	389.8	449.0	537.8	626.6	685.8
95.0	63.3	76.5	86.1	94.3	391.9	451.4	540.7	630.0	689.5
96.0	63.6	76.9	86.5	94.8	394.1	453.9	543.7	633.4	693.3
97.0	64.0	77.3	87.0	95.3	396.2	456.4	546.7	636.9	697.1
98.0	64.3	77.7	87.5	95.9	398.4	458.9	549.7	640.4	700.9
99.0	64.7	78.2	88.0	96.4	400.6	461.4	552.7	644.0	704.8
100.0	65.0	78.6	88.5	96.9	402.8	464.0	555.8	647.6	708.7

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	130	130	130	130	130	130	130	130	130
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	7.4	9.0	10.1	11.1	46.0	53.0	63.5	74.0	81.0
2.0	9.2	11.1	12.5	13.7	57.0	65.7	78.7	91.7	100.3
3.0	10.4	12.6	14.2	15.6	64.7	74.5	89.3	104.0	113.8
4.0	11.7	14.2	15.9	17.5	72.6	83.6	100.1	116.7	127.7
5.0	13.0	15.8	17.7	19.4	80.7	93.0	111.4	129.8	142.0
6.0	14.1	17.0	19.1	20.9	87.0	100.2	120.0	139.9	153.1
7.0	15.2	18.4	20.7	22.7	94.2	108.5	129.9	151.4	165.7
8.0	16.1	19.4	21.9	23.9	99.5	114.6	137.3	159.9	175.0
9.0	17.0	20.6	23.2	25.4	105.4	121.4	145.4	169.4	185.4
10.0	17.8	21.5	24.2	26.6	110.4	127.1	152.3	177.4	194.2
11.0	18.6	22.5	25.3	27.7	115.2	132.6	158.9	185.1	202.6
12.0	19.3	23.3	26.3	28.8	119.6	137.8	165.0	192.3	210.4
13.0	19.9	24.1	27.1	29.7	123.3	142.0	170.1	198.2	216.9
14.0	20.6	24.8	27.9	30.6	127.3	146.6	175.6	204.5	223.9
15.0	21.2	25.7	28.9	31.6	131.5	151.4	181.4	211.3	231.3
16.0	22.0	26.5	29.9	32.7	135.9	156.6	187.6	218.5	239.2
17.0	22.7	27.5	30.9	33.9	140.7	162.1	194.2	226.2	247.6
18.0	23.3	28.2	31.8	34.8	144.6	166.5	199.4	232.4	254.3
19.0	23.9	28.8	32.5	35.6	147.8	170.2	203.9	237.5	260.0
20.0	24.4	29.5	33.2	36.4	151.1	174.1	208.5	242.9	265.9
21.0	25.0	30.2	34.0	37.2	154.7	178.1	213.4	248.6	272.1
22.0	25.6	30.9	34.8	38.1	158.4	182.4	218.5	254.5	278.6
23.0	26.2	31.7	35.6	39.0	162.2	186.9	223.8	260.8	285.4
24.0	26.6	32.1	36.2	39.6	164.6	189.6	227.1	264.7	289.7
25.0	26.9	32.6	36.6	40.2	166.8	192.2	230.2	268.2	293.5
26.0	27.3	33.0	37.1	40.7	169.1	194.8	233.3	271.8	297.5
27.0	27.7	33.5	37.7	41.3	171.4	197.5	236.5	275.6	301.6
28.0	28.1	33.9	38.2	41.8	173.8	200.2	239.8	279.4	305.8
29.0	28.5	34.4	38.7	42.4	176.3	203.0	243.2	283.3	310.1
30.0	28.9	34.9	39.3	43.0	178.8	205.9	246.7	287.4	314.5
31.0	29.3	35.4	39.8	43.7	181.4	208.9	250.2	291.6	319.1
32.0	29.7	35.9	40.4	44.3	184.1	212.0	253.9	295.9	323.8
33.0	30.2	36.5	41.0	45.0	186.8	215.2	257.7	300.3	328.6
34.0	30.6	37.0	41.7	45.6	189.6	218.4	261.6	304.8	333.6
35.0	31.1	37.6	42.3	46.4	192.6	221.8	265.7	309.5	338.8
36.0	31.6	38.2	43.0	47.1	195.6	225.3	269.8	314.4	344.1
37.0	32.1	38.8	43.6	47.8	198.7	228.9	274.1	319.4	349.6
38.0	32.6	39.4	44.3	48.6	201.9	232.6	278.6	324.6	355.2
39.0	33.1	40.1	45.1	49.4	205.2	236.4	283.1	329.9	361.1
40.0	33.7	40.7	45.8	50.2	208.7	240.3	287.9	335.4	367.1
41.0	34.3	41.4	46.6	51.1	212.2	244.4	292.8	341.1	373.3
42.0	34.9	42.1	47.4	52.0	215.9	248.6	297.8	347.0	379.8
43.0	35.5	42.9	48.2	52.9	219.7	253.0	303.1	353.1	386.5
44.0	36.1	43.6	49.1	53.8	223.6	257.6	308.5	359.4	393.4
45.0	36.8	44.4	50.0	54.8	227.7	262.2	314.1	366.0	400.5
46.0	37.5	45.3	50.9	55.8	231.9	267.1	319.9	372.8	408.0
47.0	37.9	45.8	51.5	56.5	234.6	270.3	323.7	377.1	412.8
48.0	38.2	46.2	52.0	57.0	236.7	272.6	326.6	380.5	416.4
49.0	38.6	46.6	52.5	57.5	238.8	275.1	329.5	383.9	420.1
50.0	38.9	47.0	52.9	58.0	241.0	277.6	332.4	387.3	423.9
51.0	39.3	47.5	53.4	58.5	243.1	280.1	335.5	390.8	427.8
52.0	39.6	47.9	53.9	59.1	245.4	282.6	338.5	394.4	431.7
53.0	40.0	48.3	54.4	59.6	247.6	285.3	341.7	398.1	435.7
54.0	40.4	48.8	54.9	60.2	250.0	287.9	344.9	401.8	439.8
55.0	40.8	49.2	55.4	60.7	252.3	290.6	348.1	405.6	443.9
56.0	41.1	49.7	55.9	61.3	254.7	293.4	351.4	409.4	448.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	130	130	130	130	130	130	130	130	130
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	41.5	50.2	56.5	61.9	257.2	296.2	354.8	413.4	452.4
58.0	41.9	50.7	57.0	62.5	259.7	299.1	358.2	417.4	456.8
59.0	42.3	51.2	57.6	63.1	262.2	302.0	361.8	421.5	461.3
60.0	42.8	51.7	58.2	63.7	264.8	305.0	365.3	425.7	465.9
61.0	43.2	52.2	58.7	64.4	267.4	308.1	369.0	429.9	470.5
62.0	43.6	52.7	59.3	65.0	270.1	311.2	372.7	434.2	475.3
63.0	44.1	53.3	59.9	65.7	272.9	314.3	376.5	438.7	480.1
64.0	44.5	53.8	60.6	66.4	275.7	317.6	380.4	443.2	485.1
65.0	45.0	54.4	61.2	67.1	278.6	320.9	384.3	447.8	490.1
66.0	45.5	54.9	61.8	67.8	281.5	324.3	388.4	452.5	495.3
67.0	45.9	55.5	62.5	68.5	284.5	327.7	392.5	457.3	500.5
68.0	46.4	56.1	63.2	69.2	287.6	331.2	396.7	462.2	505.9
69.0	46.9	56.7	63.8	70.0	290.7	334.8	401.0	467.3	511.4
70.0	47.3	57.2	64.4	70.6	293.2	337.7	404.5	471.2	515.8
71.0	47.7	57.6	64.8	71.0	295.1	339.9	407.1	474.3	519.1
72.0	48.0	58.0	65.2	71.5	297.0	342.2	409.8	477.5	522.6
73.0	48.3	58.4	65.7	72.0	299.0	344.4	412.5	480.7	526.1
74.0	48.6	58.7	66.1	72.5	301.0	346.7	415.3	483.9	529.6
75.0	48.9	59.1	66.6	73.0	303.1	349.1	418.1	487.2	533.2
76.0	49.3	59.5	67.0	73.4	305.1	351.5	421.0	490.5	536.8
77.0	49.6	60.0	67.5	74.0	307.2	353.9	423.8	493.8	540.5
78.0	50.0	60.4	67.9	74.5	309.3	356.3	426.8	497.2	544.2
79.0	50.3	60.8	68.4	75.0	311.5	358.8	429.7	500.7	548.0
80.0	50.7	61.2	68.9	75.5	313.7	361.3	432.7	504.2	551.8
81.0	51.0	61.6	69.4	76.0	315.9	363.8	435.8	507.7	555.7
82.0	51.4	62.1	69.9	76.6	318.1	366.4	438.9	511.3	559.6
83.0	51.7	62.5	70.4	77.1	320.4	369.0	442.0	515.0	563.6
84.0	52.1	63.0	70.9	77.7	322.7	371.7	445.2	518.7	567.7
85.0	52.5	63.4	71.4	78.2	325.0	374.4	448.4	522.5	571.8
86.0	52.9	63.9	71.9	78.8	327.4	377.1	451.7	526.3	576.0
87.0	53.3	64.4	72.4	79.4	329.8	379.9	455.0	530.1	580.2
88.0	53.7	64.8	73.0	80.0	332.2	382.7	458.4	534.1	584.5
89.0	54.1	65.3	73.5	80.6	334.7	385.6	461.8	538.0	588.9
90.0	54.5	65.8	74.1	81.2	337.2	388.5	465.3	542.1	593.3
91.0	54.9	66.3	74.6	81.8	339.8	391.4	468.8	546.2	597.8
92.0	55.3	66.8	75.2	82.4	342.4	394.4	472.4	550.4	602.4
93.0	55.7	67.3	75.7	83.0	344.7	397.0	475.6	554.1	606.4
94.0	56.0	67.6	76.1	83.4	346.6	399.2	478.1	557.1	609.7
95.0	56.3	68.0	76.5	83.9	348.4	401.3	480.7	560.1	613.0
96.0	56.6	68.4	76.9	84.3	350.3	403.5	483.3	563.1	616.3
97.0	56.9	68.7	77.4	84.8	352.2	405.7	486.0	566.2	619.7
98.0	57.2	69.1	77.8	85.3	354.2	408.0	488.7	569.3	623.1
99.0	57.5	69.5	78.2	85.7	356.1	410.2	491.4	572.5	626.6
100.0	57.8	69.9	78.7	86.2	358.1	412.5	494.1	575.7	630.1

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	140	140	140	140	140	140	140	140	140
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
1.0	6.5	7.9	8.9	9.7	40.3	46.4	55.6	64.8	70.9
2.0	8.1	9.7	11.0	12.0	49.9	57.5	68.9	80.3	87.8
3.0	9.2	11.1	12.4	13.6	56.6	65.3	78.2	91.1	99.7
4.0	10.3	12.4	14.0	15.3	63.6	73.2	87.7	102.2	111.8
5.0	11.4	13.8	15.5	17.0	70.7	81.4	97.5	113.6	124.3
6.0	12.3	14.9	16.7	18.3	76.2	87.8	105.1	122.5	134.0
7.0	13.3	16.1	18.1	19.9	82.5	95.0	113.8	132.6	145.1
8.0	14.1	17.0	19.1	21.0	87.1	100.3	120.2	140.0	153.3
9.0	14.9	18.0	20.3	22.2	92.3	106.3	127.3	148.4	162.4
10.0	15.6	18.9	21.2	23.3	96.6	111.3	133.3	155.3	170.0
11.0	16.3	19.7	22.2	24.3	100.8	116.1	139.1	162.1	177.4
12.0	16.9	20.4	23.0	25.2	104.7	120.6	144.5	168.3	184.2
13.0	17.4	21.1	23.7	26.0	108.0	124.4	149.0	173.6	190.0
14.0	18.0	21.8	24.5	26.8	111.4	128.3	153.7	179.1	196.0
15.0	18.6	22.5	25.3	27.7	115.1	132.6	158.8	185.0	202.5
16.0	19.2	23.2	26.2	28.7	119.0	137.1	164.2	191.3	209.4
17.0	19.9	24.1	27.1	29.7	123.2	142.0	170.0	198.1	216.8
18.0	20.5	24.7	27.8	30.5	126.6	145.8	174.6	203.5	222.7
19.0	20.9	25.3	28.4	31.2	129.4	149.0	178.5	208.0	227.6
20.0	21.4	25.8	29.1	31.9	132.3	152.4	182.6	212.7	232.8
21.0	21.9	26.4	29.8	32.6	135.4	156.0	186.8	217.7	238.3
22.0	22.4	27.1	30.5	33.4	138.7	159.7	191.3	222.9	243.9
23.0	23.0	27.7	31.2	34.2	142.1	163.6	196.0	228.3	249.9
24.0	23.3	28.1	31.7	34.7	144.2	166.1	198.9	231.7	253.6
25.0	23.6	28.5	32.1	35.2	146.1	168.3	201.6	234.8	257.0
26.0	23.9	28.9	32.5	35.7	148.1	170.6	204.3	238.0	260.5
27.0	24.3	29.3	33.0	36.1	150.1	172.9	207.1	241.3	264.1
28.0	24.6	29.7	33.4	36.6	152.2	175.3	210.0	244.6	267.7
29.0	24.9	30.1	33.9	37.2	154.3	177.8	212.9	248.1	271.5
30.0	25.3	30.6	34.4	37.7	156.6	180.3	216.0	251.6	275.4
31.0	25.7	31.0	34.9	38.2	158.8	182.9	219.1	255.3	279.4
32.0	26.0	31.5	35.4	38.8	161.2	185.6	222.3	259.1	283.5
33.0	26.4	31.9	35.9	39.4	163.6	188.4	225.7	262.9	287.8
34.0	26.8	32.4	36.5	40.0	166.1	191.3	229.1	266.9	292.1
35.0	27.2	32.9	37.0	40.6	168.6	194.2	232.6	271.0	296.6
36.0	27.7	33.4	37.6	41.2	171.3	197.3	236.3	275.3	301.3
37.0	28.1	34.0	38.2	41.9	174.0	200.4	240.0	279.7	306.1
38.0	28.6	34.5	38.8	42.6	176.8	203.6	243.9	284.2	311.0
39.0	29.0	35.1	39.5	43.3	179.7	207.0	247.9	288.9	316.1
40.0	29.5	35.7	40.1	44.0	182.7	210.5	252.1	293.7	321.4
41.0	30.0	36.3	40.8	44.7	185.8	214.0	256.3	298.7	326.9
42.0	30.5	36.9	41.5	45.5	189.0	217.7	260.8	303.8	332.5
43.0	31.1	37.6	42.3	46.3	192.3	221.6	265.4	309.2	338.4
44.0	31.6	38.2	43.0	47.1	195.8	225.5	270.1	314.7	344.4
45.0	32.2	38.9	43.8	48.0	199.4	229.6	275.0	320.5	350.7
46.0	32.8	39.6	44.6	48.9	203.1	233.9	280.1	326.4	357.2
47.0	33.2	40.1	45.1	49.5	205.4	236.6	283.4	330.2	361.4
48.0	33.5	40.5	45.5	49.9	207.3	238.7	285.9	333.2	364.6
49.0	33.8	40.8	45.9	50.4	209.1	240.9	288.5	336.1	367.9
50.0	34.1	41.2	46.4	50.8	211.0	243.0	291.1	339.2	371.2
51.0	34.4	41.6	46.8	51.3	212.9	245.2	293.7	342.2	374.6
52.0	34.7	41.9	47.2	51.7	214.9	247.5	296.4	345.4	378.0
53.0	35.0	42.3	47.6	52.2	216.9	249.8	299.2	348.6	381.5
54.0	35.4	42.7	48.1	52.7	218.9	252.1	302.0	351.8	385.1
55.0	35.7	43.1	48.5	53.2	220.9	254.5	304.8	355.1	388.7
56.0	36.0	43.5	49.0	53.7	223.0	256.9	307.7	358.5	392.4

ATTACHMENT 2: CALCULATED RCS TIME TO BOIL (CONTINUED)

Tem(F)	140	140	140	140	140	140	140	140	140
Level	Mid-Loop	Top-HL	18' MSL	RCS Flange	Pool-30' MSL	Pool-32' MSL	Pool-35' MSL	Pool-38' MSL	Pool-40' MSL
Time after Shutdown (days)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)	Time To Boil (min)
57.0	36.4	44.0	49.5	54.2	225.2	259.4	310.7	362.0	396.2
58.0	36.7	44.4	50.0	54.7	227.4	261.9	313.7	365.5	400.0
59.0	37.1	44.8	50.4	55.3	229.6	264.5	316.8	369.1	403.9
60.0	37.5	45.3	50.9	55.8	231.9	267.1	319.9	372.7	407.9
61.0	37.8	45.7	51.5	56.4	234.2	269.8	323.1	376.4	412.0
62.0	38.2	46.2	52.0	57.0	236.6	272.5	326.4	380.2	416.2
63.0	38.6	46.7	52.5	57.5	239.0	275.3	329.7	384.1	420.4
64.0	39.0	47.1	53.0	58.1	241.4	278.1	333.1	388.1	424.7
65.0	39.4	47.6	53.6	58.7	243.9	281.0	336.5	392.1	429.1
66.0	39.8	48.1	54.2	59.4	246.5	283.9	340.1	396.2	433.7
67.0	40.3	48.6	54.7	60.0	249.1	287.0	343.7	400.4	438.3
68.0	40.7	49.2	55.3	60.6	251.8	290.0	347.4	404.7	443.0
69.0	41.1	49.7	55.9	61.3	254.5	293.2	351.2	409.1	447.8
70.0	41.5	50.1	56.4	61.8	256.7	295.7	354.2	412.6	451.6
71.0	41.8	50.4	56.8	62.2	258.4	297.6	356.5	415.3	454.6
72.0	42.0	50.8	57.1	62.6	260.1	299.6	358.8	418.1	457.6
73.0	42.3	51.1	57.5	63.0	261.8	301.6	361.2	420.9	460.6
74.0	42.6	51.5	57.9	63.5	263.6	303.6	363.7	423.7	463.7
75.0	42.9	51.8	58.3	63.9	265.4	305.7	366.1	426.6	466.9
76.0	43.2	52.2	58.7	64.3	267.2	307.8	368.6	429.5	470.0
77.0	43.5	52.5	59.1	64.8	269.0	309.9	371.1	432.4	473.3
78.0	43.8	52.9	59.5	65.2	270.9	312.0	373.7	435.4	476.5
79.0	44.1	53.2	59.9	65.7	272.7	314.2	376.3	438.4	479.8
80.0	44.4	53.6	60.3	66.1	274.7	316.4	378.9	441.5	483.2
81.0	44.7	54.0	60.8	66.6	276.6	318.6	381.6	444.6	486.6
82.0	45.0	54.4	61.2	67.1	278.6	320.8	384.3	447.7	490.0
83.0	45.3	54.8	61.6	67.5	280.5	323.1	387.0	450.9	493.5
84.0	45.7	55.2	62.1	68.0	282.6	325.5	389.8	454.2	497.1
85.0	46.0	55.6	62.5	68.5	284.6	327.8	392.6	457.5	500.7
86.0	46.3	56.0	63.0	69.0	286.7	330.2	395.5	460.8	504.3
87.0	46.7	56.4	63.5	69.5	288.8	332.6	398.4	464.2	508.0
88.0	47.0	56.8	63.9	70.1	290.9	335.1	401.4	467.6	511.8
89.0	47.4	57.2	64.4	70.6	293.1	337.6	404.4	471.1	515.6
90.0	47.7	57.7	64.9	71.1	295.3	340.1	407.4	474.7	519.5
91.0	48.1	58.1	65.4	71.6	297.5	342.7	410.5	478.3	523.4
92.0	48.4	58.5	65.9	72.2	299.8	345.3	413.6	481.9	527.4
93.0	48.8	58.9	66.3	72.7	301.8	347.7	416.4	485.2	531.0
94.0	49.0	59.2	66.7	73.1	303.5	349.5	418.7	487.8	533.9
95.0	49.3	59.6	67.0	73.5	305.1	351.4	420.9	490.4	536.7
96.0	49.6	59.9	67.4	73.9	306.8	353.3	423.2	493.1	539.7
97.0	49.8	60.2	67.8	74.3	308.4	355.3	425.5	495.8	542.6
98.0	50.1	60.5	68.1	74.7	310.1	357.2	427.9	498.5	545.6
99.0	50.4	60.9	68.5	75.1	311.9	359.2	430.2	501.3	548.6
100.0	50.7	61.2	68.9	75.5	313.6	361.2	432.6	504.1	551.7

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CONTINUOUS USE

9.12 CONTAINMENT CLOSURE REQUIREMENTS

[P-6547]

NOTE

(1) Containment closure requirements are not applicable during the DEFUEL mode of operation. However, containment closure shall be tracked during the DEFUEL mode of operation to ensure compliance with containment closure requirements when mode 6 is entered.

(2) When determining Time to Boil, use the highest temperature in the current temperature control band.

(3) The Equipment Hatch closure time may be extended up to 4 hours if the conditions of Limitation 3.2.8.2.1.1 are met. **[P-25534]**

WARNING

THE TIME REQUIRED TO CLOSE THE CONTAINMENT IMPAIRMENTS SHOULD NEVER EXCEED THE TIME TO BOIL.

(Initial/Date)

9.12.1 Verify the equipment hatch is capable of being closed and secured by at least 4 symmetrically spaced bolts as follows: ______/______

- within 0.5 hours during Core Alterations or load movements with or over irradiated fuel in the containment building. **[P-25815]**
- Before the calculated time for the Reactor Coolant System to boil but no longer than 1 hour with RCS water level ≤20 feet MSL. **(SOER 09-01 Recommendation #11)**
- before the calculated time for the Reactor Coolant System to boil but no longer than 1.5 hours with RCS water level between >20 feet MSL and 32' MSL. **(SOER 09-01 Recommendation #11)**
- before the calculated time for the Reactor Coolant System to boil but no longer than 4 hours with RCS water level >32' MSL. **(SOER 09-01 Recommendation #11)**

(Initial/Date)

9.12.2 Verify the escape airlock and personnel airlock are capable of being closed with at least one door as follows: _____/_____

- within 0.5 hours during Core Alterations or load movements with or over irradiated fuel in the containment building. **[P-25815]**
- before the calculated time for the Reactor Coolant System to boil but no longer than 1 hour with RCS water level $\leq$20 feet MSL. **(SOER 09-01 Recommendation #11)**
- before the calculated time for the Reactor Coolant System to boil but no longer than 1.5 hours with RCS water level between >20 feet MSL and 32' MSL. **(SOER 09-01 Recommendation #11)**
- before the calculated time for the Reactor Coolant System to boil but no longer than 4 hours with RCS water level >32' MSL. **(SOER 09-01 Recommendation #11)**

9.12.3 Verify Containment Closure log impairments are capable of being closed with contingencies satisfied as follows: _____/_____

- within 0.5 hours during Core Alterations or load movements with or over irradiated fuel in the containment building. **[P-25815]**
- before the calculated time for the Reactor Coolant System to boil but no longer than 1 hour with RCS water level $\leq$20 feet MSL. **(SOER 09-01 Recommendation #11)**
- before the calculated time for the Reactor Coolant System to boil but no longer than 1.5 hours with RCS water level between >20 feet MSL and 32' MSL. **(SOER 09-01 Recommendation #11)**
- before the calculated time for the Reactor Coolant System to boil but no longer than 4 hours with RCS water level >32' MSL. **(SOER 09-01 Recommendation #11)**

9.12.4 Transmit completed attachment to Records Management.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

LIMITING CONDITION FOR OPERATION

3.9.4 The containment building penetrations shall be in the following status:

a. The equipment door is closed,

b. A minimum of one door in each airlock is capable of being closed, and

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere shall be either:

   1. Closed by a manual or automatic isolation valve, blind flange, or equivalent, or

   2. Capable of being closed by an OPERABLE containment purge and exhaust isolation system.

Note: Penetration flow path(s) described in a, b, and c above, that provides direct access from the containment atmosphere to the outside atmosphere may be unisolated under administrative controls.

APPLICABILITY: During CORE ALTERATIONS or load movements with or over irradiated fuel within the containment.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or load movements with or over irradiated fuel in the containment building.

SURVEILLANCE REQUIREMENTS

4.9.4.1 Verify each required containment penetration is in the required status prior to the start of and once per 7 days during CORE ALTERATIONS or load movements with or over irradiated fuel within containment.

4.9.4.2 Verify each required containment purge and exhaust valve actuates to the isolation position on an actual or simulated actuation signal 72 hours prior to performing initial CORE ALTERATIONS or load movements with or over irradiated fuel within containment.

NOTE - SR 4.9.4.2 is not required to be met for containment purge and exhaust valve(s) in penetrations closed to comply with LCO 3.9.4.c.1.

Waterford 3

2017 SRO NRC Exam

JOB PERFORMANCE MEASURE

A7

Review K-eff Calculation in accordance with OP-903-090, Shutdown Margin, and identify required actions

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Review K-Effective Calculation in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation and identify required corrective actions.

Task Standard: Identified critical calculation error, determined the correct K-Effective value, and identifies required procedural and Tech Spec actions per Task Element 13.

References: OP-903-090 (rev 305); Cycle 21 Plant Data Book (rev 9) Figures 1.4.1 & 1.4.2; Tech Spec 3.1.2.9; COLR Figure 1; COLR Tables 1-5

Alternate Path: No   Time Critical: No   Validation Time: 45 min

K/A 2.2.12, Knowledge of Surveillance Procedures.   Importance Rating 4.1 SRO

Applicant: ____________________

Time Start: ______________   Time Finish: ______________

Performance Time: ______________ minutes

Critical Time: N/A minutes

Performance Rating: SAT   UNSAT

Comments: ____________________

Examiner: ____________________   Date: ______________

Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation (Applicant Handout 1)
- Pre-filled out Attachment 10.5 (Applicant Handout 2)
- Personal computer or laptop (with wifi/LAN deactivated)
- Standard electronic references thumb drive (eCart)

Description:
This JPM requires the applicant to review a completed K-Effective calculation in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation. The applicant will need to identify errors in the calculation and determine required procedural and Tech Spec actions based on his/her findings and given plant conditions. Use attached answer key to check applicants work.

READ TO APPLICANT

DIRECTION TO APPLICANT:

Each administrative JPM has a cue sheet with the instructions for that JPM. Each administrative JPM stands alone, and conditions from 1 JPM do not carry over to any other JPM. If you have any questions, raise your hand and I will come to your desk.

Provide all answers on the sheets provided.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

Examiner Note
The applicant will review a K-Effective calculation that has been performed in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation. All required data to perform the review is supplied on the cue sheet. Provide Applicant Handouts 1 and 2 to applicant at the start of the JPM.

TASK ELEMENT 1	STANDARD
7.5.5 Obtain Required Shutdown Margin from T.S. 3.1.1.1 <u>or</u> 3.1.1.2.	Recognized error & entered correct data of 1.5 %ΔK/K
Comment: Entered correct data in step 7.5.5 of Attachment 10.5. This information is obtained using COLR Figure 1.	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
7.5.6.4 Calculate Total Excess Reactivity Worth by adding value recorded in step 7.5.5 to value recorded in step 7.5.6.3.	1.729 – 1.735 %ΔK/K
Comment: Re-performed calculation per step 7.5.6.4 of Attachment 10.5 using correct data.	**SAT / UNSAT**

TASK ELEMENT 3	STANDARD
7.5.6.5 Convert %K/K to ΔK/K by dividing value recorded in step 7.5.6.4 by 100.	0.01729 – 0.01735 ΔK/K
Comment: Re-performed calculation per step 7.5.6.5 of Attachment 10.5 using correct data.	**SAT / UNSAT**

TASK ELEMENT 4	STANDARD
7.5.6.6 Calculate K-Effective by dividing 1 by the sum of 1 + step 7.5.6.5.	0.982 – 0.984
Comment: Re-performed calculation per step 7.5.6.6 of Attachment 10.5 using correct data.	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
7.5.6.7 Verify K-Effective <u>less</u> <u>than</u> <u>or</u> <u>equal</u> <u>to</u> that required by the COLR. 7.5.6.7.1 Designate Yes or No on Attachment 10.5.	Recognized error & selects NO
Comment: Based on the new K-effective value, the applicant recognized that K-effective is not less than or equal to the required K-effective.	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 6	STANDARD
7.5.7 <u>If</u> the requirements of Technical Specifications 3.1.2.9 <u>or</u> 3.9.1 are <u>not</u> met, <u>then</u> Commence Emergency Boration <u>and</u> <u>go</u> <u>to</u> OP-901-103, Emergency Boration.	Identified the following actions per OP-903-090: • Emergency Borate • Enter OP-901-103 Determined that in order to meet TS 3.1.2.9 condition b, the following actions are required: • Isolate PMU to RCS • Rack out breaker for Charging pump A <u>or</u> B • Sample RCS every 45 minutes
Comment: Initially, neither TS 3.1.2.9 condition a nor b are met and action b applies (sample RCS within 1 hour and every 45 minutes thereafter). Once TS 3.1.2.9 condition b is met, action b no longer applies and neither do the actions of OP-903-090. It is not necessary for the applicant to state actions within procedure OP-901-103, Emergency Boration. TS 3.9.1 is not applicable for the given plant conditions.	**<u>Critical</u>** **SAT / UNSAT**

END OF TASK

ANSWER KEY (**Bold** font indicates values requiring correction)

10.5 K-EFFECTIVE CALCULATION

(Typical)

Step	Description	Value	Units
7.5.1.1	RCS BORON CONCENTRATION	900	PPM
7.5.1.2	T_{AVE}	400	^{o}F
7.5.1.3	CYCLE BURNUP (POINT ID C24110 OR EQUIVALENT)	200	EFPD
7.5.2	HZP INVERSE BORON WORTH	118	PPM/%Δk/k
7.5.3	NORMALIZED BORON WORTH FACTOR	1.14	
7.5.4	REQUIRED SHUTDOWN MARGIN BORON CONCENTRATION ATT. 10.1, STEP 7.1.3.4 OR ATT. 10.4, STEP 7.4.3.5 (CIRCLE ATTACHMENT USED)	876	PPM
7.5.5	T.S. SHUTDOWN MARGIN REQUIREMENT T.S. 3.1.1.1 OR 3.1.1.2	**1.5**	%Δk/k

7.5.6.1 ACTUAL PPM BORON ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.1.1(900) − step 7.5.4 (876) = 24 PPM

7.5.6.2 ADJUSTED INVERSE BORON WORTH

step 7.5.2 (118) ÷ step 7.5.3 (1.14) = 103.5 PPM/% ΔK/K

7.5.6.3 BORON REACTIVITY WORTH ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.6.1 (24) ÷ step 7.5.6.2 (103.5) = 0.232 %ΔK/K

7.5.6.4 TOTAL EXCESS REACTIVITY WORTH

step 7.5.5 (**1.5**) + step 7.5.6.3 (0.232) = **1.729 - 1.735** %ΔK/K

7.5.6.5 UNIT CONVERSION

step 7.5.6.4 (**1.729 - 1.735**) ÷ 100 = **0.01729 - 0.01735** ΔK/K

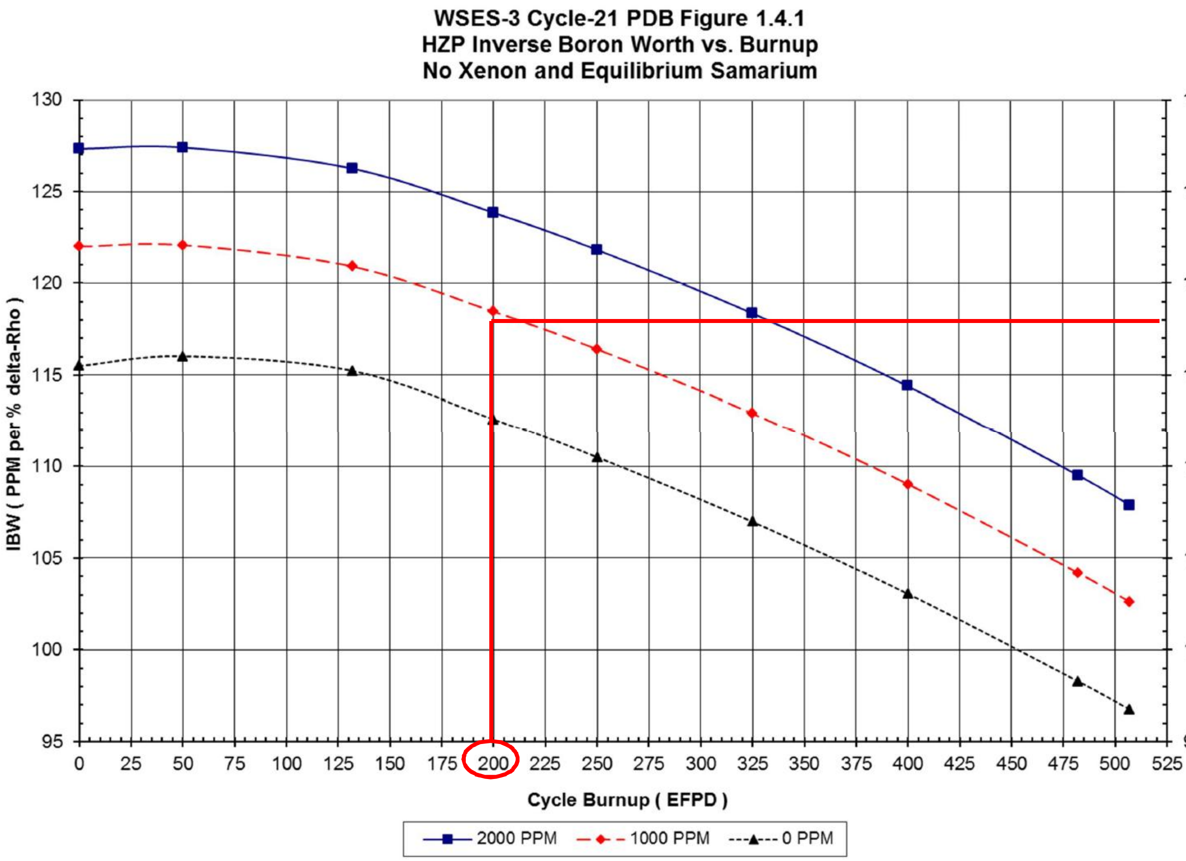
K-Effective Calculation

$$K_{EFF} = \frac{1}{1 + \text{step 7.5.6.5 } (\mathbf{0.01729 - 0.01735})} = \mathbf{0.982 - 0.984}$$

7.5.6.7 $K_{EFF} \leq K_{EFF}$ REQUIRED BY COLR YES NO (circle one)

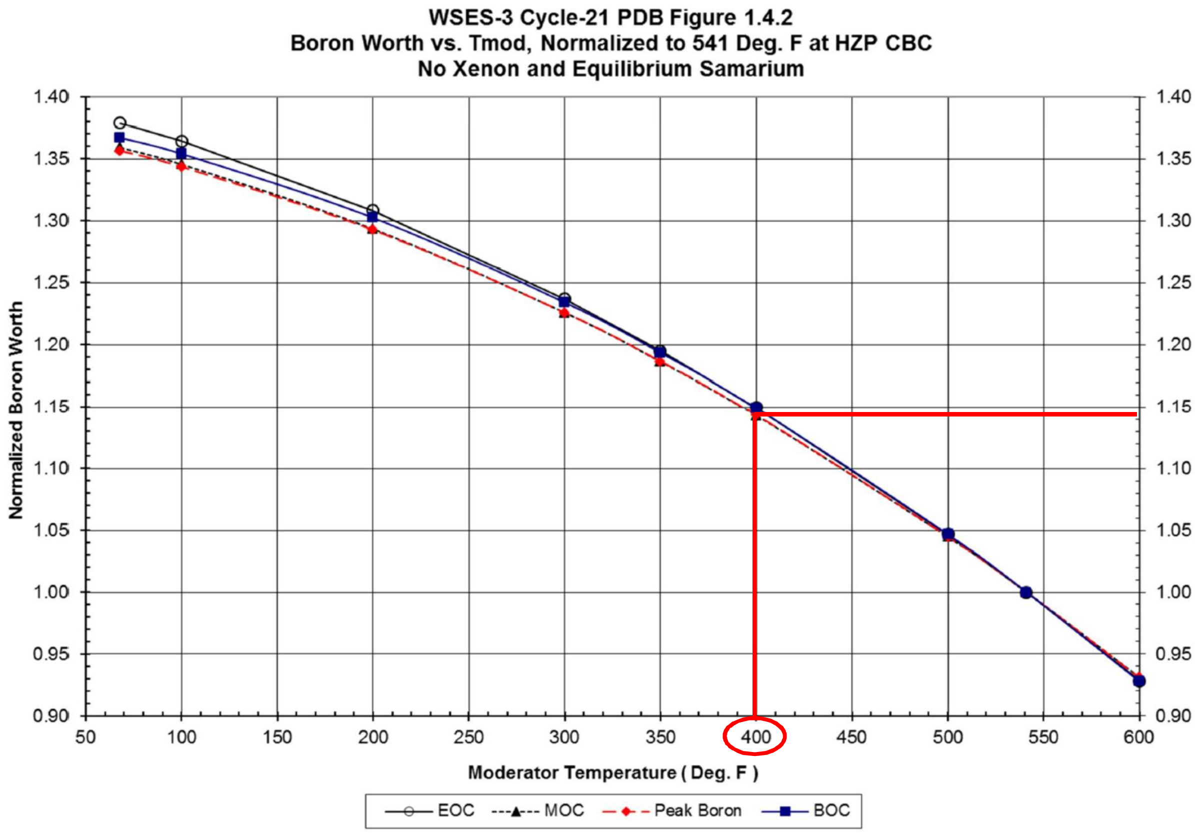
ANSWER KEY

ANSWER KEY



ANSWER KEY

ANSWER KEY



ANSWER KEY

SIMULATOR OPERATOR INSTRUCTIONS

None.

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- Plant is in MODE 3, all CEAs inserted
- RCS boron concentration is 900 PPM
- RCS Thot and Tcold are 400°F
- EFPD is 200 (MOC)
- Charging pumps A and B are running
- Charging pump AB circuit breaker is racked out
- A Shutdown Margin calculation was completed satisfactorily using OP-903-090 Attachment 10.1 and calculated to be 876 PPM.

- S/U Channel 1 fails, and the NPO performed a Keff calculation

INITIATING CUE(S):

Review the completed K-Effective calculation in accordance with OP-903-090, Shutdown Margin, Section 7.5, K-Effective Calculation, to verify that current plant conditions are in compliance with Tech Spec 3.1.2.9.

Document results and required actions, if any, on this cue sheet or on the handout(s) provided.

7.5 K-EFFECTIVE CALCULATION

CAUTION

R THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

NOTE

(1) Due to an inability to calculate Keff when CEA uncoupling begins in Mode 6, Reactor Engineering will supply a letter stating a Boron concentration that will meet the Keff requirements for Refueling. (This section is N/A when the letter is in place and CEA uncoupling has begun).

(2) When using graphs and tables in the Plant Data Book (PDB), to obtain the necessary data, it may be necessary and is acceptable to interpolate (approximate between data points or curves). However, extrapolation (approximation outside of the bounds of the data or curves) should not be used.

7.5.1 Enter the following current plant data on Attachment 10.5: (N/A this section if Reactor Engineering has supplied a letter with a Boron concentration that will meet the required Keff requirements for Refueling)

7.5.1.1 Current RCS Boron Concentration from latest Chemistry sample.

7.5.1.2 RCS T_{AVE}

7.5.1.3 Cycle Burnup (Point ID C24110 or equivalent).

7.5.2 Determine current HZP Inverse Boron Worth, using current EFPD and PDB Figure 1.4.1, HZP Inverse Boron Worth vs. Burnup.

7.5.3 Determine current Normalized Boron Worth, using temperature recorded in step 7.5.1.2 and PDB Figure 1.4.2, Normalized Boron Worth Versus Temperature Normalized to 541°F.

7.5.4 Obtain Required Shutdown Margin Boron Concentration from Attachment 10.1, step 7.1.3.4 or Attachment 10.4, step 7.4.3.5.7.5.4.1. Circle step number used on Attachment 10.5.

7.5.5 Obtain Required Shutdown Margin from T.S. 3.1.1.1 or 3.1.1.2.

7.5.6 Calculate K-Effective on Attachment 10.5 as follows:

7.5.6.1 Calculate Actual Boron Concentration above Shutdown Margin Requirement by subtracting value recorded in step 7.5.4 from value recorded in step 7.5.1.1.

7.5.6.2 Calculate Adjusted Inverse Boron Worth by dividing value recorded in step 7.5.2 by value recorded in step 7.5.3.

7.5.6.3 Calculate Boron Worth above Shutdown Margin Requirement by dividing value recorded in step 7.5.6.1 by value recorded in step 7.5.6.2.

7.5.6.4 Calculate Total Excess Reactivity Worth by adding value recorded in step 7.5.5 to value recorded in step 7.5.6.3.

7.5.6.5 Convert %K/K to ΔK/K by dividing value recorded in step 7.5.6.4 by 100.

7.5.6.6 Calculate K-Effective by dividing 1 by the sum of 1 + step 7.5.6.5.

7.5.6.7 Verify K-Effective less than or equal to that required by the COLR.

7.5.6.7.1 Designate Yes or No on Attachment 10.5.

R

7.5.7 If the requirements of Technical Specifications 3.1.2.9 or 3.9.1 are not met, then Commence Emergency Boration and go to OP-901-103, Emergency Boration.

10.5 K-EFFECTIVE CALCULATION

(Typical)

Step	Description	Value	Units
7.5.1.1	RCS BORON CONCENTRATION	*900*	PPM
7.5.1.2	T_{AVE}	*400*	^{o}F
7.5.1.3	CYCLE BURNUP (POINT ID C24110 OR EQUIVALENT)	*200*	EFPD
7.5.2	HZP INVERSE BORON WORTH	*118*	PPM/%Δk/k
7.5.3	NORMALIZED BORON WORTH FACTOR	*1.14*	
7.5.4	REQUIRED SHUTDOWN MARGIN BORON CONCENTRATION ATT. 10.1, STEP 7.1.3.4 OR ATT. 10.4, STEP 7.4.3.5 (CIRCLE ATTACHMENT USED)	*876*	PPM
7.5.5	T.S. SHUTDOWN MARGIN REQUIREMENT T.S. 3.1.1.1 OR 3.1.1.2	*2.5*	%Δk/k

7.5.6.1 ACTUAL PPM BORON ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.1.1(*900*) − step 7.5.4 (*876*) = ___*24*___PPM

7.5.6.2 ADJUSTED INVERSE BORON WORTH

step 7.5.2 (*118*) ÷ step 7.5.3 (*1.14*) = ___*103.5*___PPM/% ΔK/K

7.5.6.3 BORON REACTIVITY WORTH ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.6.1 (*24*) ÷ step 7.5.6.2 (*103.5*) = ___*0.232*___%ΔK/K

7.5.6.4 TOTAL EXCESS REACTIVITY WORTH

step 7.5.5 (*2.5*) + step 7.5.6.3 (*0.232*) = ___*2.732*___%ΔK/K

7.5.6.5 UNIT CONVERSION

step 7.5.6.4 (*2.732*) ÷ 100 = ___*0.02732*___ΔK/K

K-Effective Calculation

$$K_{EFF} = \frac{1}{1 + \text{step 7.5.6.5 (} 0.02732 \text{)}} = \underline{\quad 0.973 \quad}$$

7.5.6.7 $K_{EFF} \le K_{EFF}$ REQUIRED BY COLR YES NO (circle one)

K-EFFECTIVE CALCULATION (CONT'D)

REMARKS: *None*

Performed by:	*Jack B. Good* (Signature)	*Today* (Date)
IV of Calculations by:	*Cal Q. Lator* (Signature)	*Today* (Date)
SM/CRS Review:	(Signature)	/ (Date/Time)

REQUEST/APPROVAL PAGE

SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-903-090		REVISION: 305

TITLE: Shutdown Margin

PROCEDURE OWNER (Position Title) : Operations Manager - Support

TERM (check one) : ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 7/6/16

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

In Limitations 3.2.2 and 3.2.1, deleted specific EFPD ranges for the listed core life cycle periods (Beginning of Cycle (BOC) Peak Boron, Middle of Cycle (MOC), and End of Cycle (EOC)) and Plant Data Base figures. Also, in Limitation 3.2.2 clarified that ranges for these periods vary from cycle to cycle and (therefore) the current applicable range should normally be provided by RXE in the monthly Reactivity Management Plan. Currently the titles of the figures and tables in PDB-001 all refer to a single EFPD value and not a range over which the figures and tables are applicable. The previously stated EFPD ranges in this procedure have been inconsistent with the proper method of determining the ranges, which according to RXE should be based upon the mid ranges between the EFPD values upon which the figures and tables are based.

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			David R. Voisin	6/23/2016
EC SUPERVISOR		Administrative Review and Approval	(sign) [signature]	6-29-16
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Engineering - Reactor		Pamela Hernandez	6/23/2016
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐	PA Exclusion ☐	N/A	
TECHNICAL	Review ☐	Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐		N/A	
GROUP/DEPT. HEAD	Review ☐	Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Shutdown Margin shall be greater than or equal to that specified in the Core Operating Limits Report (COLR), as required by Technical Specification 3.1.1.1 or 3.1.1.2.

3.1.2 Shutdown Margin less conservative than specified by Technical Specification 3.1.1.1 or 3.1.1.2 is a Reportable Occurrence.

3.1.3 RHOBAL Program shall be used to determine initial Xenon Reactivity Worth if a Reactor Trip occurs during non-equilibrium Xenon conditions. Post-trip transient Xenon Worth may be obtained by running a RHOBAL poison transient in accordance with section 7.6, RHOBAL Poison Transient of this procedure or by contacting Reactor Engineering.

3.1.4 For worksheets which perform projections in the RHOBAL program, a poison transient must be performed to update the Xenon and Net Samarium worths. If manual Xenon and/or Net Samarium data is input, the projection will not be performed.

3.2 LIMITATIONS

3.2.1 Information from Plant Data Book (PDB) and Reactor Engineering Book is necessary to perform this procedure unless using RHOBAL. Figure numbers contained in this procedure refer to appropriate section of the PDB. When using graphs and tables in the Plant Data Book (PDB), to obtain the necessary data, it may be necessary and is acceptable to interpolate (approximate between data points or curves). However, extrapolation (approximation outside of the bounds of the data or curves) should not be used.

3.2.2 When using graphs and tables in the Plant Data Book (PDB-001), the core life cycle periods are defined as follows. The Effective Full Power Days (EFPD) ranges for these periods vary from cycle to cycle. The current applicable range should normally be provided by RXE in the monthly Reactivity Management Plan.

- Beginning of Cycle (BOC)
- Peak Boron
- Middle of Cycle (MOC)
- End of Cycle (EOC)

3.2.3 When using Xenon Worth graphs and tables in the Plant Data Book, use the figure or table associated with the current core life cycle period as listed below:

- Figure 1.6.1.1: BOC and Peak Boron
- Figure 1.6.1.2: MOC
- Figure 1.6.1.3: EOC

3.2.4 Column F of Attachment 11.1 of OP-004-019, Estimated Critical Configuration, can be used to satisfy Shutdown Margin in Mode 3 per either Technical Specification 4.1.1.1 (5.15% Δ k/k when Shutdown Bank CEAs are not fully inserted) or Technical Specification 4.1.1.2 (4.6% Δ k/k when all CEAs are fully inserted) as directed by OP-010-003, Plant Startup [CRs 98-0970, 01-0209]. This is done by verifying that the actual RCS boron concentration is no more than 20 ppm below Critical Boron Concentration of Column F, Att.11.1 and the question of "Allowable CEA Range is verified to be above Transient Insertion Limit for critical operations (Group 5 ≥ 60 inches)" is answered yes.

3.2.5 In the RHOBAL program when calculating Critical Boron Concentration, the adjusted boron concentration column of step 4.2 on Worksheet 1 for Critical Boron Concentration of OP-004-019, Estimated Critical Configuration, can be used to satisfy Shutdown Margin in Mode 3 per either Technical Specification 4.1.1.1 (5.15% Δ k/k when Shutdown Bank CEAs are not fully inserted) or Technical Specification 4.1.1.2 (4.6% Δ k/k when all CEAs are fully inserted) as directed by OP-010-003, Plant Startup [CRs 98-0970, 01-0209]. This is done by verifying that the Actual RCS Boron Concentration is no more than 20 ppm below the Estimated Critical Boron in step 4.2 of Worksheet 1 for Critical Boron Concentration, and the –0.5%Δk/k rod position in step 5.3 of Worksheet 1 for Critical Rod Position is above the Transient Insertion Limit for critical operations (Group 5 ≥ 60 inches).

3.2.6 In the RHOBAL program, if an input parameter is beyond the range of the cycle specific input database, a warning message is printed on the screen and/or the error log. This is intended to prevent performing a calculation outside the analyzed window.

3.2.7 In the RHOBAL program, screen minimization is not allowed. When the calculations are completed on a particular screen, it must be closed for control to return to a previous screen.

3.2.8 Changes to this procedure shall be reviewed by the Reactor Engineering (RE) Department prior to approval. **[P-21855]**

6.0 ACCEPTANCE CRITERIA

6.1 Shutdown Margin is ≥ that specified in the COLR by either:
[T.S. 3.1.1.2, T.S. 4.1.1.1.1.a, T.S. 4.1.1.1.1.e]

6.1.1 Current Boron Concentration is ≥ Shutdown Margin Boron Concentration.

<u>or</u>

6.1.2 <u>If</u> Reactor is critical with <u>no</u> Untrippable CEAs, <u>and all</u> CEAs are above Transient Insertion Limit. (Operation outside the Transient Insertion Limit is allowed up to two hours per Technical Specification 3.1.3.6).

<u>or</u>

6.1.3 For Dropped <u>or</u> Untrippable CEA, Current Power Level is ≤ Shutdown Margin Allowed Power Level.

6.1.4 Current Shutdown Margin is ≥ required Shutdown Margin.

7.5 K-EFFECTIVE CALCULATION

CAUTION

R THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

NOTE

(1) Due to an inability to calculate Keff when CEA uncoupling begins in Mode 6, Reactor Engineering will supply a letter stating a Boron concentration that will meet the Keff requirements for Refueling. (This section is N/A when the letter is in place and CEA uncoupling has begun).

(2) When using graphs and tables in the Plant Data Book (PDB), to obtain the necessary data, it may be necessary and is acceptable to interpolate (approximate between data points or curves). However, extrapolation (approximation outside of the bounds of the data or curves) should not be used.

7.5.1 Enter the following current plant data on Attachment 10.5: (N/A this section if Reactor Engineering has supplied a letter with a Boron concentration that will meet the required Keff requirements for Refueling)

7.5.1.1 Current RCS Boron Concentration from latest Chemistry sample.

7.5.1.2 RCS T_{AVE}

7.5.1.3 Cycle Burnup (Point ID C24110 or equivalent).

7.5.2 Determine current HZP Inverse Boron Worth, using current EFPD and PDB Figure 1.4.1, HZP Inverse Boron Worth vs. Burnup.

7.5.3 Determine current Normalized Boron Worth, using temperature recorded in step 7.5.1.2 and PDB Figure 1.4.2, Normalized Boron Worth Versus Temperature Normalized to 541°F.

7.5.4 Obtain Required Shutdown Margin Boron Concentration from Attachment 10.1, step 7.1.3.4 or Attachment 10.4, step 7.4.3.5.7.5.4.1. Circle step number used on Attachment 10.5.

7.5.5 Obtain Required Shutdown Margin from T.S. 3.1.1.1 or 3.1.1.2.

7.5.6 Calculate K-Effective on Attachment 10.5 as follows:

7.5.6.1 Calculate Actual Boron Concentration above Shutdown Margin Requirement by subtracting value recorded in step 7.5.4 from value recorded in step 7.5.1.1.

7.5.6.2 Calculate Adjusted Inverse Boron Worth by dividing value recorded in step 7.5.2 by value recorded in step 7.5.3.

7.5.6.3 Calculate Boron Worth above Shutdown Margin Requirement by dividing value recorded in step 7.5.6.1 by value recorded in step 7.5.6.2.

7.5.6.4 Calculate Total Excess Reactivity Worth by adding value recorded in step 7.5.5 to value recorded in step 7.5.6.3.

7.5.6.5 Convert %K/K to ΔK/K by dividing value recorded in step 7.5.6.4 by 100.

7.5.6.6 Calculate K-Effective by dividing 1 by the sum of 1 + step 7.5.6.5.

7.5.6.7 Verify K-Effective less than or equal to that required by the COLR.

7.5.6.7.1 Designate Yes or No on Attachment 10.5.

R

7.5.7 If the requirements of Technical Specifications 3.1.2.9 or 3.9.1 are not met, then Commence Emergency Boration and go to OP-901-103, Emergency Boration.

10.5 K-EFFECTIVE CALCULATION

(Typical)

Step	Description	Value	Units
7.5.1.1	RCS BORON CONCENTRATION		PPM
7.5.1.2	T_{AVE}		^oF
7.5.1.3	CYCLE BURNUP (POINT ID C24110 OR EQUIVALENT)		EFPD
7.5.2	HZP INVERSE BORON WORTH		PPM/%Δk/k
7.5.3	NORMALIZED BORON WORTH FACTOR		
7.5.4	REQUIRED SHUTDOWN MARGIN BORON CONCENTRATION ATT. 10.1, STEP 7.1.3.4 OR ATT. 10.4, STEP 7.4.3.5 (CIRCLE ATTACHMENT USED)		PPM
7.5.5	T.S. SHUTDOWN MARGIN REQUIREMENT T.S. 3.1.1.1 OR 3.1.1.2		%Δk/k

7.5.6.1 ACTUAL PPM BORON ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.1.1( ) − step 7.5.4 ( ) = ________________PPM

7.5.6.2 ADJUSTED INVERSE BORON WORTH

step 7.5.2 ( ) ÷ step 7.5.3 ( ) = ______________PPM/% ΔK/K

7.5.6.3 BORON REACTIVITY WORTH ABOVE SHUTDOWN MARGIN REQUIREMENT

step 7.5.6.1 ( ) ÷ step 7.5.6.2 ( ) = __________________%ΔK/K

7.5.6.4 TOTAL EXCESS REACTIVITY WORTH

step 7.5.5 ( ) + step 7.5.6.3 ( ) = __________________%ΔK/K

7.5.6.5 UNIT CONVERSION

step 7.5.6.4 ( ) ÷ 100 = ___________________ΔK/K

K-Effective Calculation

$$K_{EFF} = \frac{1}{1 + \text{step 7.5.6.5 (} \quad \text{)}} = \underline{\qquad\qquad\qquad}$$

7.5.6.7 $K_{EFF} \leq K_{EFF}$ REQUIRED BY COLR YES NO

(circle one)

REMARKS: ____

Performed by: ______________________ (Signature) ____________ (Date)

IV of Calculations by: ______________________ (Signature) ____________ (Date)

SM/CRS Review: ______________________ (Signature) ______ / ______ (Date/Time)

CYCLE 21 PLANT DATA BOOK

Data provided is compiled from EC 58032 and 61508 which issue the Physics Data Book and Reactivity Balance Update, which combined comprise the Plant Data Book Volume 1. Approvals of PDB and RBU are documented in the respective ECs

WSES-3 Cycle 21

Physics Data Book

Table 1.4.1

Inverse Boron Worth vs. Burnup,
HZP, Tavg = 541 °F, No Xenon and Equilibrium Samarium

(PPM/%Δρ)

PPM	<--				**EFPD**				-->
	0	**50**	**132**	**200**	**250**	**325**	**400**	**482**	**507**
0	115.505	116.028	115.237	112.629	110.501	106.974	103.047	98.295	96.751
200	116.898	117.298	116.401	113.831	111.723	108.214	104.290	99.524	97.972
400	118.244	118.539	117.551	115.015	112.925	109.432	105.509	100.729	99.169
600	119.544	119.750	118.688	116.182	114.108	110.628	106.705	101.910	100.343
800	120.796	120.931	119.810	117.331	115.270	111.801	107.877	103.067	101.493
1000	122.002	122.083	120.919	118.463	116.413	112.952	109.026	104.201	102.620
1200	123.161	123.206	122.013	119.576	117.536	114.080	110.151	105.311	103.723
1400	124.274	124.299	123.094	120.673	118.639	115.187	111.252	106.398	104.803
1600	125.340	125.363	124.161	121.751	119.722	116.271	112.330	107.461	105.860
1800	126.358	126.398	125.213	122.812	120.785	117.333	113.385	108.500	106.893
2000	127.331	127.403	126.252	123.855	121.829	118.373	114.416	109.516	107.903

WSES-3 Cycle 21

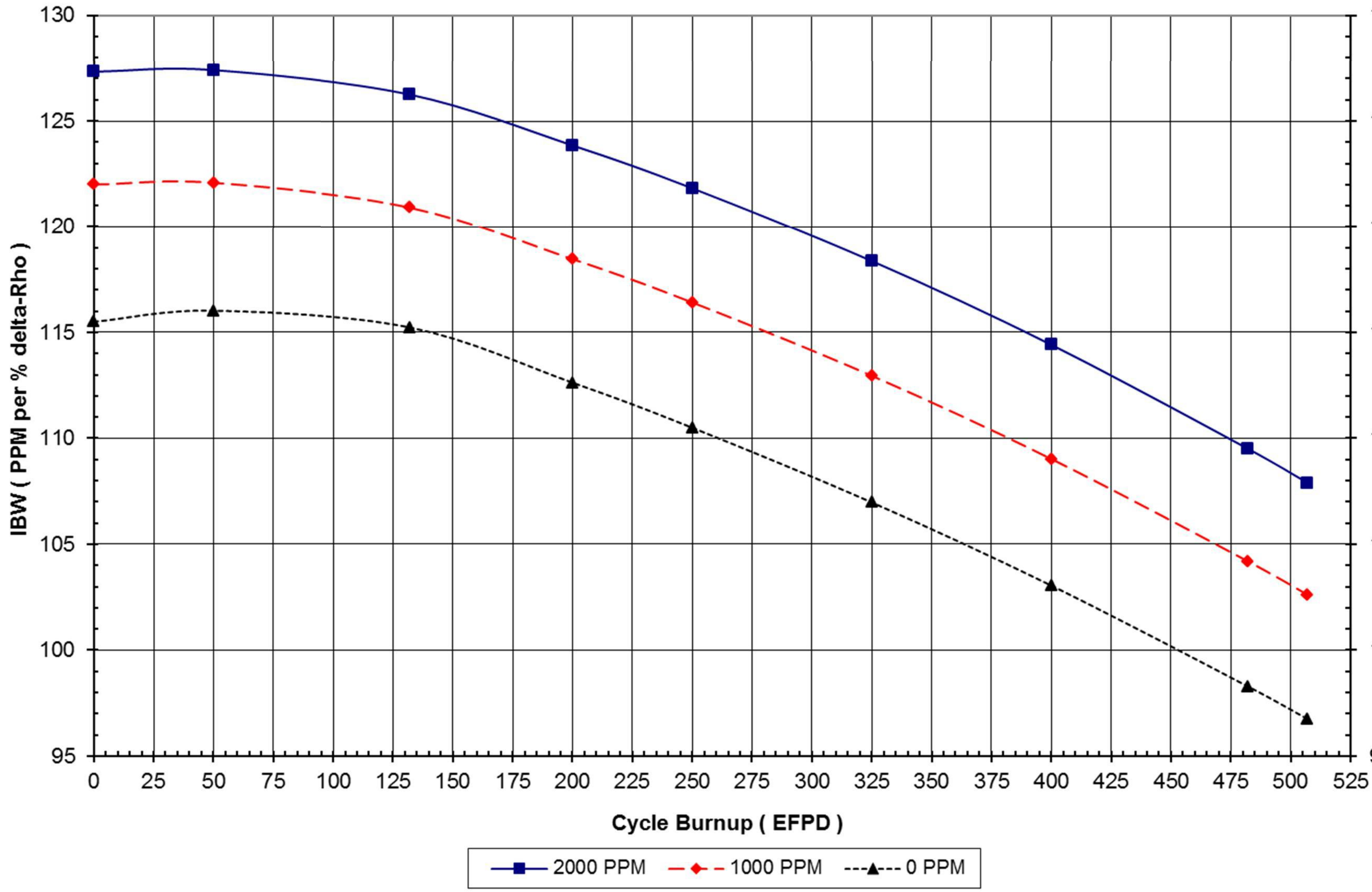
Physics Data Book

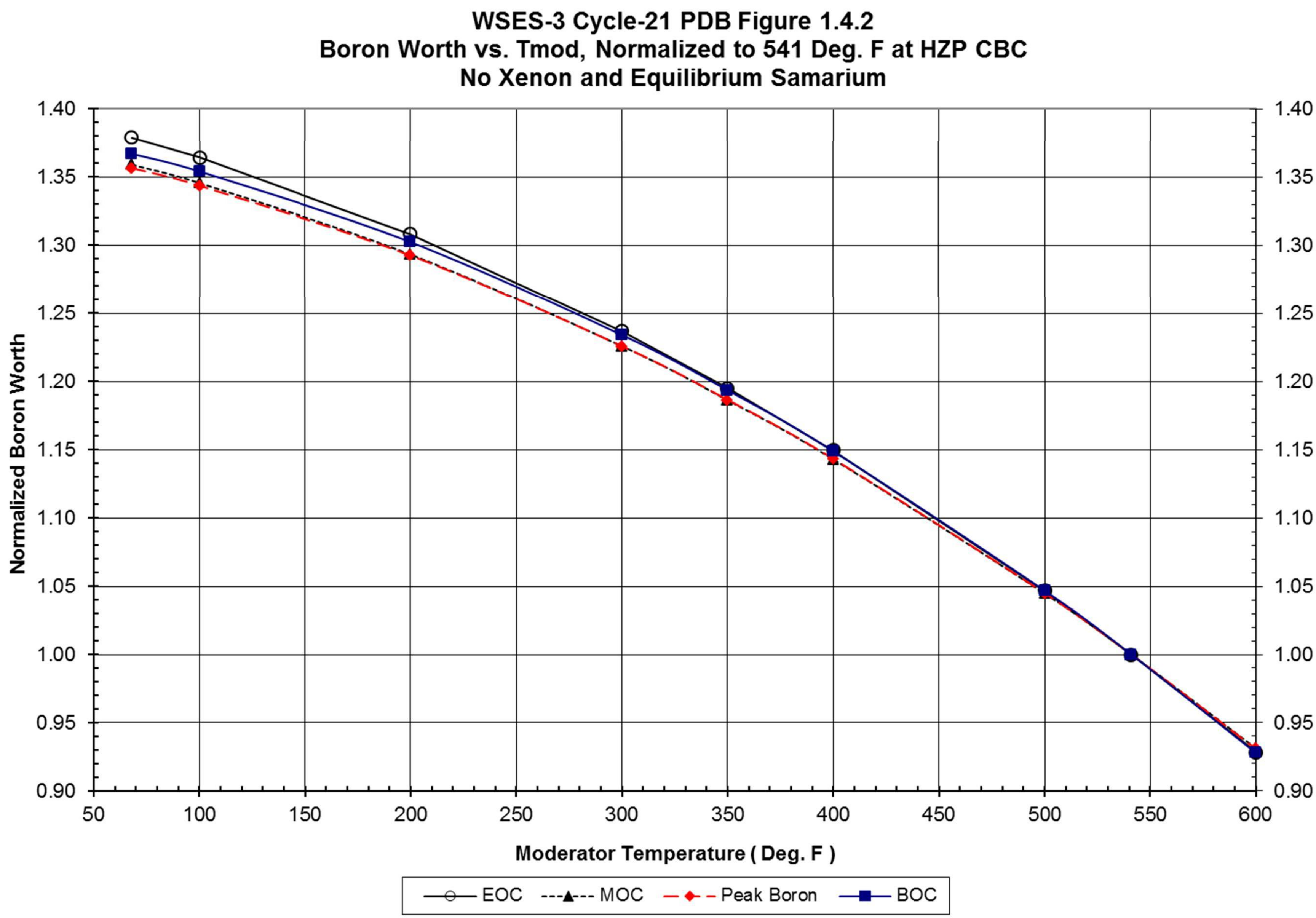
Table 1.4.2

Boron Worth vs. Moderator Temperature,
Normalized to 541 °F at HZP CBC,
No Xenon and Equilibrium Samarium

Temp	**EFPD**=>	12.5	132	250	507
(Deg. F)	**PPM**=>	1209	1510	1368	601
68		1.3671	1.3567	1.3591	1.3791
100		1.3541	1.3437	1.3456	1.3645
200		1.3025	1.2927	1.2934	1.3083
300		1.2341	1.2259	1.2258	1.2366
350		1.1935	1.1866	1.1863	1.1950
400		1.1488	1.1433	1.1429	1.1494
500		1.0467	1.0449	1.0447	1.0466
541		1.0000	1.0000	1.0000	1.0000
600		0.9278	0.9307	0.9312	0.9283

WSES-3 Cycle-21 PDB Figure 1.4.1
HZP Inverse Boron Worth vs. Burnup
No Xenon and Equilibrium Samarium




WSES-3 Cycle-21 PDB Figure 1.4.2
Boron Worth vs. Tmod, Normalized to 541 Deg. F at HZP CBC
No Xenon and Equilibrium Samarium
Normalized Boron Worth
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.90
50
100
150
200
250
300
350
400
450
500
550
600
Moderator Temperature (Deg. F)
EOC
MOC
Peak Boron
BOC

BORON DILUTION

LIMITING CONDITION FOR OPERATION

3.1.2.9 Boron concentration shall be verified consistent with SHUTDOWN MARGIN requirements of Specifications 3.1.1.1, 3.1.1.2, and 3.9.1. Boron dilution events shall be precluded by either "a" or "b" below.

a. 1. Two boron dilution alarms (startup channel high neutron flux) shall be OPERABLE with the alarms set in accordance with Specification 4.1.2.9.5

and

2. i. If the plant is in MODE 4, then remove power to at least one charging pump.

ii. If the plant is in MODE 5 with $k_{eff} \leq 0.97$, then remove power to at least one charging pump.

iii. If the plant is in MODE 5 with $k_{eff} > 0.97$, then remove power to at least two charging pumps.

iv. If the plant is in MODE 6, then remove power to at least two charging pumps.

OR

b. 1. The primary makeup water flow path to the reactor coolant system shall be isolated

and

2. Do not operate the plant in the configurations prohibited by the COLR for the current MODE.

APPLICABILITY: MODES 3*, 4, 5, and 6.

*While any shutdown CEA is less than 145 inches withdrawn.

ACTION:

a. With the boron concentration not consistent with required SHUTDOWN MARGIN, initiate emergency boration.

b. With one boron dilution alarm inoperable and the primary makeup water flow path to the reactor coolant system not isolated, determine reactor coolant system boron concentration within one hour and at least at the monitoring frequency specified in the COLR.

c. With both boron dilution alarms inoperable and the primary makeup water flow path to the reactor coolant system not isolated, determine the reactor coolant system boron concentration by two independent means within one hour and at least at the monitoring frequency specified in the COLR; otherwise, immediately suspend all operations involving positive reactivity changes or CORE ALTERATIONS (if applicable).

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

d. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.1.2.9.1 The provisions of Specification 4.0.4 are not applicable for entry into MODE 3 from MODE 2.

4.1.2.9.2 Each required boron dilution alarm shall be demonstrated OPERABLE by the performance of a CHANNEL CHECK at least once per 12 hours, a CHANNEL FUNCTIONAL TEST at least once per 31 days, and a CHANNEL CALIBRATION at least once per 18 months.

4.1.2.9.3 If the primary makeup water flow path to the Reactor Coolant System is isolated to fulfill 3.1.2.9.b, the required primary makeup water flow path to the Reactor Coolant System shall be verified to be isolated by either locked closed manual valves, deactivated automatic valves secured in the isolation position, or by power being removed from all charging pumps, at least once per 24 hours.

4.1.2.9.4 The requirements of Specification 3.1.2.9.a.2 or 3.1.2.9.b.2 shall be verified at least once per 24 hours.

4.1.2.9.5 Each required boron dilution alarm setpoint shall be adjusted to less than or equal to the existing neutron flux (cps) multiplied by the value specified in the COLR, at the frequencies specified in the COLR.

ENTERGY NUCLEAR

Engineering Report Cover Sheet

Engineering Report Title:

WSES-3 Cycle 21 Core Operating Limits Report

Engineering Report Type:

New ☒ Revision ☐ Cancelled ☐ Superseded ☐
Superseded by:________________

Applicable Site(s)

IP1	☐	IP2	☐	IP3	☐	JAF	☐	PNPS	☐	VY	☐	WPO	☐
ANO1	☐	ANO2	☐	ECH	☐	GGNS	☐	RBS	☐	WF3	☒	PLP	☐

EC No. 54054

Report Origin: ☒ Entergy ☐ Vendor

Vendor Document No.: ____________

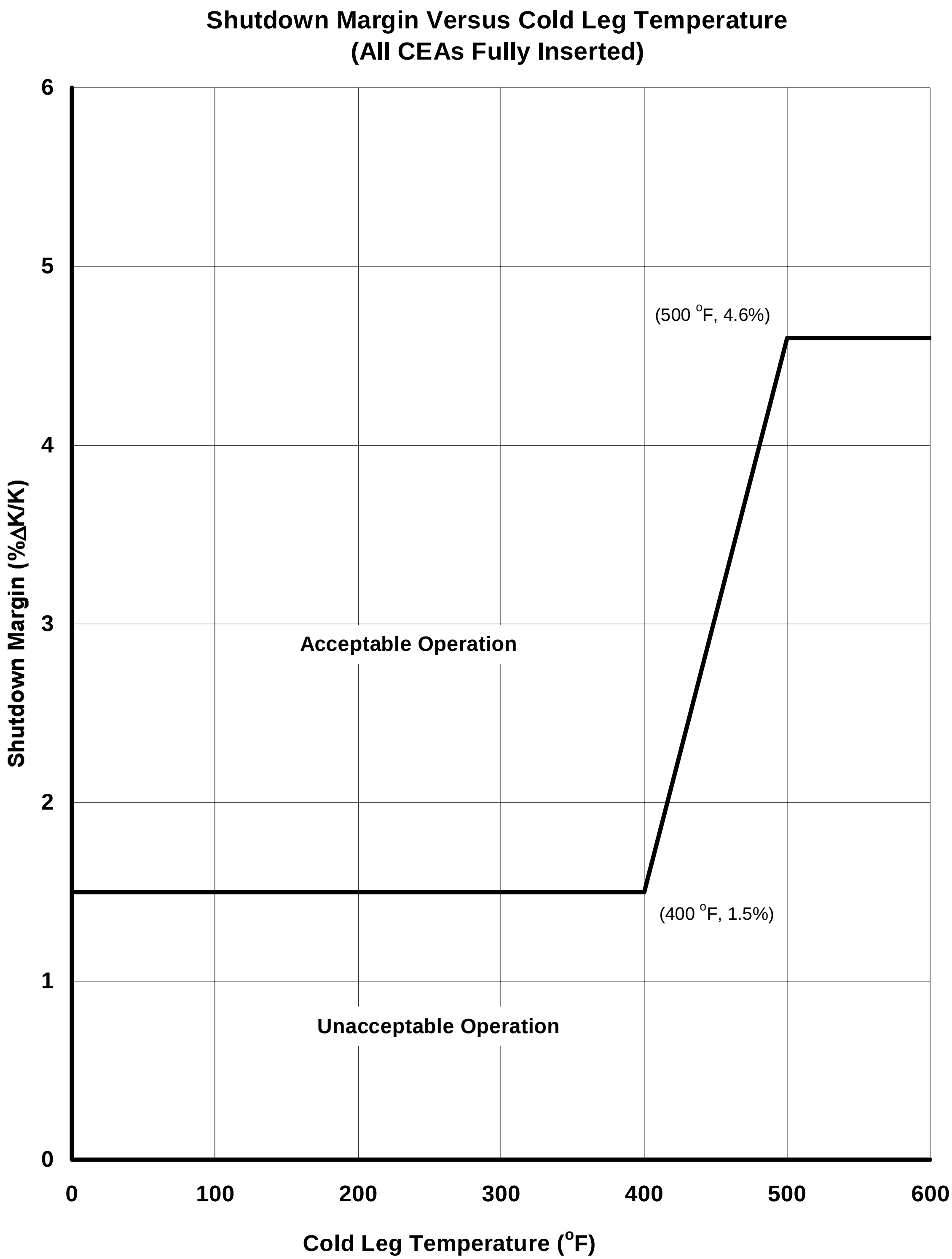
Quality-Related: ☒ Yes ☐ No

Prepared by: C. G. Eastus / See EC 54054 Date: See EC 54054
Responsible Engineer (Print Name/Sign)

Design Verified: R. E Griffith / See EC 54054 Date: See EC 54054
Design Verifier (if required) (Print Name/Sign)

Reviewed by: N/A Date: N/A
Reviewer (Print Name/Sign)

Approved by: F. H. Smith / See EC 54054 Date: See EC 54054
Supervisor / Manager (Print Name/Sign)



COLR Figure 1

BORON DILUTION

3.1.2.9 See COLR Tables 1 through 5 for required RCS boron concentration monitoring frequencies and Charging Pump operation limits.

SURVEILLANCE REQUIREMENTS

Each required boron dilution alarm shall be adjusted to less than or equal to 1.75 times (1.75x) the existing neutron flux (cps) at the following frequencies:

a. No sooner than one half hour after shutdown and no later than 1 hour after shutdown.

b. At least once per one-half (1/2) hour if the reactor has been shut down ≥ 0.5 hour but < 2 hours

c. At least once per hour if the reactor has been shutdown ≥ 2 hours but < 10 hours.

d. At least once per 5 hours if the reactor has been shut down ≥ 10 hours but < 25 hours.

e. At least once per 24 hours if the reactor has been shut down ≥ 25 hours but < 21 days.

f. At least once per 7 days, if the reactor has been shutdown ≥21 days.

COLR TABLE 1

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} GREATER THAN 0.98

$K_{eff} > 0.98$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	0.75 hours	Operation not allowed **	
4	12 hours	Operation not allowed **		
5 RCS filled	8 hours	Operation not allowed **		
5 RCS partially drained	8 hours	Operation not allowed **		
6	Operation not allowed **			

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

COLR TABLE 2

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} GREATER THAN 0.97 AND LESS THAN OR EQUAL TO 0.98

$0.98 \geq K_{eff} > 0.97$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	2.0 hours	0.5 hours	Operation not allowed**
4	12 hours	0.75 hours	Operation not allowed**	
5 RCS filled	8 hours	0.75 hours	Operation not allowed**	
5 RCS partially drained	8 hours	0.5 hours	Operation not allowed**	
6		Operation not allowed**		

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

COLR TABLE 3

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} GREATER THAN 0.96 AND LESS THAN OR EQUAL TO 0.97

$$0.97 \geq K_{eff} > 0.96$$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	3.0 hours	1.25 hours	0.5 hours
4	12 hours	1.5 hours	Operation not allowed**	
5 RCS filled	8 hours	1.5 hours	Operation not allowed**	
5 RCS partially drained	8 hours	0.75 hours	Operation not allowed**	
6		Operation not allowed**		

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

COLR TABLE 4

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} GREATER THAN 0.95 AND LESS THAN OR EQUAL TO 0.96

$0.96 \geq K_{eff} > 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	4.0 hours	2.0 hours	1.0 hours
4	12 hours	2.25 hours	0.75 hours	Operation not allowed**
5 RCS filled	8 hours	2.0 hours	0.75 hours	Operation not allowed**
5 RCS partially drained	8 hours	2.0 hours	0.5 hours	Operation not allowed**
6		Operation not allowed**		

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

COLR TABLE 5

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} LESS THAN OR EQUAL TO 0.95

$K_{eff} \leq 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	5.0 hours	2.0 hours	1.0 hours
4	12 hours	2.75 hours	1.0 hours	Operation not allowed**
5 RCS filled	8 hours	3.0 hours	1.0 hours	0.5 hours
5 RCS partially drained	8 hours	2.5 hours	0.75 hours	Operation not allowed**
6	24 hours	2.25 hours	0.5 hours	Operation not allowed**

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

Waterford 3

2017 SRO NRC Exam

JOB PERFORMANCE MEASURE

A8

Plan Work and Assign Workers Based on Dose Rates and Shielding

Applicant: ________________________________

Examiner: ________________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Plan Work and Assign Workers Based on Dose Rates and Shielding

Task Standard: Applicant calculates dose with and without shielding, and calculates that 1 team (2 workers) is required, and directs job to 1 team without shielding installed.

References: N/A

Alternate Path: No Time Critical: No Validation Time: 10 min

K/A 2.3.14 Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.

Importance Rating 3.8
SRO

Applicant: ____________________

Time Start: ____________ Time Finish: ____________

Performance Time: ____________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____________________

____

____

Examiner: ____________________ Date: ____________
Signature

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Tools/Equipment/Procedures Needed:

- None

Description:
This JPM has the applicant calculate dose and assign non-licensed operators to vent Safety Injection piping in Safeguards Room A. Given dose rate with and without shielding installed, time to install shielding, and job completion time using 1 team of operators or using 2 teams of operators, determine proper job assignment.

READ TO APPLICANT

DIRECTION TO APPLICANT:

Each administrative JPM has a cue sheet with the instructions for that JPM. Each administrative JPM stands alone, and conditions from 1 JPM do not carry over to any other JPM. If you have any questions, raise your hand and I will come to your desk.

Provide all answers on the sheets provided.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

TASK ELEMENT 1	STANDARD
Calculate dose for 1 team (2 workers) with no shielding installed.	Applicant calculated 437 to 438 mrem total dose.
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 2	STANDARD
Calculate dose for 2 teams (4 workers) with no shielding installed.	Applicant calculated 466 to 467 mrem total dose.
Comment: EXAMINER NOTE: Applicant may calculate that 1 team is 150 work-minutes and 2 teams are 160 work-minutes, and therefore not calculate 2-team dose.	**SAT / UNSAT**

TASK ELEMENT 3	STANDARD
Calculate dose to install & remove shielding.	Applicant calculated 204 to 205 mrem total dose.
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
Calculate dose for 1 team (2 workers) with shielding installed.	Applicant calculated 441 to 442 mrem total dose.
Comment: Performing the work with 1 team (2 workers) will result in 237.5 mrem + 204.2 mrem = total dose of 441.7 mrem	**Critical** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
Calculate dose for 2 workers with shielding installed.	Applicant calculated 457 to 458 mrem total dose.
Comment: Performing the job with 2 teams (4 workers) will result in 253.3 mrem + 204.2 mrem = total dose of 457.5 mrem EXAMINER NOTE: Applicant may calculate that 1 team is 150 work-minutes and 2 teams are 160 work-minutes, and therefore not calculate 2-team dose.	**SAT / UNSAT**

TASK ELEMENT 6	STANDARD
Applicant assigns job.	Job assigned to 1 team (2 workers) without shielding installed.
Comment: 1 Team no shielding = 437 to 438 mrem 2 Teams no shielding = 466 to 467 mrem 1 Team with shielding = 441 to 442 mrem 2 Teams with shielding = 457 to 458 mrem	**<u>Critical</u>** **SAT / UNSAT**

END OF TASK

SIMULATOR OPERATOR INSTRUCTIONS

None.

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

Refuel is in progress and Safety Injection Train A is being aligned from its Shutdown Cooling alignment to its Safety Injection alignment. You are the Work Management Center SRO and have been assigned to coordinate the venting of Safety Injection Train A.

- The dose rates in Safeguards Room A are 175 mrem/hour unshielded.
- Installing shielding will reduce the dose rate to 95 mrem/hour.
- It will take 2 workers a total of 35 minutes to install and remove the shielding (35 minutes each worker).
- It will take 1 team (2 workers) 75 minutes to complete the venting (75 minutes each worker).
- It will take 2 teams (4 workers) 40 minutes to complete the venting (40 minutes each worker).

How will you direct the execution of the Safety Injection System venting to allow the least amount of total worker dose? Show all calculations to support your answer.

Waterford 3

2017 SRO NRC Exam

JOB PERFORMANCE MEASURE

A9

Classify an Emergency Event

Applicant: ______________________________

Examiner: ______________________________

JPM A-9

JPM has been redacted due to potential SUNSI – Security Related Information concerns.

Facility: **Waterford 3**		Date of Examination:	**Mar 27, 2017**
Exam Level RO ☒ SRO-I ☐ SRO-U ☐		Operating Test No.:	1

Control Room Systems:* 8 for RO; 7 for SRO-I; 2 or 3 for SRO-U

	System / JPM Title	Type Code*	Safety Function
S1	001 Control Rod Drive System Place Reactor Cutback (RXC) in service and perform Immediate Operator Actions following a Cutback with unanalyzed rod configuration. **Alt. Path:** Feedwater pump will trip resulting in a RXC. During the cutback, an incorrect CEA will drop. GEN 2.4.49 The ability to perform without reference to procedures those actions that require immediate operation of system components and controls. RO – 4.6, SRO – 4.4	A,D,S	1
S2	006 Emergency Core Cooling System Reduce RCS pressure and use High Pressure Safety Injection Pumps to restore Pressurizer level in accordance with OP-901-112, Charging or Letdown Malfunction. A1.18 PZR level and pressure RO – 4.0, SRO – 4.3	D,L,S	3
S3	003 Reactor Coolant Pump System Perform a Reactor Coolant Pump Shutdown in accordance with OP-001-002, Reactor Coolant Pump Operation. **(2014 NRC Exam)** **Alt. Path:** Reactor Coolant pump reverse rotates requiring stopping of remaining Reactor Coolant Pumps. **(W3 OE)** A2.02 Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP RO – 3.7, SRO – 3.9	A,D,L,P,S	4P
S4	061 Emergency Feedwater System Reset EFW Pump AB after Overspeed Trip in accordance with OP-009-003, Emergency Feedwater (Control Room actions) GEN EPE 074 EA1.07 AFW System RO – 4.2, SRO – 4.3	EN,L,N,S	4S
S5	022 Containment Cooling System Perform OP-903-037, Containment Cooling Fans Operability Verification A4.01 CCS Fans RO – 3.6, SRO – 3.6	D,S	5
S6	064 Emergency Diesel Generator (ED/G) System Parallel Emergency Diesel Generator A for EDG testing in accordance with OP-009-002, Emergency Diesel Generator. **Alt. Path:** After EDG A load is raised, EDG A load will rise without manipulation requiring a trip of EDG A. A4.06 Manual start, loading, and stopping of the ED/G RO – 3.9, SRO – 3.9	A,D,S	6

S7	012 Reactor Protection System Reset High Containment Pressure ESFAS trip in accordance with OP-902-009, EOP Standard Appendices, Att. 5-D. A4.04 Bistable, trips, reset and test switches RO – 3.3, SRO – 3.3	EN,L,N,S	7
S8	008 Component Cooling Water System Split CCW headers in accordance with OP-901-510, CCW System Malfunction, Section E2, step 8. A4.01 CCW indications and controls RO – 3.3, SRO – 3.1	N,S	8

In-Plant Systems * (3 for RO; (3 for SRO-I); (3 or 2 for SRO-U)			
P1	076 Service Water System (ACCW) Transfer EFW Pump Suctions to Wet Cooling Tower after Condensate Storage Pool Depletion using EOP OP-902-009, Standard Appendices, Attachment 10 **(Top 10 PSA Action)** K1.20 AFW RO – 3.4, SRO – 3.4	D,E,L,R	4S
P2	064 Electrical Diesel Generators Reset EDG A following an overspeed trip with a LOOP in accordance with OP-009-002, Emergency Diesel Generator, Section 8.8. EPE 055 EA1.06 Restoration of power with one ED/G RO – 4.1, SRO – 4.5	D,E,L,R	6
P3	006 Emergency Core Cooling System Isolate RWSP from Purification in accordance with OP-902-009, EOP Standard Appendices, Att. 40. **Alt. Path:** FS-423, RWSP Suction Isolation is unable to be closed EPE 011 EK3.12 Actions contained in EOP for emergency LOCA (large break) RO – 4.4, SRO – 4.6	A,E,L,N,R	2

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all five SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for **<u>RO</u>** / SRO-I / SRO-U	
(A)lternate path	4-6 / 4-6 / 2-3	4
(C)ontrol room		0
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4	7
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1	3
(EN)gineered safety feature	≥1 / ≥1 / ≥1 (control room system)	2
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1	7
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1	4
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	1
(R)CA	≥ 1 / ≥ 1 / ≥ 1	3
(S)imulator		8

Facility: **Waterford 3**		Date of Examination: **Mar 27, 2017**	
Exam Level RO ☐ SRO-I ☒ SRO-U ☐		Operating Test No.: 1	

Control Room Systems:* 8 for RO; 7 for SRO-I; 2 or 3 for SRO-U

	System / JPM Title	Type Code*	Safety Function
S1	001 Control Rod Drive System Place Reactor Cutback (RXC) in service and perform Immediate Operator Actions following a Cutback with unanalyzed rod configuration. **Alt. Path:** Feedwater pump will trip resulting in a RXC. During the cutback, an incorrect CEA will drop. GEN 2.4.49 The ability to perform without reference to procedures those actions that require immediate operation of system components and controls. RO – 4.6, SRO – 4.4	A,D,S	1
S2	006 Emergency Core Cooling System Reduce RCS pressure and use High Pressure Safety Injection Pumps to restore Pressurizer level in accordance with OP-901-112, Charging or Letdown Malfunction. A1.18 PZR level and pressure RO – 4.0, SRO – 4.3	D,L,S	3
S3	003 Reactor Coolant Pump System Perform a Reactor Coolant Pump Shutdown in accordance with OP-001-002, Reactor Coolant Pump Operation. **(2014 NRC Exam)** **Alt. Path:** Reactor Coolant pump reverse rotates requiring stopping of remaining Reactor Coolant Pumps. A2.02 Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP RO – 3.7, SRO – 3.9	A,D,L,P,S	4P
S4	061 Emergency Feedwater System Reset EFW Pump AB after Overspeed Trip in accordance with OP-009-003, Emergency Feedwater (Control Room actions) GEN EPE 074 EA1.07 AFW System RO – 4.2, SRO – 4.3	EN,L,N,S	4S
S5			
S6	064 Emergency Diesel Generator (ED/G) System Parallel Emergency Diesel Generator A for EDG testing in accordance with OP-009-002, Emergency Diesel Generator. **Alt. Path:** After EDG A load is raised, EDG A load will rise without manipulation requiring a trip of EDG A. A4.06 Manual start, loading, and stopping of the ED/G RO – 3.9, SRO – 3.9	A,D,S	6
S7	012 Reactor Protection System Reset High Containment Pressure ESFAS trip in accordance with OP-902-009, EOP Standard Appendices, Att. 5-D. A4.04 Bistable, trips, reset and test switches RO – 3.3, SRO – 3.3	EN,L,N,S	7

S8	008 Component Cooling Water System Split CCW headers in accordance with OP-901-510, CCW System Malfunction, Section E2, step 8. A4.01 CCW indications and controls RO – 3.3, SRO – 3.1	N,S	8

In-Plant Systems * (3 for RO; (3 for SRO-I); (3 or 2 for SRO-U)			
P1	076 Service Water System (ACCW) Transfer EFW Pump Suctions to Wet Cooling Tower after Condensate Storage Pool Depletion using EOP OP-902-009, Standard Appendices, Attachment 10 **(Top 10 PSA Action)** K1.20 AFW RO – 3.4, SRO – 3.4	D,E,L,R	4S
P2	064 Electrical Diesel Generators Reset EDG A following an overspeed trip with a LOOP in accordance with OP-009-002, Emergency Diesel Generator, Section 8.8. EPE 055 EA1.06 Restoration of power with one ED/G RO – 4.1, SRO – 4.5	D,E,L,R	6
P3	006 Emergency Core Cooling System Isolate RWSP from Purification in accordance with OP-902-009, EOP Standard Appendices, Att. 40. **Alt. Path:** FS-423, RWSP Suction Isolation is unable to be closed EPE 011 EK3.12 Actions contained in EOP for emergency LOCA (large break) RO – 4.4, SRO – 4.6	A,E,L,N,R	2

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / **<u>SRO-I</u>** / SRO-U	
(A)lternate path	4-6 / 4-6 / 2-3	4
(C)ontrol room		0
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4	6
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1	3
(EN)gineered safety feature	≥1 / ≥1 / ≥1 (control room system)	2
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1	7
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1	4
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	1
(R)CA	≥ 1 / ≥ 1 / ≥ 1	3
(S)imulator		7

Facility: **Waterford 3** Date of Examination: **Mar 27, 2017**

Exam Level RO ☐ SRO-I ☐ SRO-U ☒ Operating Test No.: 1

Control Room Systems:* 8 for RO; 7 for SRO-I; 2 or 3 for SRO-U

	System / JPM Title	Type Code*	Safety Function
S1	001 Control Rod Drive System Place Reactor Cutback (RXC) in service and perform Immediate Operator Actions following a Cutback with unanalyzed rod configuration. **Alt. Path:** Feedwater pump will trip resulting in a RXC. During the cutback, an incorrect CEA will drop. GEN 2.4.49 The ability to perform without reference to procedures those actions that require immediate operation of system components and controls. RO – 4.6, SRO – 4.4	A,D,S	1
S2			
S3			
S4	061 Emergency Feedwater System Reset EFW Pump AB after Overspeed Trip in accordance with OP-009-003, Emergency Feedwater (Control Room actions) GEN EPE 074 EA1.07 AFW System RO – 4.2, SRO – 4.3	EN,L,N,S	4S
S5			
S6			
S7	012 Reactor Protection System Reset High Containment Pressure ESFAS trip in accordance with OP-902-009, EOP Standard Appendices, Att. 5-D. A4.04 Bistable, trips, reset and test switches RO – 3.3, SRO – 3.3	EN,L,N,S	7
S8			

In-Plant Systems * (3 for RO; (3 for SRO-I); (3 or 2 for SRO-U)			
P1			
P2	064 Electrical Diesel Generators Reset EDG A following an overspeed trip with a LOOP in accordance with OP-009-002, Emergency Diesel Generator, Section 8.8. EPE 055 EA1.06 Restoration of power with one ED/G RO – 4.1, SRO – 4.5	D,E,L,R	6
P3	006 Emergency Core Cooling System Isolate RWSP from Purification in accordance with OP-902-009, EOP Standard Appendices, Att. 40. **Alt. Path:** FS-423, RWSP Suction Isolation is unable to be closed EPE 011 EK3.12 Actions contained in EOP for emergency LOCA (large break) RO – 4.4, SRO – 4.6	A,E,L,N,R	2

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / **SRO-U**	
(A)lternate path	4-6 / 4-6 / 2-3	2
(C)ontrol room		0
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4	2
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1	2
(EN)gineered safety feature	≥1 / ≥1 / ≥1 (control room system)	2
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1	4
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1	3
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	0
(R)CA	≥ 1 / ≥ 1 / ≥ 1	2
(S)imulator		3

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S1

Place Reactor Cutback in service and perform Immediate Operator Actions

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Place Reactor Cutback (RXC) in service and perform Immediate Operator Actions following a Cutback with an unanalyzed rod configuration.

Task Standard: Applicant manually selects subgroups 5 & 11 for RXC actuation for Large Load Reject and Loss of Feed Pump. Places RXC in service and manually trips the reactor when unanalyzed rod configuration is detected.

References: OP-004-015, Reactor Power Cutback System (Rev 16)
OP-901-101, Reactor Power Cutback (Rev 8)

Alternate Path: Yes Time Critical: No Validation Time: 7 min

K/A 001 GEN 2.2.49 The ability to perform without reference to procedures those actions that require immediate operation of system comp. & controls.

Importance Rating 4.6 / 4.4
RO/SRO

Safety Function 1

Applicant: ____________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____________________

Examiner: ____________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-004-015, Reactor Power Cutback System (Handout)

Description:
This task is performed at CP-2. The applicant performs required manipulations to manually select subgroup 5 and 11 for RXC events for large loss of load and loss of a Feedwater pump. When the applicant places RXC in service, a Main Feedwater pump will trip resulting in a RXC. During the cutback, an incorrect CEA will drop. The applicant will be required to recognize the incorrect rod configuration and manually trip the reactor.

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

Reset to IC-171

Verify the following event inserted (should be setup in IC):

- AUTO ACTUATE OUT OF SERVICE. Code is ZDIPWAUTOACT==1

Verify the following is inserted and assigned to Trigger 1 with a 3 and 10 second delay respectively:

- FW03A MFW PUMP A OVERSPEED TRIP (3 sec)
- RD02A03 DROPPED CEA 03 (10 sec)

Do not place the Simulator in Run until the applicant is ready to perform the task and cued by examiner.

Setup with specific IC unavailable or for non NRC exams:

1. *Reset the simulator to an IC at 100% power*
2. *Remove Reactor cutback from service using section 7.1 of OP-004-015*
3. *Perform standby alignment of RXC using section 5.1 of OP-004-015*
4. *Perform steps 6.1.1 through 6.1.7 of OP-004-015*
5. *Insert commands listed above*
6. *Place simulator in FREEZE and snap a new IC or perform the JPM*

Examiner Note
Cue the Simulator Operator to place the Simulator in RUN.

TASK ELEMENT 1	STANDARD
6.1.8 If determined from Attachment 11.1 to manually align CEA subgroups for a Large Load Reject, then perform as follows: 6.1.8.1 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 2	STANDARD
6.1.8.2 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.	Subgroups 5 & 11 pushbuttons depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
6.1.8.3 Depress LARGE LOAD REJECT pushbutton and verify pushbutton illuminates.	Pushbutton Depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
6.1.8.4 When the SUBGROUP SELECT and LARGE LOAD REJECT pushbuttons have Extinguished (after approximately 60 seconds), then perform the following: 6.1.8.4.1 Depress DISPLAY SUBGRP SELECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**SAT / UNSAT**

TASK ELEMENT 5	STANDARD
6.1.8.4.2 Depress LARGE LOAD REJECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**SAT / UNSAT**

TASK ELEMENT 6	STANDARD
6.1.8.4.3 Verify correct CEA subgroup pattern is displayed.	Subgroups 5 & 11 checked
Comment:	**SAT / UNSAT**

TASK ELEMENT 7	STANDARD
6.1.8.4.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).	Subgroup pushbuttons verified extinguished.
Comment:	**SAT / UNSAT**

TASK ELEMENT 8	STANDARD
6.1.9 If determined from Attachment 11.1 to manually align CEA subgroups for a Loss of Feed Pump, then perform as follows: 6.1.9.1 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 9	STANDARD
6.1.9.2 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.	Subgroups 5 & 11 pushbuttons depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 10	STANDARD
6.1.9.3 Depress LOSS OF FEED PUMP pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 11	STANDARD
6.1.9.4 When the SUBGROUP SELECT and LOSS OF FEED PUMP pushbuttons have Extinguished (after approximately 60 seconds), then perform the following: 6.1.9.4.1 Depress DISPLAY SUBGRP SELECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**SAT / UNSAT**

TASK ELEMENT 12	STANDARD
6.1.9.4.2 Depress LOSS OF FEED PUMP pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**SAT / UNSAT**

TASK ELEMENT 13	STANDARD
6.1.9.4.3 Verify correct CEA subgroup pattern is displayed.	Subgroups 5 & 11 checked
Comment:	**SAT / UNSAT**

TASK ELEMENT 14	STANDARD
6.1.9.4.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).	Subgroup pushbuttons verified extinguished.
Comment:	**SAT / UNSAT**

TASK ELEMENT 15	STANDARD
Procedure Note: Turbine DEH System Program has a minimum floor of 20% power. A Reactor Cutback rod configuration should not be selected that would drop Reactor Power below 20% in the event of a Reactor Power Cutback.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 16	STANDARD
6.1.10 Verify both Main Feedwater Pumps operating.	Feed pumps checked
Comment:	**SAT / UNSAT**

ALTERNATE PATH STARTS HERE
Alternate Path begins here and transition to OP-901-101, Reactor Power Cutback occurs

RX

TASK ELEMENT 17	STANDARD
6.1.11 Depress AUTO ACTUATE OUT OF SERVICE pushbutton and verify pushbutton Extinguishes.	Pushbutton Depressed
Comment: EXAMINER NOTE: Feedwater Pump A will trip (after 3 second time delay) when pushbutton is depressed.	**Critical** **SAT / UNSAT**

TASK ELEMENT 18	STANDARD
Recognize Reactor Power Cutback	Recognize cutback actuation
Comment: **EXAMINER CUE: Direct applicant to perform immediate actions.**	**SAT / UNSAT**

TASK ELEMENT 19	STANDARD
1. Place Control Element Drive Mechanism Mode Select switch to AS.	Place CEDMCS mode select switch in AS
Comment: EXAMINER NOTE: It is not required to perform this step as the incorrect rod pattern is inserted.	**SAT / UNSAT**

TASK ELEMENT 20	STANDARD
2. Verify selected subgroups dropped.	Recognizes that subgroups 5 & 11 dropped along with an additional CEA.
Comment:	**SAT / UNSAT**

TASK ELEMENT 21	STANDARD
Manually Trip the Reactor	Reactor Tripped
Comment:	**Critical** **SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

RETURN ALL HANDOUTS & THIS CUE SHEET TO EXAMINER UPON COMPLETION OF TASK

INITIAL CONDITIONS:

- The plant is at 100% power.
- Section 5.1, Reactor Power Cutback System Standby Alignment of OP-004-015, Reactor Power Cutback System has been completed.
- Attachment 11.1 has been completed and subgroups 5 & 11 have been determined to be the required subgroups for both Reactor Power Cutback (RXC) events.

INITIATING CUE(S):

Align Reactor Power Cutback for manual CEA subgroup selection for both RXC events by performing section 6.1 of OP-004-015, Reactor Power Cutback System starting at step 6.1.8.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Prior to placing the Reactor Power Cutback System (RXC) in service, verify that both Main Feedwater Pumps are operating.

3.1.2 With both CEACs Inoperable, Reactor Power Cutback <u>shall</u> be removed from service within four hours. **[TS 3.3.1]**

3.2 LIMITATIONS

3.2.1 A selected CEA subgroup will <u>not</u> drop during a RXC actuation if that subgroup is on the CEDMCS hold bus. Likewise, the next sequential subgroup will not insert in Auto Sequential if the subgroup is on the hold bus. <u>When</u> a Reactor Power Cutback selected subgroup, or next sequential subgroup, is placed on the CEDMCS hold bus, <u>then</u> remove Reactor Power Cutback System from service in accordance with Section 7.1, Removing Reactor Power Cutback System from Service.

3.2.2 The auto CEA subgroup select function is <u>not</u> available for the Reactor Power Cutback System.

3.2.3 Turbine DEH System Program has a minimum floor of 20% power. Reactor Cutback Rod Configuration should not be selected which would drop Reactor Power below 20% in the event of a Reactor Cutback.

3.2.4 All referenced pushbutton controls are on the Power Cutback module on CP-2, unless otherwise stated.

3.2.5 Full steam bypass capability is 59.3% of rated thermal power. Selection of cutback groups that will initially exceed this capacity is allowed based on calculations showing that trip setpoints will not be exceeded during the transient [DAR-OA-08-02]. Additionally, subsequent subgroup insertion in Auto Sequential will assist in lowering power as needed. As specified in Attachment 11.1, for the Large Load Reject event, this limitation may only be utilized when all 6 SBCS valves are available.

6.0 NORMAL OPERATIONS

6.1 ALIGNING REACTOR POWER CUTBACK FOR MANUAL CEA SUBGROUP SELECTION

> **CAUTION**
>
> RX
>
> THIS SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.
>
> **[INPO 06-006]**

6.1.1 Determine the appropriate CEA subgroup selections by performing Attachment 11.1, Manual CEA Subgroup Selection.

6.1.2 N/A If Attachment 11.1 determines that only one event (Large Load Reject or Loss of Feed Pump) will be aligned for Reactor Power Cutback, then perform Section 7.1, Removing Reactor Power Cutback System from Service, to clear current subgroup selections.

6.1.3 Verify Section 5.1, Reactor Power Cutback System Standby Alignment, completed.

6.1.4 Perform a lamp test by depressing and releasing the LAMP TEST pushbutton and verify all pushbuttons illuminate.

6.1.5 If the TEST RESET pushbutton is illuminated, then depress the TEST RESET pushbutton and verify pushbutton extinguishes.

6.1.6 Verify Reactor Pwr Cutback Single Chnl Trouble (L-5, Cabinet H) annunciator Clear.

6.1.6.1 If Reactor Pwr Cutback Single Chnl Trouble (L-5, Cabinet H) annunciator is not Clear, then realign Reactor Power Cutback in accordance with Section 5.1.

6.1.7 Verify MANUAL SELECT Illuminated on AUTO SELECT /MANUAL SELECT pushbutton.

6.1.8 If determined from Attachment 11.1 to manually align CEA subgroups for a Large Load Reject, then perform as follows:

6.1.8.1 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.

6.1.8.2 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.

6.1.8.3 Depress LARGE LOAD REJECT pushbutton and verify pushbutton Illuminates.

6.1.8.4 When the SUBGROUP SELECT and LARGE LOAD REJECT pushbuttons have Extinguished (after approximately 60 seconds), then perform the following:

6.1.8.4.1 Depress DISPLAY SUBGRP SELECT pushbutton and verify pushbutton Illuminates.

6.1.8.4.2 Depress LARGE LOAD REJECT pushbutton and verify pushbutton Illuminates.

6.1.8.4.3 Verify correct CEA subgroup pattern is displayed.

6.1.8.4.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).

6.1.9 If determined from Attachment 11.1 to manually align CEA subgroups for a Loss of Feed Pump, then perform as follows:

6.1.9.1 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.

6.1.9.2 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.

6.1.9.3 Depress LOSS OF FEED PUMP pushbutton and verify pushbutton Illuminates.

6.1.9.4 When the SUBGROUP SELECT and LOSS OF FEED PUMP pushbuttons have Extinguished (after approximately 60 seconds), then perform the following:

6.1.9.4.1 Depress DISPLAY SUBGRP SELECT pushbutton and verify pushbutton Illuminates.

6.1.9.4.2 Depress LOSS OF FEED PUMP pushbutton and verify pushbutton Illuminates.

6.1.9.4.3 Verify correct CEA subgroup pattern is displayed.

6.1.9.4.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).

> **NOTE**
>
> Turbine DEH System Program has a minimum floor of 20% power. A Reactor Cutback rod configuration should not be selected that would drop Reactor Power below 20% in the event of a Reactor Power Cutback.

6.1.10 Verify both Main Feedwater Pumps operating.

RX 6.1.11 Depress AUTO ACTUATE OUT OF SERVICE pushbutton and verify pushbutton Extinguishes.

6.1.12 If CEA subgroup(s) were selected for the Large Load Reject cutback event, then remove Reactor Trip on Turbine Trip from service as follows:

RX 6.1.12.1 On CP-2, place LOSS OF LOAD keyswitch to RPC.

6.1.12.2 On CP-7, place all four LOSS OF TURB BYPASS keyswitches to BYPASS.

6.1.12.3 Verify all four red BYPASS lamps Illuminate.

RX 6.1.12.4 On CP-2, place LOSS OF TURBINE TRIP keyswitch to DISABLE.

6.1.13 As Reactor Power and Core EFPD change, reevaluate manual CEA subgroup selection and change as necessary in accordance with Section 6.3, Changing Manual CEA Subgroup Selection. **[P-21931]**

9.0 AUTOMATIC FUNCTIONS

9.1	Selected CEA subgroups drop on large load reject	SBCS Quick Open Demand Signals (2/2)
9.2	Selected CEA subgroups drop on loss of Feed Pump A (FW-IPS-3001-A1 and FW-IPS-3001-A2).....................................	<60 PSIG Control Oil Pressure (2/2)
9.3	Selected CEA subgroups drop on loss of Feed Pump B (FW-IPS-3001-B1 and FW-IPS-3001-B2).....................................	<60 PSIG Control Oil Pressure (2/2)

REQUEST/APPROVAL PAGE

SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-004-015 REVISION: 016

TITLE: Reactor Power Cutback System

PROCEDURE OWNER (Position Title): Operations Manager - Support

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 11/10/2016

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

This revision incorporates two changes with regard to maximizing the availability of the Reactor Power Cutback System:

1) The procedure is revised to allow for different selection of subgroups for each initiating event (loss of load event vs. loss of feed pump event). The procedure already programmed the events independently, but did not differentiate the events when determining CEA Subgroup selection. This change also allows for cutback to be taken out of service for only one event. This is in alignment with current reactor power cutback system design. Sections 6.1, 6.3 and Attachment 11.1 are updated to allow for the individual selection of the events for service and determination of appropriate subgroup selection for each event. If the number of events being selected for service is being changed, the procedure directs removing the Cutback system from service prior to changing the number of events selected.

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☑ **Normal** ☐ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES		PRINT NAME OR SIGNATURE	DATE
PREPARER		Pamela Hernandez	11/7/2016
EC SUPERVISOR	Administrative Review and Approval	(sign) N/A	
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Engineering - Systems	Camile Zenon	11/10/2016
	Engineering - Design	Billy Steelman	11/9/2016
	Engineering - Reactor (Nuclear Fuels)	Christopher Eastus	11/8/2016
	Operations [Administrative Review]	David R Voisin	11/10/2016
	N/A	N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☑ PA Exclusion ☐	D. Litolff	11/10/2016
TECHNICAL	Review ☑ Verification ☐	David F. Litolff	11/9/2016
QUALIFIED REVIEWER	Review ☑	William M Crowley	11/10/2016
GROUP/DEPT. HEAD	Review ☐ Approval ☑	(sign) [signature]	11/10/16
GM, PLANT OPERATIONS	Review ☐ Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS	Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Prior to placing the Reactor Power Cutback System (RXC) in service, verify that both Main Feedwater Pumps are operating.

3.1.2 With both CEACs Inoperable, Reactor Power Cutback shall be removed from service within four hours. **[TS 3.3.1]**

3.2 LIMITATIONS

3.2.1 A selected CEA subgroup will not drop during a RXC actuation if that subgroup is on the CEDMCS hold bus. Likewise, the next sequential subgroup will not insert in Auto Sequential if the subgroup is on the hold bus. When a Reactor Power Cutback selected subgroup, or next sequential subgroup, is placed on the CEDMCS hold bus, then remove Reactor Power Cutback System from service in accordance with Section 7.1, Removing Reactor Power Cutback System from Service.

3.2.2 The auto CEA subgroup select function is not available for the Reactor Power Cutback System.

3.2.3 Turbine DEH System Program has a minimum floor of 20% power. Reactor Cutback Rod Configuration should not be selected which would drop Reactor Power below 20% in the event of a Reactor Cutback.

3.2.4 All referenced pushbutton controls are on the Power Cutback module on CP-2, unless otherwise stated.

3.2.5 Full steam bypass capability is 59.3% of rated thermal power. Selection of cutback groups that will initially exceed this capacity is allowed based on calculations showing that trip setpoints will not be exceeded during the transient [DAR-OA-08-02]. Additionally, subsequent subgroup insertion in Auto Sequential will assist in lowering power as needed. As specified in Attachment 11.1, for the Large Load Reject event, this limitation may only be utilized when all 6 SBCS valves are available.

6.0 NORMAL OPERATIONS

6.1 ALIGNING REACTOR POWER CUTBACK FOR MANUAL CEA SUBGROUP SELECTION

CAUTION

RX

THIS SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

6.1.1 Determine the appropriate CEA subgroup selections by performing Attachment 11.1, Manual CEA Subgroup Selection.

6.1.2 If Attachment 11.1 determines that only one event (Large Load Reject or Loss of Feed Pump) will be aligned for Reactor Power Cutback, then perform Section 7.1, Removing Reactor Power Cutback System from Service, to clear current subgroup selections.

6.1.3 Verify Section 5.1, Reactor Power Cutback System Standby Alignment, completed.

6.1.4 Perform a lamp test by depressing and releasing the LAMP TEST pushbutton and verify all pushbuttons illuminate.

6.1.5 If the TEST RESET pushbutton is illuminated, then depress the TEST RESET pushbutton and verify pushbutton extinguishes.

6.1.6 Verify Reactor Pwr Cutback Single Chnl Trouble (L-5, Cabinet H) annunciator Clear.

6.1.6.1 If Reactor Pwr Cutback Single Chnl Trouble (L-5, Cabinet H) annunciator is not Clear, then realign Reactor Power Cutback in accordance with Section 5.1.

6.1.7 Verify MANUAL SELECT Illuminated on AUTO SELECT /MANUAL SELECT pushbutton.

6.1.8 If determined from Attachment 11.1 to manually align CEA subgroups for a Large Load Reject, then perform as follows:

6.1.8.1 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.

6.1.8.2 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.

6.1.8.3 Depress LARGE LOAD REJECT pushbutton and verify pushbutton Illuminates.

6.1.8.4 When the SUBGROUP SELECT and LARGE LOAD REJECT pushbuttons have Extinguished (after approximately 60 seconds), then perform the following:

6.1.8.4.1 Depress DISPLAY SUBGRP SELECT pushbutton and verify pushbutton Illuminates.

6.1.8.4.2 Depress LARGE LOAD REJECT pushbutton and verify pushbutton Illuminates.

6.1.8.4.3 Verify correct CEA subgroup pattern is displayed.

6.1.8.4.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).

6.1.9 If determined from Attachment 11.1 to manually align CEA subgroups for a Loss of Feed Pump, then perform as follows:

6.1.9.1 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.

6.1.9.2 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.

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6.1.9.4.3 Verify correct CEA subgroup pattern is displayed.

6.1.9.4.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).

NOTE

Turbine DEH System Program has a minimum floor of 20% power. A Reactor Cutback rod configuration should not be selected that would drop Reactor Power below 20% in the event of a Reactor Power Cutback.

6.1.10 Verify both Main Feedwater Pumps operating.

RX 6.1.11 Depress AUTO ACTUATE OUT OF SERVICE pushbutton and verify pushbutton Extinguishes.

6.1.12 If CEA subgroup(s) were selected for the Large Load Reject cutback event, then remove Reactor Trip on Turbine Trip from service as follows:

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6.1.12.2 On CP-7, place all four LOSS OF TURB BYPASS keyswitches to BYPASS.

6.1.12.3 Verify all four red BYPASS lamps Illuminate.

RX 6.1.12.4 On CP-2, place LOSS OF TURBINE TRIP keyswitch to DISABLE.

6.1.13 As Reactor Power and Core EFPD change, reevaluate manual CEA subgroup selection and change as necessary in accordance with Section 6.3, Changing Manual CEA Subgroup Selection. **[P-21931]**

9.0 AUTOMATIC FUNCTIONS

9.1 Selected CEA subgroups drop on large load reject .... SBCS Quick Open Demand Signals (2/2)

9.2 Selected CEA subgroups drop on loss of Feed Pump A (FW-IPS-3001-A1 and FW-IPS-3001-A2) .... <60 PSIG Control Oil Pressure (2/2)

9.3 Selected CEA subgroups drop on loss of Feed Pump B (FW-IPS-3001-B1 and FW-IPS-3001-B2) .... <60 PSIG Control Oil Pressure (2/2)

REQUEST/APPROVAL PAGE

SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-901-101		REVISION: 008
TITLE: Reactor Power Cutback		
PROCEDURE OWNER (Position Title): Assistant Operations Manager (Support)		

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 2/27/2013

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ Revision ☐ Deletion ☐ New Procedure

DESCRIPTION AND JUSTIFICATION:

1. Added Caution above Section E0 step 4 regarding Technical Specification 3.2.1 action a and 3.2.4 action a requirements to ensure corrective action is taken within 15 minutes to comply with Tech Specs when the COLSS calculated core power operating limit based on linear heat rate or DNBR is exceeded.

2. Added Notes above step 17 for the SM/CRS to consider whether to start boron equalization and a 2nd Charging Pump should be performed to assist in maintaining desired power level and information regarding Surveillance Requirement 4.1.3.6 and OP-903-001 Attachment 11.7, Regulating Group and Group P CEA Insertion Limits, being used to track durations CEA insertion Limits are exceeded.

These changes address CR-WF3-2012-01185 CA 32 and add information only, meeting the Editorial Correction criteria.

☐ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ Normal ☑ Editorial Correction (Revisions Only) ☐ Technical Verification (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES		PRINT NAME OR SIGNATURE	DATE
PREPARER		Paul I. Wood	2/25/2013
EC SUPERVISOR	Administrative Review and Approval	(sign)	2/25/2013
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Operations [Licensed Operator Peer Review]	John Lewis	2/25/2013
	Operations [Administrative Review]	David Voisin	2/25/2013
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐ PA Exclusion ☐	N/A	
TECHNICAL	Review ☐ Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐	N/A	
GROUP/DEPT. HEAD	Review ☐ Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐ Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS	Approval ☐	(sign) N/A	

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CONTINUOUS USE

A PURPOSE

1. This procedure provides instructions for responding to a Reactor Power Cutback System (RXC) actuation.

B SYMPTOMS

B_1 ALARMS

1. Reactor Pwr Cutback Actuation (Cabinet H, K-5)
2. Reactor Pwr Cutback Single Chnl Trouble (Cabinet H, L-5)
3. Feedwater Pump Turbine Trips:
   - FWPT A Trip Flow Lo (Cabinet F, G-16)
   - FWPT B Trip Flow Lo (Cabinet F, G-20)
   - FWPT A Trip Vacuum Lo (Cabinet F, H-15)
   - FWPT B Trip Vacuum Lo (Cabinet F, H-19)
   - FWPT A Trip Overspeed (Cabinet F, K-15)
   - FWPT B Trip Overspeed (Cabinet F, K-19)
   - FWPT A Trip Suction Press Lo (Cabinet F, G-15)
   - FWPT B Trip Suction Press Lo (Cabinet F, G-19)
   - FWPT A Trip Lube Oil Press Lo (Cabinet F, H-14)
   - FWPT B Trip Lube Oil Press Lo (Cabinet F, H-18)
   - FWPT A Trip Recirc Failure (Cabinet F, G-14)
   - FWPT B Trip Recirc Failure (Cabinet F, G-18)
   - FWPT A Thrust Brng Wear Hi (Cabinet F, K-14)
   - FWPT B Thrust Brng Wear Hi (Cabinet F, K-18)
   - FWPT A Trip CD Pump Lost (Cabinet F, H-16)
   - FWPT B Trip CD Pump Lost (Cabinet F, H-20)
   - FWPT A Vibration Hi (Cabinet F, K-16)
   - FWPT B Vibration Hi (Cabinet F, K-20)
   - FWPT A Lube Oil/Suct Monitor Failure (Cabinet F, H-13)
   - FWPT B Lube Oil/Suct Monitor Failure (Cabinet F, H-17)

4. Main Generator/Turbine Trips:
   - Turbine Trip Thrust Brng Failure (Cabinet E, A-3)
   - Turbine Trip Overspeed/DEH Pwr Lost (Cabinet E, A-2)
   - Turbine Trip Str Coil Water Lost (Cabinet E, C-4)
   - Turbine Trip Oil Lvl Lo-Lo (Cabinet E, A-5)
   - Turbine Trip Brng Oil Press Lo (Cabinet E, B-5)
   - Turbine Trip Exhaust Temp Hi (Cabinet E, A-6)
   - Turbine Trip Diff Exp/Vibr Hi (Cabinet E, C-6)
   - Turbine Trip Seal Oil To H2 Dp Lo (Cabinet E, A-7)
   - Turbine Trip MSR A Level Hi (Cabinet E, B-8)
   - Turbine Trip MSR B Level Hi (Cabinet E, B-9)
   - Turbine Trip Htr 5A Lvl Hi-Hi (Cabinet E, C-8)
   - Turbine Trip Htr 5B Lvl Hi-Hi (Cabinet E, C-9)
   - Turbine Trip Htr 5C Lvl Hi-Hi (Cabinet E, C-10)
   - Turbine Trip Htr 6A Lvl Hi-Hi (Cabinet E, D-8)
   - Turbine Trip Htr 6B Lvl Hi-Hi (Cabinet E, D-9)
   - Turbine Trip Htr 6C Lvl Hi-Hi (Cabinet E, D-10)
   - Turbine Trip Vacuum Lost (Cabinet E, A-1)
   - Gen 86 Relay Trip (Cabinet D, G-7)
   - Turbine Trip Ckt DC Power Lost (Cabinet E, A-10).

B_2 INDICATIONS

- Reactor power dropping
- Selected Control Element Assembly (CEA) rod bottom lights and lower electrical limit lights illuminated
- T_{avg} dropping
- Generator Output MW meter indicates power dropping or zero
- Runback Oper light illuminated on DEH Control Panel
- Turbine Tripped light illuminated on DEH Control Panel
- Main Feedwater Pump tripped
- Main Turbine tripped
- Atmospheric Dump Valves or Steam Bypass Valves open
- Generator Breaker A tripped
- Generator Breaker B tripped
- Exciter Field Breaker tripped

C AUTOMATIC ACTIONS

1. Selected subgroups drop.
2. Steam Bypass valves open to match steam demand and Reactor power.
3. Main Turbine setback to 50% (<610 MW).
4. Main Turbine runback to match steam demand and Reactor power.

D IMMEDIATE OPERATOR ACTIONS

1. Place Control Element Drive Mechanism Mode Select switch to AS.

2. Verify selected subgroups dropped.

E SUBSEQUENT OPERATOR ACTIONS

E0 GENERAL

	PLACEKEEPER		
	START	DONE	N/A
1. If Reactor Power Cutback has not occurred or the correct rod pattern has not dropped, then trip the Reactor and go to OP-902-000, Standard Post Trip Actions.	☐	☐	☐
2. If both Main Feedwater Pumps are tripped, then perform the following:	☐	☐	☐
2.1 Trip the Reactor.		☐	
2.2 Go to OP-902-000, Standard Post Trip Actions.		☐	
3. If Reactor Power Cutback was due to a Main Turbine trip due to loss of Main Turbine Lube Oil or Main Turbine High Vibration, then perform the following:	☐	☐	☐
3.1 Trip the Reactor.		☐	
3.2 Go to OP-902-000, Standard Post Trip Actions, and perform OP-901-210, Turbine Trip, concurrently with OP-902-000.		☐	

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S2

Reduce RCS Pressure and Establish Pressurizer Level on a Failure of All Charging

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Reduce RCS pressure with Main Spray and restore Pressurizer Level with High Pressure Safety Injection

Task Standard: Applicant reduced RCS pressure to below HPSI Pump shutoff head and established Safety Injection System flow in accordance with OP-901-112, Charging or Letdown Malfunction.

References: OP-901-112, Charging or Letdown Malfunction Rev 6

Alternate Path: No Time Critical: No Validation Time: 20 min

K/A 006 A1.18, Pressurizer level and pressure Importance Rating 4.0 / 4.3 RO/SRO

Safety Function 3

Applicant: ______________________________

Time Start: __________________ Time Finish: __________________

Performance Time: __________________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____

____

____

Examiner: ________________________________ Date: ________________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-901-112, Charging or Letdown Malfunction (Handout)

Description:
The applicant will perform the roles of the ATC and BOP operators for this JPM. The initial conditions describe that the plant has experienced a loss of all Charging capacity. The applicable off normal procedure directs tripping the reactor and lowering RCS pressure to < 1400 psia. The JPM begins with the reactor tripped and Standard Post Trip Actions complete. The RCS will be at normal post trip pressure, ~2000 psia. Main Spray will be used to accomplish the pressure reduction. After RCS pressure is below 1400 psia, a High Pressure Safety Injection Pump is started and flow established to restore Pressurizer level. This JPM will be run in parallel with S5.

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

Reset to IC-172

Place EFW Back Up FCV Controllers in Auto and remove Caution Tags.

Verify the following Malfunctions are active:

- CV01A, Charging Pump A Trip
- CV01B, Charging Pump B Trip
- CV01C, Charging Pump AB Trip

This JPM is run in parallel with JPM S5 (OP-903-037, CFC Operability).

Setup with specific IC unavailable or for non NRC exams:

1. *Reset the simulator to an IC in 100%*
2. *Insert Malfunctions listed above*
3. *Trip the reactor when PZR level reaches ~50%*
4. *Allow conditions to stabilize (PZR Level should be ~20%)*
5. *Place simulator in freeze and save IC*

Examiner Note
Direct the simulator operator to place the simulator in RUN when ready to start.

Examiner Note
The Pressurizer Pressure Low Trip setpoint will need to be reset on 2 different occasions during the reduction of RCS pressure to < 1400 PSIA. This step becomes applicable when either annunciator K B-16 or K C-16 alarm. The applicant may check the Pressure/Temperature curves prior to starting RCS pressure reduction. Plant conditions will allow for RCS de-pressurization to the given pressure band.

TASK ELEMENT 1	STANDARD
2.3 WHEN PZR PRESSURE LO PRETRIP annunciator alarms, THEN reset Pressurizer Pressure Low Trip setpoint on ALL FOUR channels.	Pressurizer Pressure low pressure setpoints are reset prior to receiving a Safety Injection Actuation
Comment: First occurrence.	**Critical** **SAT / UNSAT**

TASK ELEMENT 2	STANDARD
2.3 WHEN PZR PRESSURE LO PRETRIP annunciator alarms, THEN reset Pressurizer Pressure Low Trip setpoint on ALL FOUR channels.	Pressurizer Pressure low pressure setpoints are reset prior to receiving a Safety Injection Actuation
Comment: Second occurrence.	**Critical** **SAT / UNSAT**

Examiner Note
Since there is no Charging Flow, Pressurizer pressure must be reduced using Main Spray. Either the PZR Pressure Controller (RC-IPIC-0100) or the Spray Valve Controller (RC-IHIC-0100) at CP-2 can be used to lower RCS pressure by taking the selected controller to MANUAL and raising output to create Main Spray flow. If the PZR Pressure Controller (RC-IPIC-0100) is selected, then the Spray Valve Controller (RC-IHIC-0100) must remain in AUTO for it to respond appropriately.

TASK ELEMENT 3	STANDARD
2.4 Reduce Pressurizer pressure to < 1400 PSIA.	Pressurizer pressure is reduced to 1300 – 1400 PSIA using Main Spray.
Comment:	**SAT / UNSAT**

Examiner Note
After Pressurizer pressure is < 1400 PSIA, the Main Spray valves should be throttled closed to prevent Pressurizer pressure from dropping below the minimum pressure for RCP operation, approximately 1250 PSIA.

Examiner Note
The applicant is not required to secure Reactor Coolant Pumps at 1621 PSIA in the RCS since pressure is dropping under operator control. If the applicant decides to secure 2 Reactor Coolant Pumps, the control switches are located on CP-2. It is acceptable if the applicant secures 2 Reactor Coolant Pumps.

TASK ELEMENT 4	STANDARD
2.5 Start ONE available HPSI Pump AND open associated valves as required to restore Pressurizer level:	HPSI Pump A is running.
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
2.5 Start ONE available HPSI Pump AND open associated valves as required to restore Pressurizer level: HPSI Train A • HPSI COLD LEG INJECTION 1A (SI 225A) • HPSI COLD LEG INJECTION 1B (SI 226A) • HPSI COLD LEG INJECTION 2A (SI 227A) • HPSI COLD LEG INJECTION 2B (SI 228A)	At least 1 HPSI flow control valve is throttled open and Pressurizer level is rising.
Comment:	**Critical** **SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- The crew has entered OP-901-112, Charging or Letdown Malfunction, due to loss of all Charging Pumps.
- The CRS has directed a reactor trip due to the lowering Pressurizer Level.
- OP-902-000, Standard Post Trip Actions, have been completed.

INITIATING CUE(S):

The CRS directs you to complete step 2 in sub-section E1, Charging Malfunction, of OP-901-112 starting on step 2.3 and establish a RCS pressure of 1300 – 1400 psia and restore Pressurizer level to 33-60% using HPSI Pump A.

E1 CHARGING MALFUNCTION (CONT'D)

		PLACEKEEPER		
		START	DONE	N/A
2.	IF normal Charging flow can NOT be established AND Pressurizer level falls below minimum Pressurizer level for operation in accordance with Attachment 1, Pressurizer Level Versus Tave Curve, THEN perform the following:	☒	☐	☐
2.1	Trip the Reactor.	☒	☒	
2.2	Implement OP-902-000, STANDARD POST TRIP ACTIONS, concurrently with completion of this step.	☒	Continuous	☐
2.3	WHEN PZR PRESSURE LO PRETRIP annunciator alarms, THEN reset Pressurizer Pressure Low Trip setpoint on ALL FOUR channels.	☐	Continuous	☐
2.4	Reduce Pressurizer pressure to <1400 PSIA.	☐	☐	
2.5	Start ONE available HPSI Pump AND open associated valves as required to restore Pressurizer level: HPSI Train A • HPSI Cold Leg Injection 1A (SI 225A) • HPSI Cold Leg Injection 1B (SI 226A) • HPSI Cold Leg Injection 2A (SI 227A) • HPSI Cold Leg Injection 2B (SI 228A) OR HPSI Train B • HPSI Cold Leg Injection 1A (SI 225B) • HPSI Cold Leg Injection 1B (SI 226B) • HPSI Cold Leg Injection 2A (SI 227B) • HPSI Cold Leg Injection 2B (SI 228B)	☐	Continuous	☐

E1 CHARGING MALFUNCTION (CONT'D)

	PLACEKEEPER		
	START	DONE	N/A
3. IF the PMC is available, THEN display PMC Group CVCS and monitor Charging System parameters to determine cause of Charging malfunction.	☐	Continuous	☐
4. Inspect Charging System for possible cause of malfunction.	☐	☐	
5. IF a Charging Line rupture has occurred, THEN perform the following:	☐	☐	☐
5.1 Close LETDOWN STOP VALVE (CVC 101).	☐	☐	
5.2 Stop ALL Charging Pumps.	☐	☐	
5.3 IF leak has been identified AND isolated, THEN restore Charging and Letdown in accordance with Attachment 2.	☐	☐	

REQUEST/APPROVAL PAGE

SAFETY RELATED
PROCEDURE

Normal Review Class (check one):
- ☐ **OSRC**
- ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-901-112	REVISION: 006
TITLE: Charging or Letdown Malfunction	
PROCEDURE OWNER (Position Title): Operations Manager - Support	

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 3/18/15

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ Revision ☐ Deletion ☐ New Procedure

DESCRIPTION AND JUSTIFICATION:

Added additional information to the note in step E2 (6) to address CR-WF3-2013-264.

Added UNID and Nomenclature to Attachment 2 steps 13 and 14.

This procedure change adds information only and serves to enhance the procedure. This change does not alter the intent of the procedure and merely replaces missing nomenclature information. This change meets the criteria of an Editorial Correction.

☐ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ Normal ☑ Editorial Correction (Revisions Only) ☐ Technical Verification (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			Nicole Blank	3/17/2015
EC SUPERVISOR	Administrative Review and Approval		(sign) [signature]	3-17-15
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐	PA Exclusion ☐	N/A	
TECHNICAL	Review ☐	Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐		N/A	
GROUP/DEPT. HEAD	Review ☐	Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

E SUBSEQUENT OPERATOR ACTIONS: GENERAL

E_0 GENERAL

	PLACEKEEPER		
	START	DONE	N/A
1. Stop turbine load changes.	☐	☐	
2. IF malfunction is due to failure of the Pressurizer Level Control System, THEN go to OP-901-110, PRESSURIZER LEVEL CONTROL MALFUNCTION.	☐	☐	☐
3. IF a Charging Malfunction is indicated, THEN go to Subsection E1, Charging Malfunction.	☐	☐	☐
4. IF a Letdown Malfunction is indicated, THEN go to Subsection E2, Letdown Malfunction.	☐	☐	☐

NOTE

Multiple indications and SM/CRS discretion should be applied to diagnosing Charging Pump gas intrusion. Indications for gas intrusion are the following:

- Charging flow OR discharge pressure fluctuating OR lower than normal for the number of operating charging pumps.

  AND EITHER of the Following:

- Charging Suction Level Lost (a VCT, BAMT, or RWSP instrument malfunction may mask an actual low level condition).

Gas intrusion into the Charging Pumps caused by pulsation dampener failure, maintenance activities, OR a crack in the suction path of the Charging Pumps.

	START	DONE	N/A
5. IF Gas Bound Charging Pumps are indicated, THEN go to Subsection E3, Gas Bound Charging Pumps.	☐	☐	☐

END

E_1 CHARGING MALFUNCTION

	PLACEKEEPER	
START	DONE	N/A

NOTE

If all Charging Pumps are secured, then LETDOWN STOP VALVE (CVC 101) will close on high REGEN HX TUBE OUTLET temperature if RCS is ≥470°F.

CAUTION

THE REACTOR COOLANT SYSTEM WILL BE BORATED IF A CHARGING PUMP IS STARTED WITH THE RWSP AS THE MAKEUP WATER SOURCE.

Step	START	DONE	N/A
1. IF Charging Pumps have tripped, THEN perform the following:	☐	☐	☐
1.1 Verify open EITHER VCT DISCH VALVE (CVC 183) OR RWSP TO CHARGING PUMP (CVC 507).	☐	☐	
1.2 IF Letdown has NOT isolated, THEN attempt to restart Charging Pump(s).	☐	☐	☐
1.3 IF the Charging Pump can NOT be restarted, THEN verify closed LETDOWN STOP VALVE (CVC 101).	☐	☐	☐
1.4 IF the reason for the Charging pump trip is corrected AND Pressurizer level is in normal operating band, THEN place Charging and Letdown in service in accordance with Attachment 2.	☐	☐	☐

E1 CHARGING MALFUNCTION (CONT'D)

		PLACEKEEPER		
		START	DONE	N/A
2.	IF normal Charging flow can NOT be established AND Pressurizer level falls below minimum Pressurizer level for operation in accordance with Attachment 1, Pressurizer Level Versus Tave Curve, THEN perform the following:	☐	☐	☐
2.1	Trip the Reactor.	☐	☐	
2.2	Implement OP-902-000, STANDARD POST TRIP ACTIONS, concurrently with completion of this step.	☐	Continuous	☐
2.3	WHEN PZR PRESSURE LO PRETRIP annunciator alarms, THEN reset Pressurizer Pressure Low Trip setpoint on ALL FOUR channels.	☐	Continuous	☐
2.4	Reduce Pressurizer pressure to <1400 PSIA.	☐	☐	

2.5	Start ONE available HPSI Pump AND open associated valves as required to restore Pressurizer level:
	• HPSI Train A
	  • HPSI Cold Leg Injection 1A (SI 225A)
	  • HPSI Cold Leg Injection 1B (SI 226A)
	  • HPSI Cold Leg Injection 2A (SI 227A)
	  • HPSI Cold Leg Injection 2B (SI 228A)
	OR
	• HPSI Train B
	  • HPSI Cold Leg Injection 1A (SI 225B)
	  • HPSI Cold Leg Injection 1B (SI 226B)
	  • HPSI Cold Leg Injection 2A (SI 227B)
	  • HPSI Cold Leg Injection 2B (SI 228B)
		☐	Continuous	☐

E_1 CHARGING MALFUNCTION (CONT'D)

	PLACEKEEPER START	PLACEKEEPER DONE	PLACEKEEPER N/A
3. IF the PMC is available, THEN display PMC Group CVCS and monitor Charging System parameters to determine cause of Charging malfunction.	☐	Continuous	☐
4. Inspect Charging System for possible cause of malfunction.	☐	☐	
5. IF a Charging Line rupture has occurred, THEN perform the following:	☐	☐	☐
5.1 Close LETDOWN STOP VALVE (CVC 101).	☐	☐	
5.2 Stop ALL Charging Pumps.	☐	☐	
5.3 IF leak has been identified AND isolated, THEN restore Charging and Letdown in accordance with Attachment 2.	☐	☐	

E1 CHARGING MALFUNCTION (CONT'D)

CAUTION

IF HPSI PUMPS ARE OPERATING, THEN CHARGING PUMPS SHOULD NOT BE ALIGNED TO HPSI HEADER.

NOTE

Aligning Charging to HPSI Train A renders HPSI train A INOPERABLE and Charging Pumps INOPERABLE. Enter TS 3.5.2 and 3.1.2.4. Refer to TS 3.5.3.

	PLACEKEEPER START	DONE	N/A
6. IF flow can NOT be established through the normal Charging Pump discharge path, THEN align Charging Pumps to discharge through HPSI Header A as follows:	☐	☐	☐
6.1 Locally open CHARGING HEADER XCONN TO HPSI HEADER A ISOLATION (SI 504) (-35 Wing Area, Col. 6A & L).	☐	☐	
6.2 Open ONE of the following Train A HPSI COLD LEG INJECTION valves: • 1A (SI 225A) • 1B (SI 226A) • 2A (SI 227A) • 2B (SI 228A)	☐	☐	
6.3 Locally open CHARGING PUMPS DISCHARGE TO HPSI ISOLATION (CVC 199) (Charging Pump Room A).	☐	☐	

E1 CHARGING MALFUNCTION (CONT'D)

		PLACEKEEPER	
	START	DONE	N/A

> **NOTE**
>
> Charging Header flow will not indicate with CHARGING PUMPS HEADER ISOLATION VALVE (CVC 209) closed.

	START	DONE	N/A
6.4 Close Charging Pumps Header Isolation Valve (CVC 209).	☐	☐	
6.5 Operate Charging Pumps as necessary to maintain Pressurizer level within the limits of Attachment 1, Pressurizer Level Versus Tave Curve.	☐	☐	
7. WHEN repairs have been completed to the Charging Header, THEN restore Charging Pumps discharge alignment to normal as follows:	☐	☐	
7.1 Stop ALL Charging Pumps.	☐	☐	
7.2 Restore HPSI Header as follows:	☐	☐	
7.2.1 Locally close CHARGING HEADER XCONN TO HPSI HEADER A ISOLATION (SI 504) (-35 Wing Area, Col. 6A & L).	☐	☐	
7.2.2 Verify closed the following Train A HPSI COLD LEG INJECTION valves: • 1A (SI 225A) • 1B (SI 226A) • 2A (SI 227A) • 2B (SI 228A)	☐	☐	
7.2.3 Locally close CHARGING PUMP DISCHARGE TO HPSI ISOLATION (CVC 199) (Charging Pump Room A).	☐	☐	

E_1 CHARGING MALFUNCTION (CONT'D)

	PLACEKEEPER		
	START	DONE	N/A
7.2.4 Open Charging Pumps Header Isolation Valve (CVC 209).	☐	☐	

NOTE

Review TS 3.5.2, 3.5.3 and 3.1.2.4 LCOs prior to exiting once normal Charging and HPSI lineups are returned to normal.

	START	DONE	N/A
7.2.5 Establish Charging and Letdown in accordance with Attachment 2.	☐	☐	

END

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S3

Perform a Reactor Coolant Pump Shutdown

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Perform A Reactor Coolant Pump Shutdown (With Reverse Rotation)

Task Standard: Reactor Coolant Pump 1A secured in accordance with OP-001-002 section 6.2., reverse rotation is recognized and RCPs 1B, & 2B are secured in accordance with OP-901-130.

References: OP-001-002, Reactor Coolant Pump Operation (rev 22)
OP-901-130, Reactor Coolant Pump Malfunction (rev 11)

Alternate Path: Yes Time Critical: No Validation Time: 18 mins.

K/A 003 A2.02 Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP

Importance Rating 3.7 / 3.9
RO/SRO

Safety Function 4P

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____

____

____

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-001-002, Reactor Coolant Pump Operation, Section 6.2 (Handout 1)
- OP-901-130, Reactor Coolant Pump Malfunction, Section E0 & E5 (Handout 2)

Description:
This task is performed at CP-2. The examinee will perform a Reactor Coolant Pump Shutdown for Reactor Coolant Pump 1A. After the Reactor Coolant Pump is shutdown it will come to a stop and then start rotating in the reverse direction. Reverse rotation is indicated on the PMC. OP-002-001, Reactor Coolant Pump Operation directs implementation of OP-901-130, Reactor Coolant Pump Malfunction. Handout 2 is NOT revealed until the applicant has earned the information in Handout 2.

The task is complete after the examinee secures the remaining two Reactor Coolant Pumps. (W3 Operating Experience)

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

- Reset to IC-173
- Verify RC33A RCP1A ARRDFAILURE WITH ARRD TEMP SEVERITY set to a value of 172.229
- Take simulator to RUN
- Acknowledge PMC Alarms

Setup with specific IC unavailable or for non NRC exams:

1. *Reset the simulator to an IC in Mode 3*
2. *Ensure all Reactor Trip Breakers are open*
3. *Start one Oil Lift pump for RCP 2A and stop RCP 2A*
4. *Insert Malfunction listed above*
5. *Place simulator in freeze and save IC*

EXAMINER NOTE
Cue the Simulator Operator to place the Simulator in RUN. Do **NOT** reveal Handout 2 until the applicant earns this information.

RX

TASK ELEMENT 1	STANDARD
Procedure Caution: THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.	Caution reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
Procedure Caution: ALL CLOSED REACTOR TRIP BREAKERS WILL OPEN ON FIRST RCP TRIP UNLESS REACTOR COOLANT LOW FLOW BYPASSES ARE ENABLED.	Caution reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 3	STANDARD
6.2.1 For RCP to be secured (1A, 1B, 2A, or 2B), Place associated RCP (1A, 1B, 2A, 2B) Oil Lift Pump A <u>or</u> B control switch to ON <u>and</u> verify lift pump Starts.	One Lift Oil Pump for RCP 1A started
Comment:	**SAT / UNSAT**

TASK ELEMENT 4	STANDARD
6.2.1.1 Verify remaining RCP 1A (1B, 2A, 2B) Oil Lift Pump B <u>or</u> A control switch in AUTO.	Checked remaining Lift Oil Pumps in AUTO.
Comment:	**SAT / UNSAT**

TASK ELEMENT 5	STANDARD
6.2.2 Have an individual in place to monitor VLPMS for loose parts that can become dislodged by changes in Reactor Coolant flow in accordance with OP-004-017, Valve and Loose Parts Monitoring.	Recognized step is complete as per initial conditions
Comment: **Examiner Cue: If asked, inform applicant that an Operator is in place monitoring the Valve and Loose Parts system.**	**SAT / UNSAT**

TASK ELEMENT 6	STANDARD
Procedure Caution: CBO AND CCW FLOW TO SEAL COOLERS SHOULD BE MAINTAINED AFTER RCP HAS BEEN SECURED UNTIL RCS TEMPERATURE HAS BEEN REDUCED TO $\leq$140°F.	Caution reviewed
Comment:	**SAT / UNSAT**

RX

TASK ELEMENT 7	STANDARD
6.2.3 Stop desired RCP 1A (1B, 2A, 2B) by placing its associated control switch at CP-2 to Stop.	RCP 1A is secured
Comment:	**<u>Critical</u>** **SAT / UNSAT**

ALTERNATE PATH STARTS HERE
Approximately 45 seconds after RCP 1A C/S is placed to STOP, the RCP speed will reduce to approximately 0 RPM and quickly rotate in the reverse direction to a speed of approximately 480 RPM and stabilize. This indication is on the Plant Monitoring Computer and should be viewed by the applicant as part of the task.

TASK ELEMENT 8	STANDARD
6.2.4 When RCP 1A (1B, 2A, 2B) speed indicates rotor is at rest, as indicated by PMC PID (PIDs are listed on Attachment 11.2), or with SM/CRS authorization, then secure operating RCP 1A (1B, 2A, 2B) Oil Lift Pumps by placing their control switches to OFF.	Recognized RCP is not at rest
Comment:	**SAT / UNSAT**

TASK ELEMENT 9	STANDARD
6.2.4.1 After RCP 1A (1B, 2A, 2B) has been secured for approximately 5 minutes, then verify all secured RCPs are not rotating in the reverse direction by observing zero speed indicated on the computer points listed in Attachment 11.2.	Determined RCP 1A is rotating in the reverse direction.
Comment: Examiner Note: ~45 seconds after the RCP 1A C/S is manipulated, the RCP speed will reduce to approximately 0 RPM and quickly rotate in the reverse direction to a speed of ~480 RPM and stabilize. This is when it is time to provide cue below. **Examiner Cue: 5 minutes has elapsed.**	**Critical** **SAT / UNSAT**

TASK ELEMENT 10	STANDARD
6.2.4.2 If PMC points indicate any RCP is rotating in the reverse direction, then refer to OP-901-130, Reactor Coolant Pump Malfunction and notify SM/CRS.	Entered OP-901-130
Comment: **Examiner Cue: If the applicant requests guidance on how to proceed, then ask the applicant for their recommendation. If the applicant mentions the need to perform OP-901-130, then provide Handout 2 (OP-901-130).** **If the applicant simply recommends securing all RCPs, then allow the applicant to proceed without providing Handout 2.**	**SAT / UNSAT**

EXAMINER NOTE
The following steps are from subsection E_5 of OP-901-130.

TASK ELEMENT 11	STANDARD
NOTE Indicated speed will not go negative when an RCP rotates in the reverse direction, it will be an absolute number. Speed will indicate approximately 600 rpm for the affected RCP when the other three RCPs are running.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 12	STANDARD
1. Monitor Reactor Coolant Pump after shutdown for reverse rotation with the following methods: • IF conditions permit, THEN verify reverse rotation by local observation. • PMC PIDs D13214 (RCP 1A), D13614 (RCP 1B), D13414 (RCP 2A) and D13814 (RCP 2B). • Associated RCP PMC mimic	Re-verified reverse rotation of RCP 1A using PID D13214
Comment:	**SAT / UNSAT**

TASK ELEMENT 13	STANDARD
2. Start an oil lift pump on affected RCP.	Check one Lift Oil Pump for RCP 1A running
Comment:	**SAT / UNSAT**

TASK ELEMENT 14	STANDARD
3. Remove ALL Reactor Coolant Pumps from service.	RCPs 1B and 2B secured
Comment:	**Critical** **SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- The Reactor is in MODE 3 with all Reactor Trip Breakers open
- The plant is preparing to perform an RCS cooldown to MODE 5
- An Operator is in place to monitor Valve and Loose Parts Monitoring System

INITIATING CUE(S):

The CRS directs you to secure Reactor Coolant Pump 1A in accordance with OP-001-002, Reactor Coolant Pump Operation, section 6.2.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 When operating one RCP, no minimum RCS Cold Leg Temperature restrictions exist.

3.1.2 When operating in two pump, opposite loop configuration, no minimum RCS Cold Leg Temperature restrictions exist.

3.1.3 When operating in two pump, same loop configuration using RCP 2A, minimum allowable RCS Cold Leg Temperature for RCP operation is 350°F. This restriction applies to prevent motor load in excess of nameplate HP rating since RCP 2A develops higher head and requires more brake horsepower.

3.1.4 When operating in two pump, same loop configuration, minimum allowable RCS Cold Leg Temperature for RCP operation is 175°F.

3.1.5 When operating in three pump configuration using RCP 2A, minimum allowable RCS Cold Leg Temperature for RCP operation is 350°F. This restriction applies to prevent motor load in excess of nameplate HP rating since RCP 2A develops higher head and requires more brake horsepower.

3.1.6 When operating in three pump configuration, minimum allowable RCS Cold Leg Temperature for RCP operation is 202°F.

3.1.7 With fuel in the core, the fourth RCP <u>shall</u> <u>not</u> be started until RCS Temperature is ≥380°F. This restriction applies to prevent exceeding fuel assembly uplift limitations.

3.1.8 Low temperature overpressure protection and reactivity protection <u>shall</u> be provided by establishing a <100°F ΔT between RCS Cold Leg (T_c) Temperature and S/G Water Temperature prior to starting the first RCP on each loop. Reactivity excursion concerns exist on RCP start in an idle loop if S/G Water Temperature is >100°F colder than loop T_c (worst case negative ITC). Also, low temperature overpressure protection concerns exist if S/G Water Temperature is >100°F hotter than loop T_c when loop T_c is ≤272°F. For conservatism and simplicity, a RCP start limit of 100°F ΔT between SG Water Temperature and loop T_c is established. **[P-22890]**

3.1.9 A CCW temperature of 155°F at outlet of RCP Seal Cooler will isolate cooler. Manual Override exists in Control Room on CP-2. Manual Override is accomplished by first placing control switch in Closed position and then to Open position. If high temperature still exists after isolation valves are Opened, then 100 second time delay will time out and Close isolation valves. If temperature is <145°F after valves are Opened, they will remain Open.

3.1.10 Do <u>not</u> start RCPs simultaneously.

3.1.11 During RCP motor operation for oil system cleanup after maintenance, duplex strainer fouling can occur very rapidly. A rapid increase in thrust bearing temperature is an indication of duplex strainer fouling.

3.1.12 Where multiple indications for one parameter exist, more than one instrument should be used to obtain a particular reading.

3.1.13 Starting the first RCP in a Reactor Coolant Loop with the existence of a diluted pocket of RCS water could cause a Boron Dilution Event resulting in a reactivity excursion.

3.1.14 Anytime RCS pressure is greater than VCT pressure, RCP CBO should be unisolated.

3.1.15 RCP seals will exhibit some amount of weepage at low Reactor Coolant System pressures. It is expected that the seals will shut off the weeping with higher pressure in the RCS and that the weepage will stop before reaching RCS normal operating pressure. This weepage will likely result in boric acid residue in the RCP shrouds. **[CR-WF3-2005-02712]**

3.1.16 To monitor the start of an RCP, an Operator should be stationed on the D ring wall, rather than on the pump work platform. Visual monitoring of the RCP is not required if Containment access is not in effect or at the SM/CRS discretion for reasons such as precluding impact to off-normal or emergency operations or reducing industrial or radiological safety risk.

3.2 LIMITATIONS

3.2.1 When Starting RCP from cold conditions, monitor bearing temperatures for abnormally high rate of rise after reaching normal operating temperatures.

3.2.2 When starting a third RCP during plant startup, upper thrust bearing temperatures may exceed alarm limits on the single operating pump in a loop until the fourth RCP is started. **[CR-WF3-2005-02745]**

3.2.3 Each RCP Start stresses motor windings both thermally and mechanically. A Start means that motor comes up to rated speed.

3.2.4 With motor at ambient temperature, do not attempt more than two consecutive Starts, allowing motor to coast to a Stop between Starts. For additional Starts, after two consecutive Starts, wait 240 minutes before attempting subsequent Start.

3.2.5 With motor at operating temperature, do not attempt more than one Start at 60 minute intervals.

3.2.6 Do <u>not</u> exceed more than 6 Starts per day.

3.2.7 The associated RCP Oil Lift Pump must have been operating at normal pressure for a minimum of two minutes prior to Starting RCP.

3.2.8 Do <u>not</u> allow oil level of reservoirs to drop to <37%. An oil level of <37% will cause bearing uncovering and bearing temperature to rise indicating that bearing oil film is deteriorating.

3.2.9 RCP Seals rely upon CBO to maintain a thin film of water for lubrication. During operation, if CBO is lost, seals will run dry and suffer excessive frictional heat and wear.

3.2.10 When starting RCP with RCS temperature >200°F, CBO temperature exiting pump must be ≤190°F.

3.2.11 Maximum RCP operating time without CCW flow is three minutes. <u>If</u> CCW flow can be restored within 10 minutes, <u>then</u> pump may be restarted. **[P-15099]**

3.2.12 Fourth stage vapor seal can operate at full system pressure for limited time. This is a severe operating condition and requires that RCP be secured.

3.2.13 Do <u>not</u> operate RCP with system pressure >2500 PSIA.

3.2.14 CBO <u>and</u> CCW flow to seal coolers should be maintained after RCP has been secured <u>until</u> RCS temperature has been lowered to ≤140°F.

3.2.15 When Starting motor from ambient conditions, bearing temperatures should be watched very closely for minimum of two hours, or until bearing temperatures stabilize. Normal rate of rise from ambient conditions may be as high 27°F/min.

3.2.16 To minimize the effects of RCP seal perturbations, maintain Reactor Coolant Pump Control Bleedoff Pressure 40 PSIG to 65 PSIG when any Reactor Coolant Pumps are running. Reactor Coolant Pump Control Bleedoff Pressure operating band may be expanded to 30 PSIG to 120 PSIG with a ≤4 PSIG per minute rate of change limit during short periods of operation such as establishing nitrogen or hydrogen blankets on the Volume Control Tank. Refer to Attachment 11.1, RCS Pressure and Temperature Limits Graph.

6.2 STOPPING A REACTOR COOLANT PUMP

CAUTION

R THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.
[INPO 06-006]

CAUTION

ALL CLOSED REACTOR TRIP BREAKERS WILL OPEN ON FIRST RCP TRIP UNLESS REACTOR COOLANT LOW FLOW BYPASSES ARE ENABLED.

6.2.1 For RCP to be secured (1A, 1B, 2A, or 2B), Place associated RCP (1A, 1B, 2A, 2B) Oil Lift Pump A or B control switch to ON and verify lift pump Starts. **[P-15101]**

6.2.1.1 Verify remaining RCP 1A (1B, 2A, 2B) Oil Lift Pump B or A control switch in AUTO.

6.2.2 Have an individual in place to monitor VLPMS for loose parts that can become dislodged by changes in Reactor Coolant flow in accordance with OP-004-017, Valve and Loose Parts Monitoring.

CAUTION

CBO AND CCW FLOW TO SEAL COOLERS SHOULD BE MAINTAINED AFTER RCP HAS BEEN SECURED UNTIL RCS TEMPERATURE HAS BEEN REDUCED TO ≤140°F.

R 6.2.3 Stop desired RCP 1A (1B, 2A, 2B) by placing its associated control switch at CP-2 to Stop.

6.2.4 When RCP 1A (1B, 2A, 2B) speed indicates rotor is at rest, as indicated by PMC PID (PIDs are listed on Attachment 11.2), or with SM/CRS authorization, then secure operating RCP 1A (1B, 2A, 2B) Oil Lift Pumps by placing their control switches to OFF. **[P-15101]**

6.2.4.1 After RCP 1A (1B, 2A, 2B) has been secured for approximately 5 minutes, then verify all secured RCPs are not rotating in the reverse direction by observing zero speed indicated on the computer points listed in Attachment 11.2.

6.2.4.2 If PMC points indicate any RCP is rotating in the reverse direction, then refer to OP-901-130, Reactor Coolant Pump Malfunction and notify SM/CRS.

9.0 AUTOMATIC FUNCTIONS

9.1 RCP Seal Cooler CCW Isolation.. 155°F Outlet Temp

C. AUTOMATIC ACTIONS

1. High Reactor Coolant Pump CCW Return temperature (155°F) actuates automatic isolation of RCP Seal Cooler:
   - 1A RCP SEAL COOLER (CC 679A/CC 6651A)
   - 1B RCP SEAL COOLER (CC 679B/CC 6651B)
   - 2A RCP SEAL COOLER (CC 680A/CC 666A)
   - 2B RCP SEAL COOLER (CC 680B/CC 666B)

E_0 SUBSEQUENT OPERATOR ACTIONS

PLACEKEEPER		
START	DONE	N/A

NOTE

Waterford 3 has operating Experience of ARRD failures, resulting in reverse rotation of a tripped Reactor Coolant Pump. In this case, indicated speed will not go negative when a RCP rotates in the reverse direction, it will be an absolute number. Speed will indicate approximately 600 RPM for the affected RCP with the other three RCPs running.

Step	START	DONE	N/A
1. If Reactor Coolant Pump trips, then verify Reactor tripped and go to OP-902-000, Standard Post Trip Actions.		☐	☐
2. If loss of Component Cooling Water to Reactor Coolant Pumps occurs, then go to OP-901-510, COMPONENT COOLING WATER SYSTEM MALFUNCTION.		☐	☐
3. If Reactor Coolant Pump Seal has failed, then go to section E_1, Seal Failure.		☐	☐
4. If Reactor Coolant Pump low oil pressure alarm occurs, then go to section E_2, Lube Oil Emergency.		☐	☐
5. If a Reactor Coolant Pump Bearing temperature alarm occurs, then go to section E_3, Bearing Temperature High.		☐	☐
6. If Reactor Coolant Pump high vibration alarm occurs, then go to section E_4, High Vibration.		☐	☐
7. If reverse rotation is indicated on an idle Reactor Coolant Pump, then go to section E_5, Reverse Rotation.		☐	☐
8. If Reactor Coolant Pump high ARRD temperature alarm occurs, then go to section E_6, Anti-Reverse Rotation Device (ARRD) Temperature High.		☐	☐

E_0 SUBSEQUENT OPERATOR ACTIONS (CONT'D)

	PLACEKEEPER		
	START	DONE	N/A
9. If a Reactor Coolant Pump shaft high vibration computer alarm occurs on any of the following PMC PIDs: RCP 1A: PIDs A13003, A13004 RCP 2A: PIDs A13010, A13011 RCP 1B: PIDs A13017, A13018 RCP 2B: PIDs A13024, A13025 then go to section E_7, High Shaft Vibration.		☐	☐

END

E_5 REVERSE ROTATION

PLACEKEEPER		
START	DONE	N/A

NOTE

Indicated speed will not go negative when an RCP rotates in the reverse direction, it will be an absolute number. Speed will indicate approximately 600 rpm for the affected RCP when the other three RCPs running.

1. Monitor Reactor Coolant Pump after shutdown for reverse rotation with the following methods: ☐ ☐ ☐

   If conditions permit, then verify reverse rotation by local observation. ☐

   PMC PID's D13214 (RCP 1A), D13614 (RCP 1B), D13414 (RCP 2A) and D13814 (RCP 2B). ☐

   Associated RCP PMC mimic ☐

2. Start an oil lift pump on affected RCP. ☐ ☐ ☐

3. Remove ALL Reactor Coolant Pumps from service. ☐ ☐ ☐

4. Commence Plant cooldown to Shutdown Cooling entry conditions in accordance with OP-010-005, PLANT SHUTDOWN. ☐ ☐ ☐

5. Refer to the following Technical Specifications: ☐ ☐ ☐

   3.4.1.1 ☐

   3.4.1.2 ☐

   3.4.1.3 ☐

   3.4.1.4 ☐

6. Place Shutdown Cooling in service. ☐ ☐ ☐

END

REQUEST/APPROVAL PAGE

SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-001-002 — REVISION: 022

TITLE: Reactor Coolant Pump Operation

PROCEDURE OWNER (Position Title) : Operations Manager - Support

TERM (check one) : ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 5/2/2014

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

1) Changed CBO Flow computer points A13100, A13500, A13300, and A13700 to S13100, S13500, S13300, and S13700 on Attachment 11.2 as a result of EC-43302 (Replacement of CBO Flow Elements and Transmitters) and its associated daughter EC's 43306, 43307, 43308 and 43309. The purpose of this change is to improve the reliability of the CBO instruments and thus provide reliable indications to the operator concerning CBO flow and thus health of RCP Seals and capillary tubes. These changes are covered by EC-43302 and the daughter EC's and therefore the changes to this procedure is editorial in nature.

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES		PRINT NAME OR SIGNATURE	DATE
PREPARER		Robert Mcbride	5/1/2014
EC SUPERVISOR	Administrative Review and Approval	(sign)	5/1/2014
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Operations [Administrative Review]	David R. Voisin	5/1/2014
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐ PA Exclusion ☐	N/A	
TECHNICAL	Review ☐ Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐	N/A	
GROUP/DEPT. HEAD	Review ☐ Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐ Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS	Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 When operating one RCP, no minimum RCS Cold Leg Temperature restrictions exist.

3.1.2 When operating in two pump, opposite loop configuration, no minimum RCS Cold Leg Temperature restrictions exist.

3.1.3 When operating in two pump, same loop configuration using RCP 2A, minimum allowable RCS Cold Leg Temperature for RCP operation is 350°F. This restriction applies to prevent motor load in excess of nameplate HP rating since RCP 2A develops higher head and requires more brake horsepower.

3.1.4 When operating in two pump, same loop configuration, minimum allowable RCS Cold Leg Temperature for RCP operation is 175°F.

3.1.5 When operating in three pump configuration using RCP 2A, minimum allowable RCS Cold Leg Temperature for RCP operation is 350°F. This restriction applies to prevent motor load in excess of nameplate HP rating since RCP 2A develops higher head and requires more brake horsepower.

3.1.6 When operating in three pump configuration, minimum allowable RCS Cold Leg Temperature for RCP operation is 202°F.

3.1.7 With fuel in the core, the fourth RCP <u>shall</u> <u>not</u> be started until RCS Temperature is ≥380°F. This restriction applies to prevent exceeding fuel assembly uplift limitations.

3.1.8 Low temperature overpressure protection and reactivity protection <u>shall</u> be provided by establishing a <100°F ΔT between RCS Cold Leg (T_c) Temperature and S/G Water Temperature prior to starting the first RCP on each loop. Reactivity excursion concerns exist on RCP start in an idle loop if S/G Water Temperature is >100°F colder than loop T_c (worst case negative ITC). Also, low temperature overpressure protection concerns exist if S/G Water Temperature is >100°F hotter than loop T_c when loop T_c is ≤272°F. For conservatism and simplicity, a RCP start limit of 100°F ΔT between SG Water Temperature and loop T_c is established. **[P-22890]**

3.1.9 A CCW temperature of 155°F at outlet of RCP Seal Cooler will isolate cooler. Manual Override exists in Control Room on CP-2. Manual Override is accomplished by first placing control switch in Closed position and then to Open position. If high temperature still exists after isolation valves are Opened, then 100 second time delay will time out and Close isolation valves. If temperature is <145°F after valves are Opened, they will remain Open.

3.1.10 Do <u>not</u> start RCPs simultaneously.

3.1.11 During RCP motor operation for oil system cleanup after maintenance, duplex strainer fouling can occur very rapidly. A rapid increase in thrust bearing temperature is an indication of duplex strainer fouling.

3.1.12 Where multiple indications for one parameter exist, more than one instrument should be used to obtain a particular reading.

3.1.13 Starting the first RCP in a Reactor Coolant Loop with the existence of a diluted pocket of RCS water could cause a Boron Dilution Event resulting in a reactivity excursion.

3.1.14 Anytime RCS pressure is greater than VCT pressure, RCP CBO should be unisolated.

3.1.15 RCP seals will exhibit some amount of weepage at low Reactor Coolant System pressures. It is expected that the seals will shut off the weeping with higher pressure in the RCS and that the weepage will stop before reaching RCS normal operating pressure. This weepage will likely result in boric acid residue in the RCP shrouds. **[CR-WF3-2005-02712]**

3.1.16 To monitor the start of an RCP, an Operator should be stationed on the D ring wall, rather than on the pump work platform. Visual monitoring of the RCP is not required if Containment access is not in effect or at the SM/CRS discretion for reasons such as precluding impact to off-normal or emergency operations or reducing industrial or radiological safety risk.

3.2 LIMITATIONS

3.2.1 When Starting RCP from cold conditions, monitor bearing temperatures for abnormally high rate of rise after reaching normal operating temperatures.

3.2.2 When starting a third RCP during plant startup, upper thrust bearing temperatures may exceed alarm limits on the single operating pump in a loop until the fourth RCP is started. **[CR-WF3-2005-02745]**

3.2.3 Each RCP Start stresses motor windings both thermally and mechanically. A Start means that motor comes up to rated speed.

3.2.4 With motor at ambient temperature, do <u>not</u> attempt more than two consecutive Starts, allowing motor to coast to a Stop between Starts. For additional Starts, after two consecutive Starts, wait 240 minutes before attempting subsequent Start.

3.2.5 With motor at operating temperature, do <u>not</u> attempt more than one Start at 60 minute intervals.

3.2.6 Do not exceed more than 6 Starts per day.

3.2.7 The associated RCP Oil Lift Pump must have been operating at normal pressure for a minimum of two minutes prior to Starting RCP.

3.2.8 Do not allow oil level of reservoirs to drop to <37%. An oil level of <37% will cause bearing uncovering and bearing temperature to rise indicating that bearing oil film is deteriorating.

3.2.9 RCP Seals rely upon CBO to maintain a thin film of water for lubrication. During operation, if CBO is lost, seals will run dry and suffer excessive frictional heat and wear.

3.2.10 When starting RCP with RCS temperature >200°F, CBO temperature exiting pump must be ≤190°F.

3.2.11 Maximum RCP operating time without CCW flow is three minutes. If CCW flow can be restored within 10 minutes, then pump may be restarted. **[P-15099]**

3.2.12 Fourth stage vapor seal can operate at full system pressure for limited time. This is a severe operating condition and requires that RCP be secured.

3.2.13 Do not operate RCP with system pressure >2500 PSIA.

3.2.14 CBO and CCW flow to seal coolers should be maintained after RCP has been secured until RCS temperature has been lowered to ≤140°F.

3.2.15 When Starting motor from ambient conditions, bearing temperatures should be watched very closely for minimum of two hours, or until bearing temperatures stabilize. Normal rate of rise from ambient conditions may be as high 27°F/min.

3.2.16 To minimize the effects of RCP seal perturbations, maintain Reactor Coolant Pump Control Bleedoff Pressure 40 PSIG to 65 PSIG when any Reactor Coolant Pumps are running. Reactor Coolant Pump Control Bleedoff Pressure operating band may be expanded to 30 PSIG to 120 PSIG with a ≤4 PSIG per minute rate of change limit during short periods of operation such as establishing nitrogen or hydrogen blankets on the Volume Control Tank. Refer to Attachment 11.1, RCS Pressure and Temperature Limits Graph.

6.2 STOPPING A REACTOR COOLANT PUMP

> **CAUTION**
>
> RX THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.
>
> **[INPO 06-006]**

> **CAUTION**
>
> ALL CLOSED REACTOR TRIP BREAKERS WILL OPEN ON FIRST RCP TRIP UNLESS REACTOR COOLANT LOW FLOW BYPASSES ARE ENABLED.

6.2.1 For RCP to be secured (1A, 1B, 2A, or 2B), Place associated RCP (1A, 1B, 2A, 2B) Oil Lift Pump A or B control switch to ON and verify lift pump Starts. **[P-15101]**

6.2.1.1 Verify remaining RCP 1A (1B, 2A, 2B) Oil Lift Pump B or A control switch in AUTO.

6.2.2 Have an individual in place to monitor VLPMS for loose parts that can become dislodged by changes in Reactor Coolant flow in accordance with OP-004-017, Valve and Loose Parts Monitoring.

> **CAUTION**
>
> CBO AND CCW FLOW TO SEAL COOLERS SHOULD BE MAINTAINED AFTER RCP HAS BEEN SECURED UNTIL RCS TEMPERATURE HAS BEEN REDUCED TO ≤140°F.

RX 6.2.3 Stop desired RCP 1A (1B, 2A, 2B) by placing its associated control switch at CP-2 to Stop.

6.2.4 When RCP 1A (1B, 2A, 2B) speed indicates rotor is at rest, as indicated by PMC PID (PIDs are listed on Attachment 11.2), or with SM/CRS authorization, then secure operating RCP 1A (1B, 2A, 2B) Oil Lift Pumps by placing their control switches to OFF. **[P-15101]**

6.2.4.1 After RCP 1A (1B, 2A, 2B) has been secured for approximately 5 minutes, then verify all secured RCPs are not rotating in the reverse direction by observing zero speed indicated on the computer points listed in Attachment 11.2.

6.2.4.2 If PMC points indicate any RCP is rotating in the reverse direction, then refer to OP-901-130, Reactor Coolant Pump Malfunction and notify SM/CRS.

9.0 AUTOMATIC FUNCTIONS

9.1 RCP Seal Cooler CCW Isolation.. 155°F Outlet Temp

REQUEST/APPROVAL PAGE

SAFETY RELATED
PROCEDURE

Normal Review Class (check one):

☐ **OSRC**

☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-901-130	REVISION: 011
TITLE: Reactor Coolant Pump Malfunction	
PROCEDURE OWNER (Position Title): Operations Manager - Support	

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable):

Expiration Date / Milestone (if applicable): N/A 12/16/2015

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

In Section E2, Step 3, changed Thrust Bearing Temperature from 205 to 208 deg F.
In Section E3, Step 1, changed Thrust Bearing Temperature from 205 to 208 deg F.
In Section E4, Step 3, changed Thrust Bearing Temperature from 205 to 208 deg F.

These changes were made based on EC-62008 and associated PAD. This EC discusses the fact that the newly installed (RF-20) Reactor Coolant Pump (2A) thrust bearing is consistently running at a higher temperature of 203 to 204.7 deg F. The procedure is being changed to allow more margin to the off normal entry condition.

☐ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☑ **Normal** ☐ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			Nicole Blank	12/15/2015
EC SUPERVISOR	Administrative Review and Approval		(sign) N/A	
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☑	PA Exclusion ☐	Robert Ledet	12/15/2015
TECHNICAL	Review ☑	Verification ☐	Michael Shumate	12/15/2015
QUALIFIED REVIEWER	Review ☑		Jude N Foret	12/16/2015
GROUP/DEPT. HEAD	Review ☐	Approval ☑	(sign)	12-16-15
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

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CONTINUOUS USE

A. PURPOSE

1. Provide instructions for responding to any of the following Reactor Coolant Pump (RCP) malfunctions:
   - Seal Failure
   - Lube Oil Emergency
   - Bearing Temperature High
   - High Vibration
   - Reverse Rotation
   - High ARRD Temperature
   - High Shaft Vibration

B. SYMPTOMS

1. Alarms:
    - RCP 1A VIBRATION HI (Cabinet H, A-4)
    - RCP 1B VIBRATION HI (Cabinet H, A-6)
    - RCP 2A VIBRATION HI (Cabinet H, A-8)
    - RCP 2B VIBRATION HI (Cabinet H, A-10)
    - RCP 1A SEAL COOLER CCW PRESSURE HI (Cabinet H, C-4)
    - RCP 1B SEAL COOLER CCW PRESSURE HI (Cabinet H, C-6)
    - RCP 2A SEAL COOLER CCW PRESSURE HI (Cabinet H, C-8)
    - RCP 2B SEAL COOLER CCW PRESSURE HI (Cabinet H, C-10)
    - RCP 1A SEAL CLR CCW VALVES CLOSED (Cabinet H, D-4)
    - RCP 1B SEAL CLR CCW VALVES CLOSED (Cabinet H, D-6)
    - RCP 2A SEAL CLR CCW VALVES CLOSED (Cabinet H, D-8)
    - RCP 2B SEAL CLR CCW VALVES CLOSED (Cabinet H, D-10)
    - RCP 1A LUBE OIL PRESSURE LO (Cabinet H, E-3)
    - RCP 1B LUBE OIL PRESSURE LO (Cabinet H, E-5)
    - RCP 2A LUBE OIL PRESSURE LO (Cabinet H, E-7)
    - RCP 2B LUBE OIL PRESSURE LO (Cabinet H, E-9)
    - RCP 1A SEAL COOLER CCW TEMPERATURE HI (Cabinet H, E-4)
    - RCP 1B SEAL COOLER CCW TEMPERATURE HI (Cabinet H, E-6)
    - RCP 2A SEAL COOLER CCW TEMPERATURE HI (Cabinet H, E-8)
    - RCP 2B SEAL COOLER CCW TEMPERATURE HI (Cabinet H, E-10)
    - RCP 1A THRUST BRNG TEMPERATURE HI (Cabinet H, F-3)
    - RCP 1B THRUST BRNG TEMPERATURE HI (Cabinet H, F-5)
    - RCP 2A THRUST BRNG TEMPERATURE HI (Cabinet H, F-7)
    - RCP 2B THRUST BRNG TEMPERATURE HI (Cabinet H, F-9)
    - RCP 1A CONTROLLED BLEEDOFF TEMP HI (Cabinet H, F-4)
    - RCP 1B CONTROLLED BLEEDOFF TEMP HI (Cabinet H, F-6)
    - RCP 2A CONTROLLED BLEEDOFF TEMP HI (Cabinet H, F-8)
    - RCP 2B CONTROLLED BLEEDOFF TEMP HI (Cabinet H, F-10)
    - RCP 1A CCW FLOW LOST (Cabinet SA, A-1), (Cabinet SB, A-6)

Alarms (cont'd):

- RCP 1B CCW FLOW LOST (Cabinet SA, A-2), (Cabinet SB, A-7)
- RCP 2A CCW FLOW LOST (Cabinet SA, A-3), (Cabinet SB, A-8)
- RCP 2B CCW FLOW LOST (Cabinet SA, A-4), (Cabinet SB, A-9)
- RCP CONTL BLEEDOFF HEADER PRESS HI-HI (Cabinet G, M-5)
- RCP CONTL BLEEDOFF HEADER PRESSURE HI (Cabinet G, N-5)

2. Indications:

- RCP Controlled Bleedoff temperature rising
- RCP Controlled Bleedoff flow rising
- RCP Bearing temperature rising
- Seal Water Cooler CCW Outlet temperature rising
- RCP Motor Lube Oil Reservoir Cooler(s) CCW return temperature rising
- RCP Motor Lube Oil Reservoir(s) temperature rising
- RCP Motor Oil Cooler(s) differential temperature rising
- RCP Oil Reservoir level dropping
- RCP Seal pressures outside of normal parameters
- RCP Anti-Reverse Rotation Device temperature(s) rising
- PMC PID A13003, RCP-1A X-PLANE PUMP SHAFT
- PMC PID A13004, RCP-1A Y-PLANE PUMP SHAFT
- PMC PID A13010, RCP-2A X-PLANE PUMP SHAFT
- PMC PID A13011, RCP-2A Y-PLANE PUMP SHAFT
- PMC PID A13017, RCP-1B X-PLANE PUMP SHAFT
- PMC PID A13018, RCP-1B Y-PLANE PUMP SHAFT
- PMC PID A13024, RCP-2B X-PLANE PUMP SHAFT
- PMC PID A13025, RCP-2B Y-PLANE PUMP SHAFT

C. AUTOMATIC ACTIONS

1. High Reactor Coolant Pump CCW Return temperature (155°F) actuates automatic isolation of RCP Seal Cooler:
   - 1A RCP SEAL COOLER (CC 679A/CC 6651A)
   - 1B RCP SEAL COOLER (CC 679B/CC 6651B)
   - 2A RCP SEAL COOLER (CC 680A/CC 666A)
   - 2B RCP SEAL COOLER (CC 680B/CC 666B)

D. IMMEDIATE OPERATOR ACTIONS

NONE

E_0 SUBSEQUENT OPERATOR ACTIONS

	PLACEKEEPER	
START	DONE	N/A

NOTE

Waterford 3 has operating Experience of ARRD failures, resulting in reverse rotation of a tripped Reactor Coolant Pump. In this case, indicated speed will not go negative when a RCP rotates in the reverse direction, it will be an absolute number. Speed will indicate approximately 600 RPM for the affected RCP with the other three RCPs running.

1. If Reactor Coolant Pump trips, then verify Reactor tripped and go to OP-902-000, Standard Post Trip Actions. ☐ ☐

2. If loss of Component Cooling Water to Reactor Coolant Pumps occurs, then go to OP-901-510, COMPONENT COOLING WATER SYSTEM MALFUNCTION. ☐ ☐

3. If Reactor Coolant Pump Seal has failed, then go to section E_1, Seal Failure. ☐ ☐

4. If Reactor Coolant Pump low oil pressure alarm occurs, then go to section E_2, Lube Oil Emergency. ☐ ☐

5. If a Reactor Coolant Pump Bearing temperature alarm occurs, then go to section E_3, Bearing Temperature High. ☐ ☐

6. If Reactor Coolant Pump high vibration alarm occurs, then go to section E_4, High Vibration. ☐ ☐

7. If reverse rotation is indicated on an idle Reactor Coolant Pump, then go to section E_5, Reverse Rotation. ☐ ☐

8. If Reactor Coolant Pump high ARRD temperature alarm occurs, then go to section E_6, Anti-Reverse Rotation Device (ARRD) Temperature High. ☐ ☐

E_0 SUBSEQUENT OPERATOR ACTIONS (CONT'D)

	PLACEKEEPER		
	START	DONE	N/A
9. If a Reactor Coolant Pump shaft high vibration computer alarm occurs on any of the following PMC PIDs: • RCP 1A: PIDs A13003, A13004 • RCP 2A: PIDs A13010, A13011 • RCP 1B: PIDs A13017, A13018 • RCP 2B: PIDs A13024, A13025 then go to section E_7, High Shaft Vibration.		☐	☐

END

E_5 REVERSE ROTATION

	PLACEKEEPER	
START	DONE	N/A

> **NOTE**
>
> Indicated speed will not go negative when an RCP rotates in the reverse direction, it will be an absolute number. Speed will indicate approximately 600 rpm for the affected RCP when the other three RCPs running.

1. Monitor Reactor Coolant Pump after shutdown for reverse rotation with the following methods:
   - If conditions permit, then verify reverse rotation by local observation.
   - PMC PID's D13214 (RCP 1A), D13614 (RCP 1B), D13414 (RCP 2A) and D13814 (RCP 2B).
   - Associated RCP PMC mimic
2. Start an oil lift pump on affected RCP.
3. Remove ALL Reactor Coolant Pumps from service.
4. Commence Plant cooldown to Shutdown Cooling entry conditions in accordance with OP-010-005, PLANT SHUTDOWN.
5. Refer to the following Technical Specifications:
   - 3.4.1.1
   - 3.4.1.2
   - 3.4.1.3
   - 3.4.1.4
6. Place Shutdown Cooling in service.

END

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S4

Reset Overspeed Trip of EFW Pump AB (Control Room Actions)

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Reset overspeed trip of EFW Pump AB in accordance with OP-009-003, Emergency Feedwater (Control Room Actions)

Task Standard: Applicant resets overspeed trip and re-starts EFW Pump AB in accordance with OP-009-003, Emergency Feedwater.

References: OP-009-003, Emergency Feedwater (rev 309)

Alternate Path: No Time Critical: No Validation Time: 10 min

K/A 061 GEN EPE 074 EA1.07 AFW System Importance Rating 4.2 / 4.3
RO/SRO

Safety Function 4S

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ______________________

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-009-003, Emergency Feedwater, Section 8.4 (Handout)

Description:
Applicant will perform Control Room actions to reset the overspeed trip and re-start EFW Pump AB in accordance with OP-009-003, Emergency Feedwater. This JPM is run in parallel with JPM S7.

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

Reset to IC-177

There are no Malfunctions or Overrides for this JPM.
Place EFW Back Up FCV Controllers in Auto and remove Caution Tags.
This JPM is run in parallel with JPM S7 (Reset Hi Cntmt Press ESFAS trip)

Pull up MS-407, EFW AB Drip Pot Normal Drain Bypass, (CP-13) on Extreme View to simulate NAO actions to open or close the valve by overriding the control switch should this be requested by the Examiner.

Note: EFW AB tripped due to overspeed while testing on the simulator with ~700 psig in the supply header.

Setup with specific IC unavailable or for non NRC exams:

1. *Reset the simulator to an IC at 100% power*
2. *Trip both SGFPs*
3. *Trip the reactor*
4. *Trip EFW Pump AB using FW05 after it auto starts*
5. *Reset mechanical trip device using FWR85*
6. *Place simulator in freeze and save IC*

Examiner Note
Cue the Simulator Operator to place the Simulator in RUN.

RX

TASK ELEMENT 1	STANDARD
Procedure Caution: THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.	Caution reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
8.4.1 Verify the following valves Closed: MS-401A EFW Pump AB Turbine Steam Supply Valve From S/G 1 MS-401B EFW Pump AB Turbine Steam Supply Valve From S/G 2	Both valves are closed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
8.4.2 Verify EFW Pump AB Turb Drip Pot Normal Drain Bypass, MS-407, Open.	MS-407 is open
Comment: Control switch for MS-407 is located on CP-13. The Control switch for MS-407 must be held in the "Open" position until the valve indicates full open otherwise the valve goes back closed. Opening this valve will de-pressurize the steam supply header to EFW Pump AB. Steam header pressure indication is on CP-8. **Examiner Cue: If the Applicant calls an NAO to operate MS-407, then ask, "Can MS-407 be operated remotely when power is available?" If the Applicant is not aware of the control switch on CP-13 or continues to request an NAO, then inform the simulator booth operator to perform the NAO actions.**	**SAT / UNSAT**

TASK ELEMENT 4	STANDARD
Procedure Caution: DURING A STATION BLACKOUT, ELECTRICAL POWER MAY NOT BE AVAILABLE TO OPERATE MS-416 AND THE MECHANICAL TRIP LINKAGE WILL NOT AUTOMATICALLY RE-LATCH.	Caution reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 5	STANDARD
8.4.3 If electrical power is not available to MS-416, then manually Close EFW Pump AB Turbine Stop Valve, MS-416.	Recognizes power is available and valve is closed.
Comment: This step is N/A.	**SAT / UNSAT**

TASK ELEMENT 6	STANDARD
Procedure Note: If the trip was a mechanical trip, then MS-416 cannot be operated from CP-8 until the mechanical linkage is reset locally.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 7	STANDARD
8.4.4 If the trip was a mechanical overspeed trip, then Reset locally as follows: 8.4.4.1 Reset mechanical overspeed tappet by pushing connecting rod lever back towards Stop Valve. 8.4.4.2 Verify tappet nut fully recessed. 8.4.4.3 Release connecting rod.	Recognizes that overspeed trip was not mechanical (given in cue)
Comment: Step 8.4.4 is N/A.	**SAT / UNSAT**

TASK ELEMENT 8	STANDARD
8.4.5 When Main Steam To EFPT Turb Press (MS IPT8340) is depressurized, then Close EFW Pump AB Turb Drip Pot Normal Drain Bypass, MS-407.	Turbine Steam Pressure is depressurized below a steam pressure that will not cause turbine overspeed when MS-416 is opened.
Comment: MS IPT8340 is located on CP-8. It is labeled “Turbine Steam Press”. MS-407 control switch is on CP-13. MS-407 position is not critical. This task is unsat if EFW Pump AB trips due to overspeed when MS-416 is opened in Task Element 10.	**Critical** **SAT / UNSAT**

TASK ELEMENT 9	STANDARD
Procedure Caution: (1) THE GOVERNOR VALVE IS FULL OPEN AND RESIDUAL STEAM PRESSURE IN THE STEAM ADMISSION LINES MAY ROLL THE TURBINE (MOMENTARILY) WHEN OPENING MS-416. (2) DURING A STATION BLACKOUT, ELECTRICAL POWER MAY NOT BE AVAILABLE TO OPERATE MS-416.	Caution reviewed
Comment:	**SAT / UNSAT**

RX

TASK ELEMENT 10	STANDARD
8.4.6 Open EFW Pump AB Turbine Stop Valve, MS-416, as follows: 8.4.6.1 If electrical power is available to MS-416, then Open EFW Pump AB Turbine Stop Valve, MS-416, from CP-8.	Stop valve (MS-416) is open
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 11	STANDARD
8.4.6.2 Open the following valves: MS-401A EFW Pump AB Turbine Steam Supply Valve From S/G 1 MS-401B EFW Pump AB Turbine Steam Supply Valve From S/G 2	At least one supply valve is open and EFW Pump AB is running
Comment: Applicant should monitor turbine speed and pump discharge pressure as EFW Pump AB ramps up to speed. Turbine speed normally stabilizes at 4420-4480 RPM with steam supply pressure greater than or equal to 750 PSIG.	**Critical** **SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

RETURN ALL HANDOUTS & THIS CUE SHEET TO EXAMINER UPON COMPLETION OF TASK

INITIAL CONDITIONS:

- Main Feedwater is not available
- EFW Pump AB has tripped due to an electrical overspeed signal

INITIATING CUE(S):

The CRS directs you to reset EFW Pump AB in accordance with OP-009-002, Emergency Feedwater.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Successive starts of EFW Pump motors should conform to the guidelines in OI-042-000, Watch Station Processes.

3.1.2 Prior to starting EFW Pump AB for surveillance testing, the steam supply line heat tracing circuits shall be verified at proper temperatures in accordance with OP-002-007, Freeze Protection and Temperature Maintenance. **[P-15359]**

3.1.3 EFW Pump and turbine bearing oil levels should be verified prior to starting and after starting the pump.

3.1.4 Feedwater flow should be limited to less than 150 GPM for 5 minutes if Steam Generator level is less than 46% Narrow Range.

3.2 LIMITATIONS

3.2.1 Chemistry should be notified prior to use of Emergency Feedwater Pumps (except during actual emergencies) to feed Steam Generators.

3.2.2 Chemistry should be notified of automatic operation of Emergency Feedwater Pumps.

3.2.3 The EFW Pump AB Turbine is equipped with two level gauges, one in each bearing housing. The level gauges each have two marks which indicate low and high levels. The volume between the marks is about 500 ml. Turbine oil levels should be maintained as follows: **[ER-W3-2003-0758]**:

- With the EFW Pump AB Turbine secured, and oil at ambient temperature, maintain oil levels between low and high marks.
- If EFW Pump AB Turbine oil level is at, or just above, the low mark with the turbine secured, oil level may lower slightly (<1/4 inch) below the low mark during turbine operation. This is an acceptable level for operation of the turbine.
- With oil levels high in band (> midway between high and low marks) with the turbine secured, oil may leak out in the area of the overspeed tappet assembly during turbine operation.

8.4 Resetting EFW Pump AB After Overspeed Trip

CAUTION

R THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

8.4.1 Verify the following valves Closed:

MS-401A	EFW Pump AB Turbine Steam Supply Valve From S/G 1
MS-401B	EFW Pump AB Turbine Steam Supply Valve From S/G 2

8.4.2 Verify EFW Pump AB Turb Drip Pot Normal Drain Bypass, MS-407, Open.

CAUTION

DURING A STATION BLACKOUT, ELECTRICAL POWER MAY NOT BE AVAILABLE TO OPERATE MS-416 AND THE MECHANICAL TRIP LINKAGE WILL NOT AUTOMATICALLY RE-LATCH.

8.4.3 If electrical power is not available to MS-416, then manually Close EFW Pump AB Turbine Stop Valve, MS-416.

NOTE

If the trip was a mechanical trip, then MS-416 cannot be operated from CP-8 until the mechanical linkage is reset locally.

8.4.4 If the trip was a mechanical overspeed trip, then Reset locally as follows:

8.4.4.1 Reset mechanical overspeed tappet by pushing connecting rod lever back towards Stop Valve.

8.4.4.2 Verify tappet nut fully recessed.

8.4.4.3 Release connecting rod.

8.4.5 When Main Steam To EFPT Turb Press (MS IPT8340) is depressurized, then Close EFW Pump AB Turb Drip Pot Normal Drain Bypass, MS-407.

CAUTION

(1) THE GOVERNOR VALVE IS FULL OPEN AND RESIDUAL STEAM PRESSURE IN THE STEAM ADMISSION LINES MAY ROLL THE TURBINE (MOMENTARILY) WHEN OPENING MS-416.

(2) DURING A STATION BLACKOUT, ELECTRICAL POWER MAY NOT BE AVAILABLE TO OPERATE MS-416.

RX

8.4.6 Open EFW Pump AB Turbine Stop Valve, MS-416, as follows:

8.4.6.1 If electrical power is available to MS-416, then Open EFW Pump AB Turbine Stop Valve, MS-416, from CP-8.

8.4.6.2 Open the following valves:

- MS-401A EFW Pump AB Turbine Steam Supply Valve From S/G 1
- MS-401B EFW Pump AB Turbine Steam Supply Valve From S/G 2

8.4.6.3 If electrical power is not available to MS-416, then manually throttle Open EFW Pump AB Turbine Stop Valve, MS-416, to establish desired EFW flow.

9.0 AUTOMATIC FUNCTIONS

9.1	Emergency Feedwater Pump AB Turbine Electrical Overspeed Trip (EFW-IST-8350AB)	4895 RPM
9.2	Emergency Feedwater Pump AB Turbine Mechanical Overspeed Trip (EFW-MPMP-0001AB)	4930-4980 RPM
9.3	Main Steam to Emergency Feedwater Pump AB Turbine Drain Leg Level Hi to Alarm and Open Hi Drain Valve, MS-407, (MS-ILIS-0311)	8.0 INWC
9.4	Main Steam to Emergency Feedwater Pump AB Turbine Drain Leg Level Hi to Open Normal Drain Valve, MS-408, (MS-ILIS-0311)	5.5 INWC
9.5	EFAS-1 Train A or B Logic Initiated	SG1 ≤27.4% NR SG1 ≥666PSIA or SG1 ≤27.4% NR SG1 123 PSID >SG2
9.6	EFAS-2 Train A or B Logic Initiated	SG2 ≤27.4% NR SG2 ≥666 PSIA or SG2 ≤27.4% NR SG2 123 PSID >SG1
9.7	DEFAS Actuation	DRTS signal present with the following: • Both SG1 and SG2 WR levels $\leq$ 55% • Both SG1 and SG2 pressures $\geq$750 PSIA • No EFAS-1 or EFAS-2

REQUEST/APPROVAL PAGE

SAFETY RELATED
PROCEDURE

Normal Review Class (check one):

☐ **OSRC**

☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-009-003	REVISION: 309
TITLE: Emergency Feedwater	
PROCEDURE OWNER (Position Title): Operations Manager - Support	

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 9/8/16

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

(a) Added guidance in Section 8.5 and Attachment 11.4 for local manual operation of the EFW Isolation Valves (EFW-228A&B, EFW-229A&B) in addition to the EFW Flow Control Valves. The titles of section 8.5 and Attachment 11.4 have been updated to indicate the expanded scope. There are certain failures that could require local manual operation of the EFW Isolation Valves as well as the EFW FCVs. EC-41355 assigned a local operation safety function to these valves. The operation of the Isol Valves is identical to the FCVs. Steps for operating these valves locally already exist in OP-903-121 but should be added to OP-009-003 since this is the procedure that would be used for local operation if needed. The instructions of operation of the EFW Isolation Valves duplicate existing approved instructions and match the with the operation of the EFW FCVs. Therefore, this change meets Editorial Correction criteria.

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			David R. Voisin	9/6/2016
EC SUPERVISOR	Administrative Review and Approval		(sign) [illegible]	9/7/16
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Operations [Administrative Review]		David F. Litolff	9/6/2016
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐	PA Exclusion ☐	N/A	
TECHNICAL	Review ☐	Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐		N/A	
GROUP/DEPT. HEAD	Review ☐	Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Successive starts of EFW Pump motors should conform to the guidelines in OI-042-000, Watch Station Processes.

3.1.2 Prior to starting EFW Pump AB for surveillance testing, the steam supply line heat tracing circuits shall be verified at proper temperatures in accordance with OP-002-007, Freeze Protection and Temperature Maintenance. **[P-15359]**

3.1.3 EFW Pump and turbine bearing oil levels should be verified prior to starting and after starting the pump.

3.1.4 Feedwater flow should be limited to less than 150 GPM for 5 minutes if Steam Generator level is less than 46% Narrow Range.

3.2 LIMITATIONS

3.2.1 Chemistry should be notified prior to use of Emergency Feedwater Pumps (except during actual emergencies) to feed Steam Generators.

3.2.2 Chemistry should be notified of automatic operation of Emergency Feedwater Pumps.

3.2.3 The EFW Pump AB Turbine is equipped with two level gauges, one in each bearing housing. The level gauges each have two marks which indicate low and high levels. The volume between the marks is about 500 ml. Turbine oil levels should be maintained as follows: **[ER-W3-2003-0758]**:

- With the EFW Pump AB Turbine secured, and oil at ambient temperature, maintain oil levels between low and high marks.
- If EFW Pump AB Turbine oil level is at, or just above, the low mark with the turbine secured, oil level may lower slightly (<1/4 inch) below the low mark during turbine operation. This is an acceptable level for operation of the turbine.
- With oil levels high in band (> midway between high and low marks) with the turbine secured, oil may leak out in the area of the overspeed tappet assembly during turbine operation.

8.4 RESETTING EFW PUMP AB AFTER OVERSPEED TRIP

> **CAUTION**
>
> RX THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.
>
> **[INPO 06-006]**

8.4.1 Verify the following valves Closed:

- MS-401A EFW Pump AB Turbine Steam Supply Valve From S/G 1
- MS-401B EFW Pump AB Turbine Steam Supply Valve From S/G 2

8.4.2 Verify EFW Pump AB Turb Drip Pot Normal Drain Bypass, MS-407, Open.

> **CAUTION**
>
> DURING A STATION BLACKOUT, ELECTRICAL POWER MAY NOT BE AVAILABLE TO OPERATE MS-416 AND THE MECHANICAL TRIP LINKAGE WILL NOT AUTOMATICALLY RE-LATCH.

8.4.3 If electrical power is not available to MS-416, then manually Close EFW Pump AB Turbine Stop Valve, MS-416.

> **NOTE**
>
> If the trip was a mechanical trip, then MS-416 cannot be operated from CP-8 until the mechanical linkage is reset locally.

8.4.4 If the trip was a mechanical overspeed trip, then Reset locally as follows:

8.4.4.1 Reset mechanical overspeed tappet by pushing connecting rod lever back towards Stop Valve.

8.4.4.2 Verify tappet nut fully recessed.

8.4.4.3 Release connecting rod.

8.4.5 When Main Steam To EFPT Turb Press (MS IPT8340) is depressurized, then Close EFW Pump AB Turb Drip Pot Normal Drain Bypass, MS-407.

CAUTION

(1) THE GOVERNOR VALVE IS FULL OPEN AND RESIDUAL STEAM PRESSURE IN THE STEAM ADMISSION LINES MAY ROLL THE TURBINE (MOMENTARILY) WHEN OPENING MS-416.

(2) DURING A STATION BLACKOUT, ELECTRICAL POWER MAY NOT BE AVAILABLE TO OPERATE MS-416.

RX

8.4.6 Open EFW Pump AB Turbine Stop Valve, MS-416, as follows:

8.4.6.1 If electrical power is available to MS-416, then Open EFW Pump AB Turbine Stop Valve, MS-416, from CP-8.

8.4.6.2 Open the following valves:

- MS-401A EFW Pump AB Turbine Steam Supply Valve From S/G 1
- MS-401B EFW Pump AB Turbine Steam Supply Valve From S/G 2

8.4.6.3 If electrical power is not available to MS-416, then manually throttle Open EFW Pump AB Turbine Stop Valve, MS-416, to establish desired EFW flow.

9.0 AUTOMATIC FUNCTIONS

9.1	Emergency Feedwater Pump AB Turbine Electrical Overspeed Trip (EFW-IST-8350AB)	4895 RPM
9.2	Emergency Feedwater Pump AB Turbine Mechanical Overspeed Trip (EFW-MPMP-0001AB)	4930-4980 RPM
9.3	Main Steam to Emergency Feedwater Pump AB Turbine Drain Leg Level Hi to Alarm <u>and</u> Open Hi Drain Valve, MS-407, (MS-ILIS-0311)	8.0 INWC
9.4	Main Steam to Emergency Feedwater Pump AB Turbine Drain Leg Level Hi to Open Normal Drain Valve, MS-408, (MS-ILIS-0311)	5.5 INWC
9.5	EFAS-1 Train A <u>or</u> B Logic Initiated	SG1 ≤27.4% NR SG1 ≥666PSIA <u>or</u> SG1 ≤27.4% NR SG1 123 PSID >SG2
9.6	EFAS-2 Train A <u>or</u> B Logic Initiated	SG2 ≤27.4% NR SG2 ≥666 PSIA <u>or</u> SG2 ≤27.4% NR SG2 123 PSID >SG1
9.7	DEFAS Actuation	DRTS signal present <u>with</u> the following: • <u>Both</u> SG1 <u>and</u> SG2 WR levels <u><</u> 55% • <u>Both</u> SG1 <u>and</u> SG2 pressures <u>></u>750 PSIA • <u>No</u> EFAS-1 <u>or</u> EFAS-2

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S5

Perform OP-903-037, Containment Cooling Fans Operability Check

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Perform OP-903-037, Containment Cooling Fans Operability Check

Task Standard: Applicant completes OP-903-037, Containment Cooling Fans Operability Check

References: OP-903-037, Containment Cooling Fans Operability Check (rev 7)

Alternate Path: No Time Critical: No Validation Time: 15 min

K/A 022 A4.01 CCS Fans

Importance Rating 3.6 / 3.6
RO/SRO

Safety Function 5

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-903-037, Containment Cooling Fans Operability Check (Handout)

Description:
This task is performed at CP-18. The applicant must perform surveillance OP-903-037, which will require logging differential pressure for the 3 running fans. The candidate will then have to secure a running Containment Cooling Fan and start Containment Cooling Fan D, at which time the data for CCS Fan D can be recorded. The applicant should then leave the CCS Fans in an alignment with A, B, and D running, as specified in OP-903-037. This JPM will be run in parallel with S2.

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

Reset to IC-172

Verify CFC A, B, and C are running initially
There are no malfunctions or overrides for this JPM.
This JPM is run in parallel with JPM S2 (Reduce RCS Press and raise PZR level).

Examiner Note
Cue the Simulator Operator to place the Simulator in RUN. Train A Containment Fan Coolers (CFC) are: A and C Train B Containment Fan Coolers (CFC) are: B and D

TASK ELEMENT 1	STANDARD
Procedure Note: (1) Normal DP for Containment Fan Coolers is 5.0 INWC to 8.0 INWC, as indicated on CCS-IDPR-5154A(B). Engineering support may be needed to determine Operability if DP is found outside of this band. (2) This section is intended to ensure that there is ≥625 gpm CCW flow per train with either the A or C fan running with either the B or D fan. Different combinations of fans are allowed; however, only one fan should be running per train when recording CCW flow.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
7.1 Verify the operating CFC units have been running for ≥15 minutes and document on Attachment 10.1, CFC Data Sheet. 7.1.1 Record DP for the operating Containment Fan Coolers on Attachment 10.1.	D/P values for CFC A, B and C recorded on Att. 10.1
Comment: Operating time is given in cue sheet. D/P values are not critical (not part of acceptance criteria).	**SAT / UNSAT**

TASK ELEMENT 3	STANDARD
Procedure Caution: To prevent vibration alarms, and damage to containment cooling unit duct work, limit configuration to only three (3) of four (4) units operating at a time.	Caution reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 4	STANDARD
7.2 Adjust CFC operating unit configuration to attain one Containment Cooling Fan running per train as follows: 7.2.1 If two Containment Fan Coolers are running on the A Train, then stop one of the Containment Fan Coolers A(C) by placing CFC A(C) control switch CCS-0003 A(C) to Stop.	CFC A or C is stopped
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
7.2.2 If two Containment Fan Coolers are running on the B Train, then stop one of the Containment Fan Coolers B(D) by placing CFC B(D) control switch CCS-0003 B(D) to Stop.	Determine that only one B Train CFC is running
Comment: This step is not applicable.	**SAT / UNSAT**

TASK ELEMENT 6	STANDARD
7.2.3 When CCW flow has stabilized, then record CCW flow for all of the operating Containment Fan Coolers on Attachment 10.1.	Flow values of 2 operating CFCs recorded on Att. 10.1
Comment: The applicant will record flow for the two operating CFCs. Operating CFCs: B and A or C (circle the Train A CFC operating/tested)	**Critical** **SAT / UNSAT**

TASK ELEMENT 7	STANDARD
7.3 Adjust CFC operating unit configuration to test the two Containment Cooling Fans not tested in step 7.2 as follows: 7.3.1 Start the non-running Containment Fan Cooler on Train A by placing CFC A(C) control switch CCS-0003 A(C) to Start/ Fast.	CFC A or C is started
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 8	STANDARD
7.3.1.1 Record start time on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1. 7.3.1.2 Record DP on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.	Determine that both A and C were previously running
Comment: These steps are not applicable.	**SAT / UNSAT**

TASK ELEMENT 9	STANDARD
7.3.2 Secure the previously tested Containment Fan Cooler on Train A by placing CFC A(C) control switch CCS-0003 A(C) to Stop.	CFC A or C is stopped
Comment: Secures the Train A CFC tested in Task Element 6.	**Critical** **SAT / UNSAT**

TASK ELEMENT 10	STANDARD
7.3.3 Start the non-running Containment Fan Cooler on Train B by placing CFC B(D) control switch CCS-0003 B(D) to Start/ Fast.	CFC D is started
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 11	STANDARD
7.3.3.1 Record start time on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.	CFC D start time recorded on Att. 10.1
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 12	STANDARD
7.3.3.2 Record DP on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.	CFC D D/P value recorded on Att. 10.1
Comment: D/P values are not critical (not part of acceptance criteria).	**SAT / UNSAT**

TASK ELEMENT 13	STANDARD
7.3.4 Secure the previously tested Containment Fan Cooler on Train B by placing CFC B(D) control switch CCS-0003 B(D) to Stop.	CFC B is stopped
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 14	STANDARD
7.3.5 When CCW flow has stabilized, then record CCW flow for the operating Containment Fan Coolers on Attachment 10.1.	Flow values of 2 operating CFCs recorded on Att. 10.1
Comment: The applicant will record flow for the two operating CFCs. Operating CFCs: D and A or C (circle the Train A CFC operating/tested) Note: The Train A CFC circled should be the one not tested in Task Element 6.	**Critical** **SAT / UNSAT**

TASK ELEMENT 15	STANDARD
Procedure Note: In Attachment 10.2, Run Time Equalization Schedule Sheet, the CFCs should be run for the majority of the month they are listed with. If necessary, use the previously running CFCs as a reference for fan alignment for the next 30 days.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 16	STANDARD
7.4 Using Attachment 10.2, Run Time Equalization Schedule Sheet, align CFC units for monthly operation as follows: 7.4.1 Start desired Containment Fan Cooler (CFC), by placing Fan Cooler A(B)(C)(D) control switch CCS-0003 A(B)(C)(D) to Start/ Fast.	CFC A or C is started
Comment: Per the cue sheet, the April alignment is A, C, and D. The applicant should start the non-running Train A CFC.	**SAT / UNSAT**

TASK ELEMENT 17	STANDARD
7.5 Once all CFC units have run for 15 minutes, document CCW flow rate is ≥625 GPM per train for the CFC units that were tested, and each CFC unit has run for ≥15 minutes on Attachment 10.1.	Step 7.5 of Att. 10.1 initialed as satisfactory.
Comment: **Examiner Cue: 15 minutes has elapsed.**	**Critical** **SAT / UNSAT**

TASK ELEMENT 18	STANDARD
7.6 Document on Attachment 10.1, CFC Data Sheet, that CFC units are aligned as required by Attachment 10.2.	Step 7.6 of Att. 10.1 initialed as satisfactory.
Comment:	**SAT / UNSAT**

TASK ELEMENT 19	STANDARD
7.7 Document on Attachment 10.1 that CFC DP was within the normal operating band of 5.0 INWC – 8.0 INWC for all CFC units. 7.7.1 If a CFC DP is found to be outside of the normal operating band, then initiate a Condition Report and obtain Engineering support, as required, to determine Operability.	Step 7.7 of Att. 10.1 initialed as satisfactory.
Comment:	**SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- Plant is in Mode 3.
- Containment Fan Coolers have been running for about a month in the current alignment.

INITIATING CUE(S):

The CRS has directed you to perform OP-903-037, Containment Cooling Fans Operability Check. Align the final Containment Fan Cooler configuration for the month of April.

3.0 PRECAUTIONS AND LIMITATIONS

JPM S5 Handout

3.1 PRECAUTIONS

3.1.1 Air flow is reduced to the D-rings when fewer than three Containment Fan Coolers are operating. This will cause temperatures on the RCPs to rise and may cause in-leakage to the Reactor Drain Tank to rise if any RCP gasket leakoff is aligned to the RDT per OP-001-001. This effect is most prominent when outdoor ambient temperature exceeds 65°F.

3.2 LIMITATIONS

3.2.1 Inform the SM/CRS if the conditions of Section 6.0, Acceptance Criteria, cannot be met.

6.0 ACCEPTANCE CRITERIA

6.1 Each component tested on Attachment 10.1, CFC Data Sheet, shall meet the following criteria.

6.1.1 Each CFC unit not already in operation is started from Control Room and operates for ≥15 minutes.

6.1.2 With one CFC running per train CCW flow rate is ≥625 GPM per train.

7.0 PROCEDURE

NOTE

(1) Normal DP for Containment Fan Coolers is 5.0 INWC to 8.0 INWC, as indicated on CCS-IDPR-5154A(B). Engineering support may be needed to determine Operability if DP is found outside of this band.

(2) This section is intended to ensure that there is ≥625 gpm CCW flow per train with either the A or C fan running with either the B or D fan. Different combinations of fans are allowed; however, only one fan should be running per train when recording CCW flow.

7.1 Verify the operating CFC units have been running for ≥15 minutes and document on Attachment 10.1, CFC Data Sheet.

7.1.1 Record DP for the operating Containment Fan Coolers on Attachment 10.1.

CAUTION

TO PREVENT VIBRATION ALARMS, AND DAMAGE TO CONTAINMENT COOLING UNIT DUCT WORK, LIMIT CONFIGURATION TO ONLY THREE (3) OF FOUR (4) UNITS OPERATING AT A TIME.

7.2 Adjust CFC operating unit configuration to attain one Containment Cooling Fan running per train as follows:

7.2.1 If two Containment Fan Coolers are running on the A Train, then stop one of the Containment Fan Coolers A(C) by placing CFC A(C) control switch CCS-0003 A(C) to Stop.

7.2.2 If two Containment Fan Coolers are running on the B Train, then stop one of the Containment Fan Coolers B(D) by placing CFC B(D) control switch CCS-0003 B(D) to Stop.

7.2.3 When CCW flow has stabilized, then record CCW flow for all of the operating Containment Fan Coolers on Attachment 10.1.

7.3 Adjust CFC operating unit configuration to test the two Containment Cooling Fans not tested in step 7.2 as follows:

7.3.1 Start the non-running Containment Fan Cooler on Train A by placing CFC A(C) control switch CCS-0003 A(C) to Start/ Fast.

7.3.1.1 Record start time on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.

7.3.1.2 Record DP on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.

7.3.2 Secure the previously tested Containment Fan Cooler on Train A by placing CFC A(C) control switch CCS-0003 A(C) to Stop.

7.3.3 Start the non-running Containment Fan Cooler on Train B by placing CFC B(D) control switch CCS-0003 B(D) to Start/ Fast.

7.3.3.1 Record start time on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.

7.3.3.2 Record DP on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.

7.3.4 Secure the previously tested Containment Fan Cooler on Train B by placing CFC B(D) control switch CCS-0003 B(D) to Stop.

7.3.5 When CCW flow has stabilized, then record CCW flow for the operating Containment Fan Coolers on Attachment 10.1.

NOTE

In Attachment 10.2, Run Time Equalization Schedule Sheet, the CFCs should be run for the majority of the month they are listed with. If necessary, use the previously running CFCs as a reference for fan alignment for the next 30 days.

7.4 Using Attachment 10.2, Run Time Equalization Schedule Sheet, align CFC units for monthly operation as follows:

7.4.1 Start desired Containment Fan Cooler (CFC), by placing Fan Cooler A(B)(C)(D) control switch CCS-0003 A(B)(C)(D) to Start/ Fast.

7.5 Once all CFC units have run for 15 minutes, document CCW flow rate is ≥625 GPM per train for the CFC units that were tested, and each CFC unit has run for ≥15 minutes on Attachment 10.1.

7.6 Document on Attachment 10.1, CFC Data Sheet, that CFC units are aligned as required by Attachment 10.2.

7.7 Document on Attachment 10.1 that CFC DP was within the normal operating band of 5.0 INWC – 8.0 INWC for all CFC units.

7.7.1 If a CFC DP is found to be outside of the normal operating band, then initiate a Condition Report and obtain Engineering support, as required, to determine Operability.

10.1 CFC DATA SHEET

Test Permission: _*CR Supervisor*______/__*Today/Now*__
SM/CRS (Signature) Date/Time

CFC A	CC-IFI-7570A2S	______	GPM
	Check one:	☐ OPERATING	☐ STARTED
	Start time:	______	(maybe N/A)
	Fan DP (CCS-IDPR-5154A)	______	INWC
CFC B	CC-IFI-7570B2S	______	GPM
	Check one:	☐ OPERATING	☐ STARTED
	Start time:	______	(maybe N/A)
	Fan DP (CCS-IDPR-5154B)	______	INWC
CFC C	CC-IFI-7570A1S	______	GPM
	Check one:	☐ OPERATING	☐ STARTED
	Start time:	______	(maybe N/A)
	Fan DP (CCS-IDPR-5154A)	______	INWC
CFC D	CC-IFI-7570B1S	______	GPM
	Check one:	☐ OPERATING	☐ STARTED
	Start time:	______	(maybe N/A)
	Fan DP (CCS-IDPR-5154B)	______	INWC

STEP		initials
7.5	Verify CFC units CCW flow rate is ≥625 GPM and all CFC units started have been operated at least 15 minutes.	______
7.6	Verify CFC units aligned, if possible, per Attachment 10.2, Run Time Equalization Schedule Sheet.	______
7.7	Verify CFC units DP is within 5.0 INWC – 8.0 INWC when running **[CR-WF3-2013-02530]**	______

CFC DATA SHEET (CONT'D)

REMARKS: ____

____

____

Performed: ______________________ ____________
(Operator Signature) (Date)

Independent Review: ______________________ ____________
(Signature) (Date)

SM/CRS Review: ______________________ ______/______
(Signature) (Date/Time)

10.2 RUN TIME EQUALIZATION SCHEDULE SHEET

NOTE

CFC units should be aligned in accordance with monthly schedule to equalize run times. If conditions do not allow running CFCs in accordance with this schedule or the System Engineer requests a different alignment, note change in remarks section of Attachment 10.1, CFC Data Sheet.

Month	CFC Alignment
January	A, B, C
February	A, B, D
March	B, C, D
April	A, C, D
May	A, B, C
June	A, B, D
July	B, C, D
August	A, C, D
September	A, B, C
October	A, B, D
November	B, C, D
December	A, C, D

REQUEST/APPROVAL PAGE

SAFETY RELATED
PROCEDURE

Normal Review Class (check one):

☐ **OSRC**

☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-903-037		REVISION: 007

TITLE: Containment Cooling Fan Operability Verification

PROCEDURE OWNER (Position Title): Assistant Operations Manager (Support)

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 12/11/2014

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

Section 7.0 and Attachment 10.1 were revised to include the recording of differential pressure for operating Containment Fan Coolers. The operator is directed to compare the recorded DP to the normal operating band of 5.0 – 8.0 INWC. If fan DP is outside of this band, then the operator is directed to initiate a Condition Report and obtain Engineering assistance, if needed, to determine Operability. This is the same band as given in OP-008-003, Containment Cooling System. The actions directed to take if DP is found to be abnormal are the same general actions that would be taken if the DP was found to be abnormal during normal operation of the system. The recording of fan DP does not affect the performance of this surveillance, it only provides a means to trend a possibly degrading trend. Therefore, this revision meets the criteria of an Editorial Correction. This revision partially satisfies the requirements of CR-WF3-2013-02530 CA-51.

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES		PRINT NAME OR SIGNATURE	DATE
PREPARER		Brett Griffith	12/10/2014
EC SUPERVISOR	Administrative Review and Approval	(sign) [signature]	12/11/14
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Operations [Licensed Operator Peer Review]	David Litolff	12/10/2014
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐ PA Exclusion ☐	N/A	
TECHNICAL	Review ☐ Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐	N/A	
GROUP/DEPT. HEAD	Review ☐ Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐ Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS	Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Air flow is reduced to the D-rings when fewer than three Containment Fan Coolers are operating. This will cause temperatures on the RCPs to rise and may cause in-leakage to the Reactor Drain Tank to rise if any RCP gasket leakoff is aligned to the RDT per OP-001-001. This effect is most prominent when outdoor ambient temperature exceeds 65°F.

3.2 LIMITATIONS

3.2.1 Inform the SM/CRS if the conditions of Section 6.0, Acceptance Criteria, cannot be met.

6.0 ACCEPTANCE CRITERIA

6.1 Each component tested on Attachment 10.1, CFC Data Sheet, shall meet the following criteria.

6.1.1 Each CFC unit not already in operation is started from Control Room and operates for ≥15 minutes.

6.1.2 With one CFC running per train CCW flow rate is ≥625 GPM per train.

7.0 PROCEDURE

NOTE

(1) Normal DP for Containment Fan Coolers is 5.0 INWC to 8.0 INWC, as indicated on CCS-IDPR-5154A(B). Engineering support may be needed to determine Operability if DP is found outside of this band.

(2) This section is intended to ensure that there is ≥625 gpm CCW flow per train with either the A or C fan running with either the B or D fan. Different combinations of fans are allowed; however, only one fan should be running per train when recording CCW flow.

7.1 Verify the operating CFC units have been running for ≥15 minutes and document on Attachment 10.1, CFC Data Sheet.

7.1.1 Record DP for the operating Containment Fan Coolers on Attachment 10.1.

CAUTION

TO PREVENT VIBRATION ALARMS, AND DAMAGE TO CONTAINMENT COOLING UNIT DUCT WORK, LIMIT CONFIGURATION TO ONLY THREE (3) OF FOUR (4) UNITS OPERATING AT A TIME.

7.2 Adjust CFC operating unit configuration to attain one Containment Cooling Fan running per train as follows:

7.2.1 If two Containment Fan Coolers are running on the A Train, then stop one of the Containment Fan Coolers A(C) by placing CFC A(C) control switch CCS-0003 A(C) to Stop.

7.2.2 If two Containment Fan Coolers are running on the B Train, then stop one of the Containment Fan Coolers B(D) by placing CFC B(D) control switch CCS-0003 B(D) to Stop.

7.2.3 When CCW flow has stabilized, then record CCW flow for all of the operating Containment Fan Coolers on Attachment 10.1.

7.3 Adjust CFC operating unit configuration to test the two Containment Cooling Fans not tested in step 7.2 as follows:

7.3.1 Start the non-running Containment Fan Cooler on Train A by placing CFC A(C) control switch CCS-0003 A(C) to Start/ Fast.

7.3.1.1 Record start time on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.

7.3.1.2 Record DP on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.

7.3.2 Secure the previously tested Containment Fan Cooler on Train A by placing CFC A(C) control switch CCS-0003 A(C) to Stop.

7.3.3 Start the non-running Containment Fan Cooler on Train B by placing CFC B(D) control switch CCS-0003 B(D) to Start/ Fast.

7.3.3.1 Record start time on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.

7.3.3.2 Record DP on Attachment 10.1 if the Containment Fan Cooler was not previously running in step 7.1.

7.3.4 Secure the previously tested Containment Fan Cooler on Train B by placing CFC B(D) control switch CCS-0003 B(D) to Stop.

7.3.5 When CCW flow has stabilized, then record CCW flow for the operating Containment Fan Coolers on Attachment 10.1.

NOTE

In Attachment 10.2, Run Time Equalization Schedule Sheet, the CFCs should be run for the majority of the month they are listed with. If necessary, use the previously running CFCs as a reference for fan alignment for the next 30 days.

7.4 Using Attachment 10.2, Run Time Equalization Schedule Sheet, align CFC units for monthly operation as follows:

7.4.1 Start desired Containment Fan Cooler (CFC), by placing Fan Cooler A(B)(C)(D) control switch CCS-0003 A(B)(C)(D) to Start/ Fast.

7.5 Once all CFC units have run for 15 minutes, document CCW flow rate is ≥625 GPM per train for the CFC units that were tested, and each CFC unit has run for ≥15 minutes on Attachment 10.1.

7.6 Document on Attachment 10.1, CFC Data Sheet, that CFC units are aligned as required by Attachment 10.2.

7.7 Document on Attachment 10.1 that CFC DP was within the normal operating band of 5.0 INWC – 8.0 INWC for all CFC units.

7.7.1 If a CFC DP is found to be outside of the normal operating band, then initiate a Condition Report and obtain Engineering support, as required, to determine Operability.

10.1 CFC DATA SHEET

Test Permission: ____________________/____________
SM/CRS (Signature) Date/Time

CFC A	CC-IFI-7570A2S	____________	GPM
	Check one:	☐ OPERATING	☐ STARTED
	Start time:	____________	(maybe N/A)
	Fan DP (CCS-IDPR-5154A)	____________	INWC
CFC B	CC-IFI-7570B2S	____________	GPM
	Check one:	☐ OPERATING	☐ STARTED
	Start time:	____________	(maybe N/A)
	Fan DP (CCS-IDPR-5154B)	____________	INWC
CFC C	CC-IFI-7570A1S	____________	GPM
	Check one:	☐ OPERATING	☐ STARTED
	Start time:	____________	(maybe N/A)
	Fan DP (CCS-IDPR-5154A)	____________	INWC
CFC D	CC-IFI-7570B1S	____________	GPM
	Check one:	☐ OPERATING	☐ STARTED
	Start time:	____________	(maybe N/A)
	Fan DP (CCS-IDPR-5154B)	____________	INWC

STEP		initials
7.5	Verify CFC units CCW flow rate is $\geq$625 GPM and all CFC units started have been operated at least 15 minutes.	____________
7.6	Verify CFC units aligned, if possible, per Attachment 10.2, Run Time Equalization Schedule Sheet.	____________
7.7	Verify CFC units DP is within 5.0 INWC – 8.0 INWC when running **[CR-WF3-2013-02530]**	____________

CFC DATA SHEET (CONT'D)

REMARKS: ______________________________

____

____

Performed: ______________________________ ______________
(Operator Signature) (Date)

Independent Review: ______________________________ ______________
(Signature) (Date)

SM/CRS Review: ______________________________ ______ / ______
(Signature) (Date/Time)

10.2 Run Time Equalization Schedule Sheet

NOTE

CFC units should be aligned in accordance with monthly schedule to equalize run times. If conditions do not allow running CFCs in accordance with this schedule or the System Engineer requests a different alignment, note change in remarks section of Attachment 10.1, CFC Data Sheet.

Month	CFC Alignment
January	A, B, C
February	A, B, D
March	B, C, D
April	A, C, D
May	A, B, C
June	A, B, D
July	B, C, D
August	A, C, D
September	A, B, C
October	A, B, D
November	B, C, D
December	A, C, D

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S6

Start and Load Emergency Diesel Generator A

Applicant: ____________________________________

Examiner: ____________________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Start and Load Emergency Diesel Generator A

Task Standard: Applicant starts and commences loading EDG A in accordance with OP-009-002. Applicant must trip EDG A when load starts rising without manipulation.

References: OP-009-002, Emergency Diesel Generator (Rev 336)
OP-903-068, Emergency Diesel Generator and Subgroup Relay Operability Verification (Rev 317)

Alternate Path: Yes Time Critical: No Validation Time: 20 min

K/A 064 A4.06 Manual start, loading, and stopping of the ED/G

Importance Rating 3.9 / 3.9
RO/SRO

Safety Function 6

Applicant: ____________________

Time Start: ____________ Time Finish: ____________

Performance Time: ____________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____________________

Examiner: ____________________ Date: ____________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-009-002, Emergency Diesel Generator (Handout 1)
- OP-903-068, Emergency Diesel Generator and Subgroup Relay Operability Verification (Handout 2)

Description:
The applicant will be directed to start and load Emergency Diesel Generator A in accordance with OP-903-068 and OP-009-002. When the EDG A load is raised to 1 MW, load will begin rising on its own. The applicant must trip the EDG from CP-1. No action is necessary by the simulator booth operator.
Prompts will be required to inform the applicant that the EDG A pre-start checks have been completed and that other operators will be gathering start time information for the EDG Start Evaluation.

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

Reset to IC-176

Verify the following using the “Events” button:
- ZAOEGEM2328CS > 0.1 set to initiate Trigger 1

Verify the following Overrides:
- DI-01A07S02-1 set to RAISE on Trigger 1

Setup with specific IC unavailable or for non NRC exams:

1. *Reset the simulator to any IC with EDG A available to be started & paralleled.*
2. *Create an Event as follows: Click the Events button, double click the Trigger number of your choice and select “Edit Event”. In the Event Code field type:* ***ZAOEGEM2328CS > 0.1****. Save the event if desired. Resetting the simulator will delete the event.*
3. *Override* ***DI-01A07S02-1*** *to RAISE on event Trigger created in step 2*
4. *Save to an available IC if desired.*

Examiner Note
Cue the Simulator Operator to place the Simulator in RUN.

Examiner Note
The applicant should refer to OP-903-068, Emergency Diesel Generator and Subgroup Relay Operability Verification (Handout 2), and start the task in OP-009-002, Emergency Diesel Generator (Handout 1). Give applicant both handouts at the start of the JPM.

TASK ELEMENT 1	STANDARD
Procedure Note: (1) The Starting sequence is listed in Attachment 11.6, Starting Sequence, for reference. (2) Receipt of Starting Air System Malfunction alarm during start sequence may be indication of failed starting air solenoid <u>or</u> starting air control valves. (3) During engine operation, oil or water may be observed dripping from EG A(B) Left and Right Intercooler Drains, EGA-201A(B) and EGA-202A(B).	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
Procedure Caution: (1) MINIMIZE THE TIME THE DIESEL GENERATOR IS OPERATED AT UNLOADED <u>OR</u> LOW LOAD CONDITIONS. (2) BOTH EMERGENCY DIESEL GENERATOR'S <u>SHALL</u> <u>NOT</u> BE OPERATED IN THE TEST MODE SIMULTANEOUSLY, EXCEPT WHEN PERFORMING TESTING PURSUANT TO TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENT 4.8.1.1.2.G. (3) STEP 6.3.4 REQUIRES THE USE OF TWO STOPWATCHES <u>AND</u> OPERATORS FOR TWO DIFFERENT TIME REQUIREMENTS. M&TE DATES ARE RECORDED ON ATTACHMENT11.9, DIESEL GENERATOR RUNNING LOG.	Caution reviewed
Comment: **Examiner Cue:** Additional operators are in position and standing by to perform timing duties and complete start evaluation attachment and diesel running log.	**SAT / UNSAT**

TASK ELEMENT 3	STANDARD
6.3.4 Simultaneously position the Engine Control Switch to Start on CP-1, and start timing: 6.3.4.1 When the Emergency Diesel Generator voltage and frequency achieve 3920 VAC and 58.8 Hz, then stop timing. 6.3.4.1.1 Document Emergency Diesel Generator voltage and frequency achievement times on Attachment 11.8, Emergency Diesel Generator Start Evaluation and Attachment 11.9, Diesel Generator Running Log. 6.3.4.2 When the Emergency Diesel Generator voltage and frequency settle between 3920 - 4580 VAC and 58.8 - 61.2 Hz, then stop timing.	Positions EDG A Engine Control Switch to START
Comment: Timing not critical, performed by other operators.	**Critical** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
Procedure Note: HVR-501A(B) limit switch positions are also shown on PMC mimic HVR3.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 5	STANDARD
6.3.5 Verify EDG A(B) room ventilation has started and operates properly as follows: 6.3.5.1 Verify Diesel Generator A Exh Fan, HVR-0025A, has started.	Verified Exh Fan A started
Comment: Exhaust Fan control switch is located on CP-18.	**SAT / UNSAT**

<table>
<tr><th>TASK ELEMENT 6</th><th>STANDARD</th></tr>
<tr><td>6.3.5.2 Verify EG A(B) Room Outside Air Intake Damper, HVR-501A(B), Open using the following PMC PID points and indications:

<u>EDG A</u>
• D60404 EDG A RM VENT OAI DMPR HVR501A — OPEN
• D60405 EDG A RM OAI DMPR HVR501A — NT CLSD
• EDG A Room Verify Dampers HVR 501(A1)(A2)(A3)(A4) — ALL OPEN</td><td>Verified damper (HVR-501A) is open using PMC indication and locally with NAO</td></tr>
<tr><td>Comment:

Examiner Cue: All dampers for HVR-501A are open.</td><td>SAT / UNSAT</td></tr>
</table>

<table>
<tr><th>TASK ELEMENT 7</th><th>STANDARD</th></tr>
<tr><td>6.3.5.2.1 Document proper damper operation on Attachment 11.9, Diesel Generator Running Logs.

6.3.5.2.2 Monitor the applicable PMC PIDs above to ensure EG A(B) Room Outside Air Intake Damper, HVR-501A(B), remains open during EDG A(B) operation.</td><td>Maintained indication of HVR-501A during EDG A operation.</td></tr>
<tr><td>Comment:

Evaluator Cue: Additional operators have documented proper damper operation on the Diesel Generator Running Logs.</td><td>SAT / UNSAT</td></tr>
</table>

<table>
<tr><th>TASK ELEMENT 8</th><th>STANDARD</th></tr>
<tr><td>Procedure Note:
Local indicators HVR-IFS-5023A or HVR-IFS-5023B may be used to verify proper fan operation if the associated EDG computer point is suspect or not operating properly. In this case a DP reading greater than 1.0 INWC may be used as a substitute of verifying PMC points.</td><td>Note Reviewed.</td></tr>
<tr><td>Comment:</td><td>SAT / UNSAT</td></tr>
</table>

TASK ELEMENT 9	STANDARD
6.3.5.3 Verify proper operation of EDG A(B) Room Exhaust Fan by verifying the following indicate NT LO for the applicable EDG: <u>EDG A</u> • D60403 EDG A RM Fan E-28A Air DP	Verified Exh Fan A DP is not low
Comment: **Examiner Cue:** IF asked, HVR-IFS-5023A reading is 1.3 INWC	**SAT / UNSAT**

TASK ELEMENT 10	STANDARD
6.3.6 Verify Emergency Diesel Generator parameters are within acceptable ranges 15 minutes after start and every 30 minutes thereafter in accordance with Attachment 11.9, Diesel Generator Running Log. 6.3.6.1 <u>If</u> any parameters are found to be outside of acceptable ranges (Full Load Expected Value) at any time during operation of the EDG at full load, <u>then</u> notify Systems Engineering <u>and</u> generate a CR.	Performed by others
Comment: **Evaluator Cue:** Additional operators are standing by to record readings and monitor diesel parameters.	**SAT / UNSAT**

Examiner Note
The applicant will transition to OP-903-068, Emergency Diesel Generator and Subgroup Relay Operability Verification.

TASK ELEMENT 11	STANDARD
7.1.6 Verify that the Emergency Diesel Generator steady state voltage and frequency are maintained between 3920 to 4580 VAC and 58.8 to 61.2 Hz respectively.	Verification complete.
Comment:	**SAT / UNSAT**

TASK ELEMENT 12	STANDARD
7.1.7 Record start times on Attachment 10.1.	Performed by other operators.
Comment: Documentation performed by other operators.	**SAT / UNSAT**

TASK ELEMENT 13	STANDARD
7.1.8 Operate Emergency Diesel Generator A(B) unloaded for 5 minutes.	N/A
Comment: **Evaluator Cue:** 5 minutes has passed.	**SAT / UNSAT**

TASK ELEMENT 14	STANDARD
Procedure Caution: DO <u>NOT</u> EXCEED 4.84 MW FOR <u>MORE</u> <u>THAN</u> TWO HOURS OUT OF <u>ANY</u> 24 HOUR PERIOD.	Caution reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 15	STANDARD
7.1.9 Synchronize the Emergency Diesel Generator to Offsite Power <u>and</u> load to $\geq$ 1.0 MW and $\leq$ 1.2 MW, in accordance with OP-009-002, Emergency Diesel Generator. 7.1.9.1 Maintain this load for 5 minutes.	Refers to OP-009-002
Comment:	**SAT / UNSAT**

Examiner Note
The applicant will should transition back to OP-009-002, Emergency Diesel Generator, section 6.4.

TASK ELEMENT 16	STANDARD
Procedure Note: (1) Diesel Generator load changes can be accomplished by performing the following: • Manual voltage control, when in parallel, will raise or lower reactive load. • Manual voltage control, when not in parallel, will raise or lower generator voltage. • While in parallel engine speed control is used to raise or lower generator load. (2) The operations necessary to synchronize the Diesel Generator either from the Control Room <u>or</u> locally are identical. The point of control is determined by whether the Control mode is selected for Local <u>or</u> RTGB (Control Room). Switch positions for the local control panel are in parentheses.	Note reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 17	STANDARD
Procedure Caution: WHENEVER POSSIBLE THE EMERGENCY DIESEL GENERATOR SHOULD BE OPERATED FOR 5 MINUTES PRIOR TO LOADING. THIS WILL HELP TO MINIMIZE THERMAL STRESS ON THE ENGINE TO ENSURE OPTIMUM ENGINE LIFE AND PERFORMANCE.	Caution reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 18	STANDARD
6.4.1 Verify Emergency Diesel Generator operating with voltage 3920 - 4580 VAC <u>and</u> frequency 58.8 - 61.2 Hz.	Verification complete.
Comment:	**SAT / UNSAT**

TASK ELEMENT 19	STANDARD
6.4.2 Verify Volt Regulator Mode Select (Sevr Manual/Auto) Switch is in Auto.	Verified EDG A V/R Mode Select Switch position
Comment:	**SAT / UNSAT**

TASK ELEMENT 20	STANDARD
Procedure Caution: RELAY DAMAGE MAY RESULT IF SYNCHRONIZER IS ENERGIZED FOR LONGER THAN 5 MINUTES	Caution reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 21	STANDARD
Procedure Warning EMERGENCY DIESEL GENERATOR B SHOULD <u>NOT</u> BE OPERATED IN PARALLEL WITH THE MAIN GENERATOR WHEN MAIN GENERATOR VOLTAGE IS >25.95 KV AS INDICATED BY PID A58003. REACTIVE LOAD (MVAR) MAY BE LOWERED TO REDUCE MAIN GENERATOR VOLTAGE. OPERATING EDG B IN PARALLEL WITH THE MAIN GENERATOR WHEN MAIN GENERATOR VOLTAGE IS >25.95 KV HAS THE POTENTIAL TO CAUSE THE 3B32 BUS BREAKERS, UPON A FAULT, TO STRUCTURALLY DECOMPOSE AND EXPLODE.	Warning reviewed
Comment: Warning refers to Emergency Diesel Generator B, EDG A is being started.	**SAT / UNSAT**

TASK ELEMENT 22	STANDARD
6.4.3 Position the Emergency Diesel Generator A(B) Synchronizer Switch (Man/Off/Auto Synch Switch) to Gen Man (Man).	Positions EDG A Synch Switch to MAN
Comment: Record Time Synch Switch is in MAN:____________	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 23	STANDARD
6.4.4 Verify proper voltage response using the Volt Adjust (Sevr Potentiometer Adjust), then adjust Emergency Diesel Generator A(B) voltage to slightly higher than system voltage.	Raises and lowers EDG A voltage using Volt Adjust switch Verifies EDG A Voltage slightly higher than bus voltage and between 3920-4580 Volts
Comment:	**SAT / UNSAT**

TASK ELEMENT 24	STANDARD
6.4.5 Verify proper frequency response using the Speed Adjust (Engine Speed Adjustment), then adjust engine speed until the synchroscope is rotating slowly in the clockwise direction.	Raises and lowers EDG A Speed and verifies EDG A frequency responds
Comment: Examiner Note: Rate of synchroscope rotation will vary slightly as speed is adjusted.	**SAT / UNSAT**

TASK ELEMENT 25	STANDARD
Procedure Note: If the Red Start light is out, then the Emergency Diesel Generator control circuit may not be lined up to automatically shift to the Test Mode of operation when the Emergency Diesel Generator output breaker is Closed. This may make the Emergency Diesel Generator trip when the Emergency Diesel Generator output breaker is closed.	Note reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 26	STANDARD
6.4.6 Verify Emergency Diesel Generator A(B) Red Start Light Illuminated.	Verifies light is lit on EDG A Start Switch.
Comment:	**SAT / UNSAT**

TASK ELEMENT 27	STANDARD
Procedure Note: Do not simultaneously connect both Emergency Diesel Generator A(B) to their respective busses during non-emergency conditions or with offsite power available.	Note reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 28	STANDARD
Procedure Caution: WHEN EMERGENCY DIESEL GENERATOR IS CONNECTED TO THE GRID, MAINTAIN OUTGOING REACTIVE LOAD (MVAR) AND AT LEAST 0.1 MW REAL LOAD TO PREVENT A REVERSE POWER TRIP.	Caution reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 29	STANDARD
6.4.7 Observing Synchroscope rotating slowly in the clockwise direction, Close the Diesel Generator output breaker at the 5 minutes to twelve position on the synchroscope.	Breaker Closed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 30	STANDARD
6.4.8 Immediately apply a small load, approximately 0.1 MW, to the Emergency Diesel Generator A(B) using the Speed Adjust (Engine Speed Adjustment) Control Switch.	EDG A does not trip on Reverse Power
Comment:	**SAT / UNSAT**

TASK ELEMENT 31	STANDARD
6.4.9 Position the Emergency Diesel Generator A(B) Synchronizer Switch (Man/Off/Auto Synch Switch) to OFF.	EDG A Synch Switch placed in OFF
Comment: Record Time Synch Switch is in OFF:____________ Total time energized should be < 5 minutes (only the switch manipulation is critical, not the time)	**Critical** **SAT / UNSAT**

TASK ELEMENT 32	STANDARD
Procedure Caution: WHILE ADJUSTING MVAR DO NOT EXCEED BUS VOLTAGE OF 4470 VAC.	Caution reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 33	STANDARD
6.4.10 Adjust the Volt Adjust to obtain 1 MVAR.	Adjusts MVAR to obtain ~ 1 MVAR out
Comment:	**SAT / UNSAT**

Examiner Note
The **Alternate Path** is inserted at this point. When the applicant raises load, the EDG load will continue rising after the Speed Adjust switch is released.

TASK ELEMENT 34	STANDARD
Adjusts EDG A Load to between 1.0 and 1.2 MWe using Speed Adjust switch as needed per step 7.1.9 of OP-902-068.	Raises MW load and releases Speed Adjust switch when load is in required range.
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 35	STANDARD
Notes that EDG A load does not stop increasing when Speed Adjust switch is released and secures EDG A by any of the following: • DIESEL GEN A TRIP pushbutton on CP-1 • Opens EDG A Output Breaker at CP-1 • Takes the EDG A control switch to stop • Directs the local NAO to pull the EDG overspeed	Trips EDG A or Opens Output Breaker prior to exceeding 4.84 MWe.
Comment:	**Critical** **SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

RETURN ALL HANDOUTS & THIS CUE SHEET TO EXAMINER UPON COMPLETION OF TASK

INITIAL CONDITIONS:

- The shift is scheduled to perform a remote start of Emergency Diesel Generator (EDG) A in accordance with OP-903-068, Emergency Diesel Generator and Subgroup Relay Operability Verification, Section 7.1.
- This is not for ESFAS testing.
- OP-903-068 Section 7.1 is complete through step 7.1.4.
- All pre-startup checks have been completed and the RAB Watch is standing by.
- 2 additional operators are standing by with stop watches to time the start of EDG A. They will time the start and fill out Attachment 11.8 Emergency Diesel Generator Start Evaluation.

INITIATING CUE(S):

The CRS directs you to perform a manual start and load of EDG A in accordance with OP-903-068, Emergency Diesel Generator and Subgroup Relay Operability Verification, starting on step 7.1.5.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 If the Jacket Water System has been drained and refilled, then the following should be performed:

3.1.1.1 Vent the Jacket Water tubing for the Woodward Speed Control Governor Oil Cooler using EG A(B) Governor Oil Cooler Jacket Water Outlet Vent, EGC-119 A(B). This is the high point vent for the Woodward Speed Control Governor Oil Cooler tubing.

3.1.1.2 Operate the Jacket Water Pumps for at least 5 minutes prior to energizing Jacket Water Heaters.

3.1.2 The Emergency Diesel Generator shall not be started with lube oil temperature <70°F, to prevent damage to the main lube oil filter elements.

3.1.3 Do not perform a rapid load of an EDG before verifying engine warmed up to ≥120°F and proper operation of Jacket Water Circulating Pump, Pre-Lube Oil Pump, and associated heaters.

3.1.4 Caution should be taken not to allow a Diesel Generator to run longer than required at unloaded or low load conditions.

3.1.5 When the EDG is operating unloaded or at low load conditions, then fuel injection pump temperatures may become too hot to comfortably hold your hand on, due to the pump not circulating fuel that would normally cool it. The time in this condition should be minimized for consideration of long term reliability of the fuel injection pumps.

3.1.6 When in Test Mode and paralleled to offsite, then the Diesel Generator shall not be operated for more than 6 hours at <50% load (2.2 MW) without loading the Diesel Generator to ≥3.3 MW for 15-30 minutes, to minimize buildup of unburned exhaust products.

3.1.7 When EDG is connected to the grid, always maintain outgoing reactive load (MVAR) and at least 0.1 MW real load to prevent a reverse power trip. EDG may trip if not loaded within 5 seconds after its output breaker is closed.

3.1.8 If possible, then do not operate unit when a shutdown occurs until the cause has been found and corrected.

3.1.9 The mechanical stops on EDG A(B) CCW Flow Control, CC-413A(B), shall not be adjusted without SM/CRS permission.

3.1.10 Do not use Maintenance Lube Oil Tank to store lube oil. This is applicable at all times.

3.1.11 If the Lube Oil System has been drained and refilled, then operate the Lube Oil Pumps for at least 5 minutes prior to energizing Lube Oil Heaters.

3.1.12 If the Fuel Oil System has been drained and refilled, then vent the Standby Fuel Oil Pump suction piping from the following points:

- EGF-12210A(B) EG A(B) Standby Fuel Oil Pump Suction Vent
- EGF-12210-A1(B1) EG A(B) Fuel Oil Strainer Inlet Line Vent
- EGF-12210-A2(B2) EG A(B) Fuel Oil Strainer Outlet Line Vent

EGF-MSTRN-001A(B) in service:

- EGF-1222-A1(B1) EG A(B) Fuel Oil Strainer Bowl Vent

EGF-MSTRN-002A(B) in service:

- EGF-1222-A2(B2) EG A(B) Fuel Oil Strainer Bowl Vent

3.1.13 EDG B should not be operated in parallel with the Main Generator when Main Generator voltage is >25.95 KV as indicated by PID A58003. Reactive load (MVAR) may be lowered to reduce Main Generator Voltage. Operating EDG B in parallel with the Main Generator when Main Generator voltage is >25.95 KV has the potential to cause the 3B32 bus breakers, upon a fault, to structurally decompose and explode. **[CR-WF3-2004-02220]**

3.1.14 Overfilling Main Governor with oil during EDG operation can adversely affect EDG performance by causing sluggish governor operation. 10 ml of oil will change sightglass level by roughly 1/16 of an inch.

3.1.15 To ensure the fuel oil consumption analysis remains valid, EDG frequency must be maintained ≤60.1 Hz. **[EC-11723, CR-WF3-2008-05183]**

3.1.16 EDG's have had a calculation performed that states the EDGs could run without CCW for up to 10.7 minutes at 3.23 MW and up to 20.9 minutes unloaded should the output breaker fail to close without causing damage to the EDGs. **[ECM12-001, EC-56635]**

3.1.17 EDG A(B) Fuel Rack Override Lever position must be Vertical and Latched. **[CR-WF3-2014-00737]**

3.2 LIMITATIONS

3.2.1 With one Emergency Diesel Generator Inoperable, the Operable Emergency Diesel Generator should not be paralleled to offsite or non-vital loads.

3.2.2 Continuously monitor Emergency Diesel Generator when operating. Monitoring an Emergency Diesel Generator while it is in operation does not require the assigned operator's physical presence in the room on a continuous basis. However, the operator's activities should be limited to ensure 1) an adequate assessment of engine operation and 2) timely identification and correction of problems. **[P-5549]**

3.2.3 If DC power is secured or lost to EDG A(B) Control Panel through EDG A(B) Control Panel Feeder #1, EG-EBKR-A(B)-11, then EG A(B) Fuel Oil Transfer Pump, EGF-EBKR-312A(B)-3F, should be Opened to prevent overflowing Feed Tank.

3.2.4 Do not run both Emergency Diesel Generators in test mode simultaneously, except when performing testing pursuant to Technical Specification Surveillance requirement 4.8.1.1.2.g.

3.2.5 During normal operation, Emergency Diesel Generator ratings of 4.4 MW for continuous loading and 4.84 MW for 2 hours out of any 24 hours should not be exceeded.

3.2.6 If during normal Emergency Diesel Generator operation, there is a significantly noticeable diesel exhaust plume visible for >6 minutes in any consecutive 60 minute period, then contact the Environmental Engineer to determine appropriate action by qualified personnel or comply with UNT-006-010, Event Notification and Reporting. Startup, shutdown, and emergency periods are exempt from this requirement. Smoke opacity can be accurately determined only during daylight conditions.

3.2.7 If an Emergency Diesel Generator starts in response to a loss of offsite power or other valid event, then ensure that makeup is available to the Emergency Diesel Generator Jacket Water System (EGC) from any source prior to shutting down the Emergency Diesel Generator and allowing it to cool.

3.2.8 When practical, the Diesel Generator should be operated in accordance with the following chart to minimize thermal stresses on the Diesel Engine to ensure optimum engine life and performance :

Diesel Generator Load ➀	Hold Time
Start Unloaded	5 minutes
≥1.0 MW to 1.2 MW	5 minutes
≥2.1 MW to 2.3 MW	10 minutes
≥3.2 MW to 3.4 MW	10 minutes
≥4.0 MW to 4.4 MW	≥3.5 hours or at SM/CRS direction
0.5 MW to 1.0 MW	15 minutes

➀ The Emergency Diesel Generator should be loaded at a rate of approximately 0.5 MW/minute.

3.2.9 All shutdowns, with the exception of the overspeed and generator differential, are locked out during the Emergency Mode of Operation.

3.2.10 If control air is lost during any Emergency Diesel Generator run, then the Fuel Rack Override lever must be used to shutdown the Emergency Diesel Generator.

3.2.11 The Emergency Diesel Generator may continue to operate for up to 7 days following a loss of control air. Continuous operation exceeding 7 days may cause damage to the Turbocharger.

3.2.12 The Emergency Diesel Generator may be started for any non-emergency start with lube oil temperature <120°F but ≥70°F if the following conditions are met and restrictions observed:

- The pre-lube system should be operating for at least 30 minutes prior to starting the Emergency Diesel Generator.
- Lube oil temperature of ≥100°F is required to ensure a start of <10 seconds.
- The start may be conducted with Lube oil temperature ≥70°F but <100°F when a timed start is not required (i.e. post maintenance start).
- The engine should not be loaded above 0.44 MW until lube oil and jacket water temperatures are ≥120°F.

3.2.13 Diesel Fuel Oil Storage Tank minimum levels are listed in the following table. Level may be as low as the 5-Day Minimum values for up to 5 days, provided replacement Fuel Oil is on site within the first 48 hours.
[TS 3.8.1.3, P-26756]

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60120, C60220	≥40,088 gallons	≥37,773 gallons
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B)	≥98.8% level	≥93.1% level
EGF-ILI-6993A(B)*	≥44’-6”	≥42’-0”

* EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.14 The fill limits for the Diesel Fuel Oil Storage Tanks are as follows:

Lower fill limit: **[TS 3.8.1.3, P-26756]**

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,210 gallons (98.56% Full)
- Using EGF-ILI-6995A(B): 98.9%

Upper fill limit:

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,480 gallons (99.34% Full)
- Using EGF-ILI-6995A(B): 99.3%
- Using EGF-ILI-6993A(B)*: 45’-9”

  * EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.15 The Emergency Diesel Generator may be started with the jacket water temperature <120°F for any non-emergency start. The engine should not be loaded above 0.44 MW until the jacket water temperature is ≥120°F.

3.2.16 Emergency Diesel Generator fuel oil storage has very little margin to support the Design Basis Accident loadings for seven days. EC-24379 provides guidance on additional margin for Engineering and Operations to establish operability of the EDG in the event of a fuel oil leak.

6.3 MANUAL REMOTE START

6.3.1 Verify RTGB light Illuminated on CP-1.

6.3.2 Dispatch an Operator to the Diesel Room to observe Start sequence.

6.3.3 Perform Emergency Diesel Generator pre-startup checks in accordance with Subsection 6.1, Emergency Diesel Generator Pre-Startup Checks.

NOTE

(1) The Starting sequence is listed in Attachment 11.6, Starting Sequence, for reference.

(2) Receipt of Starting Air System Malfunction alarm during start sequence may be indication of failed starting air solenoid or starting air control valves.

(3) During engine operation, oil or water may be observed dripping from EG A(B) Left and Right Intercooler Drains, EGA-201A(B) and EGA-202A(B).

CAUTION

(1) MINIMIZE THE TIME THE DIESEL GENERATOR IS OPERATED AT UNLOADED OR LOW LOAD CONDITIONS.

(2) BOTH EMERGENCY DIESEL GENERATOR'S SHALL NOT BE OPERATED IN THE TEST MODE SIMULTANEOUSLY, EXCEPT WHEN PERFORMING TESTING PURSUANT TO TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENT 4.8.1.1.2.G.

(3) STEP 6.3.4 REQUIRES THE USE OF TWO STOPWATCHES AND OPERATORS FOR TWO DIFFERENT TIME REQUIREMENTS. M&TE DATES ARE RECORDED ON ATTACHMENT11.9, DIESEL GENERATOR RUNNING LOG.

6.3.4 Simultaneously position the Engine Control Switch to Start on CP-1, and start timing:

6.3.4.1 When the Emergency Diesel Generator voltage and frequency achieve 3920 VAC and 58.8 Hz, then stop timing.

6.3.4.1.1 Document Emergency Diesel Generator voltage and frequency achievement times on Attachment 11.8, Emergency Diesel Generator Start Evaluation and Attachment 11.9, Diesel Generator Running Log.

6.3.4.2 When the Emergency Diesel Generator voltage and frequency settle between 3920 - 4580 VAC and 58.8 - 61.2 Hz, then stop timing.

6.3.4.2.1 Document Emergency Diesel Generator voltage and frequency settle times on Attachment 11.8, Emergency Diesel Generator Start Evaluation and Attachment 11.9, Diesel Generator Running Log.

NOTE

HVR-501A(B) limit switch positions are also shown on PMC mimic HVR3.

6.3.5 Verify EDG A(B) room ventilation has started and operates properly as follows:

6.3.5.1 Verify Diesel Generator A(B) Exh Fan, HVR-0025A(B), has started.

6.3.5.2 Verify EG A(B) Room Outside Air Intake Damper, HVR-501A(B), Open using the following PMC PID points and indications:

EDG A

- D60404 EDG A RM VENT OAI DMPR HVR501A................ OPEN
- D60405 EDG A RM OAI DMPR HVR501A .... NT CLSD
- EDG A Room Verify Dampers HVR 501(A1)(A2)(A3)(A4)...... ALL OPEN

EDG B

- D60418 EDG B RM VENT OAI DMPR HVR501B................ OPEN
- D60419 EDG B RM OAI DMPR HVR501B .... NT CLSD

6.3.5.2.1 Document proper damper operation on Attachment 11.9, Diesel Generator Running Logs.

6.3.5.2.2 Monitor the applicable PMC PIDs above to ensure EG A(B) Room Outside Air Intake Damper, HVR-501A(B), remains open during EDG A(B) operation.

NOTE

Local indicators HVR-IFS-5023A or HVR-IFS-5023B may be used to verify proper fan operation if the associated EDG computer point is suspect or not operating properly. In this case a DP reading greater than 1.0 INWC may be used as a substitute of verifying PMC points). **[CR-2013-02530 CA-32]**

6.3.5.3 Verify proper operation of EDG A(B) Room Exhaust Fan by verifying the following indicate NT LO for the applicable EDG: **[CR 2013-02530 CA-32]**:

EDG A

- D60403 EDG A RM Fan E-28A Air DP

EDG B

- D60417 EDG B RM Exh Fan E-28 Air DP

6.3.6 Verify Emergency Diesel Generator parameters are within acceptable ranges 15 minutes after start and every 30 minutes thereafter in accordance with Attachment 11.9, Diesel Generator Running Log.

6.3.6.1 If any parameters are found to be outside of acceptable ranges (Full Load Expected Value) at any time during operation of the EDG at full load, then notify Systems Engineering and generate a CR.

6.4 EMERGENCY DIESEL GENERATOR SYNCHRONIZATION AND LOADING

NOTE

(1) Diesel Generator load changes can be accomplished by performing the following:

- Manual voltage control, when in parallel, will raise or lower reactive load.
- Manual voltage control, when not in parallel, will raise or lower generator voltage.
- While in parallel engine speed control is used to raise or lower generator load.

(2) The operations necessary to synchronize the Diesel Generator either from the Control Room or locally are identical. The point of control is determined by whether the Control mode is selected for Local or RTGB (Control Room). Switch positions for the local control panel are in parentheses.

CAUTION

WHENEVER POSSIBLE THE EMERGENCY DIESEL GENERATOR SHOULD BE OPERATED FOR 5 MINUTES PRIOR TO LOADING. THIS WILL HELP TO MINIMIZE THERMAL STRESS ON THE ENGINE TO ENSURE OPTIMUM ENGINE LIFE AND PERFORMANCE.

6.4.1 Verify Emergency Diesel Generator operating with voltage 3920 - 4580 VAC and frequency 58.8 - 61.2 Hz.

6.4.2 Verify Volt Regulator Mode Select (Sevr Manual/Auto) Switch is in Auto.

CAUTION

RELAY DAMAGE MAY RESULT IF SYNCHRONIZER IS ENERGIZED FOR LONGER THAN 5 MINUTES.

WARNING

EMERGENCY DIESEL GENERATOR B SHOULD NOT BE OPERATED IN PARALLEL WITH THE MAIN GENERATOR WHEN MAIN GENERATOR VOLTAGE IS >25.95 KV AS INDICATED BY PID A58003. REACTIVE LOAD (MVAR) MAY BE LOWERED TO REDUCE MAIN GENERATOR VOLTAGE. OPERATING EDG B IN PARALLEL WITH THE MAIN GENERATOR WHEN MAIN GENERATOR VOLTAGE IS >25.95 KV HAS THE POTENTIAL TO CAUSE THE 3B32 BUS BREAKERS, UPON A FAULT, TO STRUCTURALLY DECOMPOSE AND EXPLODE. [CR-WF3-2004-02220]

6.4.3 Position the Emergency Diesel Generator A(B) Synchronizer Switch (Man/Off/Auto Synch Switch) to Gen Man (Man).

6.4.4 Verify proper voltage response using the Volt Adjust (Sevr Potentiometer Adjust), then adjust Emergency Diesel Generator A(B) voltage to slightly higher than system voltage.

6.4.5 Verify proper frequency response using the Speed Adjust (Engine Speed Adjustment), then adjust engine speed until the synchroscope is rotating slowly in the clockwise direction.

NOTE

If the Red Start light is out, then the Emergency Diesel Generator control circuit may not be lined up to automatically shift to the Test Mode of operation when the Emergency Diesel Generator output breaker is Closed. This may make the Emergency Diesel Generator trip when the Emergency Diesel Generator output breaker is closed.

6.4.6 Verify Emergency Diesel Generator A(B) Red Start Light Illuminated.

NOTE

Do not simultaneously connect both Emergency Diesel Generator A(B) to their respective busses during non-emergency conditions or with offsite power available.

CAUTION

WHEN EMERGENCY DIESEL GENERATOR IS CONNECTED TO THE GRID, MAINTAIN OUTGOING REACTIVE LOAD (MVAR) AND AT LEAST 0.1 MW REAL LOAD TO PREVENT A REVERSE POWER TRIP.

6.4.7 Observing Synchroscope rotating slowly in the clockwise direction, Close the Diesel Generator output breaker at the 5 minutes to twelve position on the synchroscope.

6.4.8 Immediately apply a small load, approximately 0.1 MW, to the Emergency Diesel Generator A(B) using the Speed Adjust (Engine Speed Adjustment) Control Switch.

6.4.9 Position the Emergency Diesel Generator A(B) Synchronizer Switch (Man/Off/Auto Synch Switch) to OFF.

CAUTION

WHILE ADJUSTING MVAR DO NOT EXCEED BUS VOLTAGE OF 4470 VAC.

6.4.10 Adjust the Volt Adjust to obtain 1 MVAR.

NOTE

(1) During normal operations, the diesel generator ratings of 4.4 MW continuous load and 4.84 MW for 2 hours out of any 24 hour period should not be exceeded.

(2) The following chart is the recommended Emergency Diesel Generator loading sequence:

Diesel Generator Load ①	Hold Time
Start Unloaded	5 minutes
≥1.0 MW to 1.2 MW	5 minutes
≥2.1 MW to 2.3 MW	10 minutes
≥3.2 MW to 3.4 MW	10 minutes
≥4.0 MW to 4.4 MW	≥3.5 hours or at SM/CRS direction
0.5 MW to 1.0 MW	15 minutes

① The Diesel Generator should be loaded at a rate of approximately 0.5 MW/minute.

6.4.11 Adjust Emergency Diesel Generator A(B) real load (MW) <u>and</u> reactive load (MVAR) as directed by the SM/CRS.

6.4.12 <u>If</u> in Test Mode <u>and</u> paralleled to offsite, <u>then</u> for each 6 hour interval the Diesel Generator operates at <50% load (2.2 MW) perform the following:

6.4.12.1 Raise load to ≥3.3 MW for 15 - 30 minutes.

9.0 AUTOMATIC FUNCTIONS

9.1 EDG Trip (all modes)

9.1.1 Engine Overspeed, EGF-ISSCV-3006.1A(B)..................... 660 RPM

9.1.2 Generator Differential, EG-EREL-2316(EDG A),

EG- EREL-2366(EDG B) .... 0.14 AMPS

9.2 EDG Trip (except in Emergency Mode)

9.2.1 Engine Lube Oil Pressure Low, EGL-IPEV-3014A(B) ...... 30 PSIG

9.2.2 Turbo Lube Oil Press Low, EGL-IPDEV-3018A(B) .... 3 PSIG

9.2.3 Main & Conn Rod Brg Temp High, EG-ITS-3002A(B) ...... MAIN – 228°F

.... CONN ROD 197°F

9.2.4 Turbo Thrust Brg Fail, EG-ITS-3001A(B) .... 228°F

9.2.5 High Jacket Water Temp, EGC-ITEV-3017A(B) .... 205°F

9.2.6 Generator Fault, EG-EREL-4766J1(2) .... Various

9.2.7 Jacket Water Low Press, EGC-IPEV-3028A(B) .... 5 PSIG

9.2.8 Lube Oil Temp High, EGL-ITEV-3031A(B) .... 185°F

9.2.9 Generator Outboard Brg Temp Hi, EG-ITEV-3019A(B)..... 228°F

9.2.10 Generator Overcurrent, EG-EREL-4766F1 (G1)

EG-EREL-4766F2 (G2), EG-EREL-4766H1 (H2).............. 4 Amps/104 Volts

9.3	EDG Air Compr. Auto Start/Stop, EGA-IPS-1990A1 (A2), ...	Start: 242 PSIG
	EGA-IPS-1990B1 (B2)	Stop: 257 PSIG
9.4	EDG Standpipe M/U Valve, CMU-524A(B), EGC-ILS-1980A(B)	Open: 16”
	....	Close: 22”
9.5	EDG Fuel Oil XFR Pump: EGF-ILS-6907 A(B), EGF-ILS-6908 A(B)...	Start: -30” ≈ Indic level 58.3%/3.5 Ft
	....	Stop: -6” ≈ Indic level 91.7%/5.5 Ft
9.6	EDG Fuel Oil Booster Pump: EGF-IPS-3032A1 (B1), EGF-IPS-3032A2 (B2)	Start: 25 PSIG
	....	Stop: 50 PSIG
9.7	EDG Jacket Water Circ. Pump, EGC-ITS-6951A(B)....................	Start: 120°F
	....	Stop: 130°F
9.8	EDG Jacket Water Heater, EGC-ITS-6951A(B)...........................	On: 120°F
	....	Off: 130°F
9.9	EDG Lube Oil Heater, EGL-ITS-6950A(B)..................................	On: 120°F
	....	Off: 135°F
9.10	Diesel Generator A(B) Exh Fan, HVRMFAN0025A(B),................	Start in conjunction with EDGs

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 For ESFAS Test Module starts:

3.1.1.1 Verify proper ESFAS Test Module switch alignment prior to actuating components.

3.1.1.2 This procedure returns all actuated components to a normal operating alignment. Final component configuration may be determined by the SM/CRS dependent upon plant conditions.

3.1.1.3 Verify that all control switches are returned to their Norm (Auto) position, as applicable.

3.1.1.4 If HPSI Pump AB is aligned to replace HPSI Pump A or B, then the HPSI Pump AB will be actuated during this test and the intent of the procedure will be met.

3.1.2 Caution should be taken not to allow a Diesel Generator to run for an extended period of time unloaded. At no time shall a Diesel Generator run more than 6 hours while it is at less than 50% load (2.2 MW) without loading the diesel to at least 3.3 MW for 15-30 minutes.

3.1.3 Monitoring an Emergency Diesel Generator while it is in operation does not require the physical presence in the room on a continuous basis. However, the assigned operator's activities should be limited to ensure: 1) an adequate assessment of engine operation and 2) timely identification and correction of problems.

3.1.4 When Emergency Diesel Generator is connected to the grid, always maintain outgoing reactive load (MVARs) and at least 0.1 MW real load to prevent a reverse power trip.

3.1.5 If sections, subsections, or selected steps are being used as post-maintenance retest, then the following conditions shall be checked:

All prerequisite conditions for selected component actuations are met

Components actuated will not jeopardize personnel or plant safety

The steps being performed clearly demonstrate the operability of the equipment relative to the maintenance performed

3.1.6 To ensure the fuel oil consumption analysis remains valid, EDG frequency must be maintained ≤60.1 Hz. **[EC-11723, CR-WF3-2008-05183]**

3.1.7 Prior to draining the A(B) Diesel Feed Tank back to the EDG A(B) FOST, ensure that the cover of the manway on the roof of the tank is installed to prevent any splashing.

3.2 LIMITATIONS

3.2.1 Upon release of the Initiate Actuation pushbutton, there is a one minute time delay before the test circuit can be actuated again.

3.2.2 Those ESFAS subgroup relays which are not tested by this procedure are tested during power operation by OP-903-094, ESFAS Subgroup Relay Test - Operating.

3.2.3 This test shall not automatically fail nor be declared unsatisfactory if individual relays are out of service for repair or fail during the performance of this procedure. In order to make a determination of ESFAS Operability, the entire ESFAS must be evaluated against the criteria of Technical Specifications, Tables 3.3-3 and 4.3-2.

3.2.4 Component Cooling Water Pumps A and B must be in service while performing Sections 7.3 or 7.4 to properly test all CCW Pumps Suction and Discharge Crossconnect Valves.

3.2.5 During normal operation the Emergency Diesel Generator ratings of 4.4 MW for continuous loading and 4.84 MW for two (2) hours out of any 24 hour period should not be exceeded.

3.2.6 If during normal operation of the Emergency Diesel Generator there is a significantly noticeable diesel exhaust plume that is visible for >6 minutes in any consecutive 60 minute period, contact the Environmental Engineer to determine appropriate action by qualified personnel or comply with Attachment 6.9, Emergency Opacity Noncompliance Report Checklist, of UNT-006-010, Event Notification and Reporting. Startup, shutdown and emergency periods are exempt from this requirement. Smoke opacity can be accurately determined only during daylight conditions.

3.2.7 Diesel Fuel Oil Storage Tank minimum levels are listed in the following table. Level may be as low as the 5-Day Minimum values for up to 5 days, provided replacement Fuel Oil is on site within the first 48 hours.
[TS 3.8.1.3, P-26756]

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60120, C60220	≥40,088 gallons	≥37,773 gallons
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B):	≥98.8% level	≥93.1% level
EGF-ILI-6993A(B)	≥44’-6”	≥42’-0”

* EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.8 The fill limits for the Diesel Fuel Oil Storage Tanks are as follows:

<u>Lower fill limit:</u> **[TS 3.8.1.3, P-26756]**

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,210 gallons (98.68% Full)
- Using EGF-ILI-6995A(B): 98.9%

<u>Upper fill limit:</u>

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,480 gallons (99.34% Full)
- Using EGF-ILI-6995A(B): 99.3%
- Using EGF-ILI-6993A(B)*: 45'-9"

  * EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.9 Do not run both Emergency Diesel Generators in the test mode simultaneously, except when performing testing pursuant to Technical Specification Surveillance requirement 4.8.1.1.2.g.

3.2.10 The EDGs may be run without CCW without damage for 10.7 minutes at 3.23 MW and 20.9 minutes unloaded should the output breaker fail to close. **[EC-56635, ECM12-001]**

7.0 PROCEDURE

7.1 EMERGENCY DIESEL GENERATOR OPERABILITY TEST LOADED

NOTE

(1) Refer to Limitation 3.2.7 for Diesel Oil Feed Tank level requirements. **[TS 3.8.1.3, P-26756]**

(2) Both EDGs shall not be operated in the TEST mode simultaneously except when performing testing pursuant to Technical Specification Surveillance requirement 4.8.1.1.2.g.

7.1.1 Obtain SM/CRS permission to perform test and document on Attachment 10.1, Loaded Emergency Diesel Generator Surveillance Data Sheet.

7.1.2 Verify DFOST A(B) level meets the 7-Day Minimum requirements as listed in the following table: **[TS 3.8.1.3, P-26756]**

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B)	≥98.8% level	≥93.1% level

7.1.2.1 Record on Attachment 10.1.

7.1.2.2 If DFOST A(B) level does not meet the 5-Day Minimum requirements, then refer to Technical Specification 3.8.1.3 for Operability.

7.1.2.3 If DFOST A(B) level meets the 5-Day Minimum requirements but not the 7-Day Minimum requirements, then Diesel Fuel must be ordered. Refer to Technical Specification 3.8.1.3 for time requirements.

CAUTION

DIESEL OIL FEED TANKS OVERFLOW WHEN LEVEL EXCEEDS SIX (6) FEET

7.1.3 At the discretion of the SM/CRS, take credit for the Diesel Oil Feed Tank A(B) level rise during the loaded run.

N/A

7.1.4 If not taking credit for the Diesel Oil Feed Tank A(B) level rise during the loaded run then perform the following:

7.1.4.1 Drain the Diesel Oil Feed Tank to a level of ≥4.5 feet as indicated on Diesel Oil Feed Tank A(B) Level Indicator, EGF-ILI-6903A(B) by performing the following:

7.1.4.1.1 Unlock and Close EG A(B) Fuel Oil Injector Drain Header Isolation, EGF-123A(B).

7.1.4.1.2 Unlock and Close EG A(B) Fuel Oil Injector Drain Header Isolation, EGF-124A(B).

CAUTION

PRIOR TO DRAINING THE A(B) DIESEL FEED TANK BACK TO THE EDG A(B) FOST, ENSURE THAT THE COVER OF THE MANWAY ON THE ROOF OF THE TANK IS INSTALLED TO PREVENT ANY SPLASHING.

7.1.4.1.3 Unlock and Open EG A(B) Feed Tank Outlet Isol to F.O. Gravity Drain Hdr, EGF-122A(B).

7.1.4.2 When the desire level is reached, then perform the following:

7.1.4.2.1 Close and Lock EG A(B) Feed Tk Outlet Isol to F.O. Gravity Drain Hdr, EGF-122A(B).

7.1.4.2.2 Open and Lock EG A(B) Fuel Oil Injector Drain Header Isolation, EGF-123A(B).

7.1.4.2.3 Open and Lock EG A(B) Fuel Oil Injector Drain Header Isolation, EGF-124A(B).

7.1.4.2.4 Record on Attachment 10.1.

7.1.4.3 At the local Emergency Diesel Generator Control Panel, place the Fuel Oil Transfer Pump A(B) control switch to ON.

7.1.4.4 At CP-1, monitor level rise on Diesel Oil Feed Tank A(B) Level Indicator, EGF-ILI-6903A(B).

7.1.4.4.1 Raise level 0.5 to 0.8 feet.

N/A

7.1.4.5 When the desired level rise is reached, then perform the following:

7.1.4.5.1 At the local Emergency Diesel Generator Control Panel, place the Fuel Oil Transfer Pump A(B) control switch to AUTO.

7.1.4.5.2 Verify the Fuel Oil Transfer Pump A(B) Stops.

7.1.4.6 Record on Attachment 10.1.

NOTE

(1) Timing shall be started when the Emergency Diesel Generator is started. Timing shall be stopped when the EDG voltage reaches 3920 VAC and frequency reaches 58.8 Hz.

(2) A Chart Recorder may be substituted, under an approved WA, for recording EDG start time(s) at the discretion of the SM/CRS.

7.1.5 Perform a start of the Emergency Diesel Generator A(B) using one of the following methods:

- Manual, in accordance with OP-009-002, Emergency Diesel Generator.
- Simulated loss-of-offsite-power by itself, in accordance with OP-903-115 (OP-903-116), Train A(B) Integrated Emergency Diesel Generator/Engineered Safety Features Test.
- Simulated loss-of-offsite-power in conjunction with an ESF actuation test signal, in accordance with OP-903-115 (OP-903-116), Train A(B) Integrated Emergency Diesel Generator/Engineered Safety Features Test.

7.1.6 Verify that the Emergency Diesel Generator A(B) steady state voltage and frequency are maintained between 3920 to 4580 VAC and 58.8 to 61.2 Hz respectively.

7.1.7 Record start times on Attachment 10.1.

7.1.8 Operate Emergency Diesel Generator A(B) unloaded for 5 minutes.

CAUTION

DO NOT EXCEED 4.84 MW FOR MORE THAN TWO HOURS OUT OF ANY 24 HOUR PERIOD.

7.1.9 Synchronize the Emergency Diesel Generator A(B) to Offsite Power and load to ≥1.0 MW and ≤1.2 MW, in accordance with OP-009-002, Emergency Diesel Generator.

7.1.9.1 Maintain this load for 5 minutes.

7.1.10 Raise Emergency Diesel Generator A(B) load to ≥2.1 MW and ≤2.3 MW, and maintain load for 10 minutes.

7.1.11 Raise Emergency Diesel Generator A(B) load to ≥3.2 MW and ≤3.4 MW, and maintain load for 10 minutes.

7.1.12 Raise Emergency Diesel Generator A(B) load to ≥4.0 MW and ≤4.4 MW.

NOTE

EDG must be run for at least 60 minutes at full load for Technical Specification 4.8.1.1.2.a.5. The 3.5 hour run at full load is desired to ensure optimum engine life and performance.

7.1.13 Operate the Emergency Diesel Generator A(B) at a load ≥4.0 and ≤4.4 MW for at least 60 minutes.

7.1.13.1 Record time and load on Attachment 10.1.

7.1.14 Lower the Emergency Diesel Generator A(B) load to ≥0.5 and ≤1.0 MW for 15 minutes in accordance with OP-009-002, Emergency Diesel Generator.

7.1.15 Stop the Emergency Diesel Generator A(B) and place in Standby in accordance with OP-009-002, Emergency Diesel Generator.

7.1.15.1 Document on Attachment 10.1.

7.1.16 At CP-1, verify Diesel Oil Feed Tank A(B) Level Indicator, EGF-ILI-6903A(B), indicates ≥4.5 feet.

7.1.16.1 Record results on Attachment 10.1.

7.1.17 Verify DFOST A(B) level meets the 5-Day Minimum requirements as listed in the following table: **[TS 3.8.1.3, P-26756]**

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B)	≥98.8% level	≥93.1% level

7.1.17.1 Record on Attachment 10.1.

7.1.17.2 If DFOST A(B) level does not meet the 5-Day Minimum requirements, then refer to Technical Specification 3.8.1.3 for Operability.

7.1.17.3 If DFOST A(B) level meets the 5-Day Minimum requirements but not the 7-Day Minimum requirements, then Diesel Fuel must be ordered. Refer to Technical Specification 3.8.1.3 for time requirements.

7.1.18 If a Fuel Oil Storage Tank A(B) sample is requested by Chemistry, then obtain a sample in accordance with OP-009-002, Emergency Diesel Generator.

8.0 AUTOMATIC FUNCTIONS

NONE

REQUEST/APPROVAL PAGE

# SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-009-002	REVISION: 336

TITLE: Emergency Diesel Generator

PROCEDURE OWNER (Position Title): Operations Manager - Support

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 11/10/2016

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

(a) Added the following Source References in Section 10.2:

* EC-62346, EDG FOST Level Indication Changes to Address Potential Vortexing (Parent EC)
* EC-63914, Child EC for EGFIL6995A Alarm Setpoint Change (Parent EC 62346)
* EC-63915, Child EC for EGFIL6995B Alarm Setpoint Change (Parent EC 62346)

Addition of document references meets Editorial Correction criteria.

☒ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☐ **Editorial Correction** (Revisions Only) ☑ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			David R. Voisin	11/8/2016
EC SUPERVISOR	Administrative Review and Approval		(sign) N/A	
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☑	PA Exclusion ☐	James W. Hoss	7/5/2016
TECHNICAL	Review ☐	Verification ☑	David F. Litolff	11/8/2016
QUALIFIED REVIEWER	Review ☐		N/A	
GROUP/DEPT. HEAD	Review ☐	Approval ☑	(sign) [signature]	11/9/16
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 If the Jacket Water System has been drained and refilled, then the following should be performed:

3.1.1.1 Vent the Jacket Water tubing for the Woodward Speed Control Governor Oil Cooler using EG A(B) Governor Oil Cooler Jacket Water Outlet Vent, EGC-119 A(B). This is the high point vent for the Woodward Speed Control Governor Oil Cooler tubing.

3.1.1.2 Operate the Jacket Water Pumps for at least 5 minutes prior to energizing Jacket Water Heaters.

3.1.2 The Emergency Diesel Generator shall not be started with lube oil temperature <70°F, to prevent damage to the main lube oil filter elements.

3.1.3 Do not perform a rapid load of an EDG before verifying engine warmed up to ≥120°F and proper operation of Jacket Water Circulating Pump, Pre-Lube Oil Pump, and associated heaters.

3.1.4 Caution should be taken not to allow a Diesel Generator to run longer than required at unloaded or low load conditions.

3.1.5 When the EDG is operating unloaded or at low load conditions, then fuel injection pump temperatures may become too hot to comfortably hold your hand on, due to the pump not circulating fuel that would normally cool it. The time in this condition should be minimized for consideration of long term reliability of the fuel injection pumps.

3.1.6 When in Test Mode and paralleled to offsite, then the Diesel Generator shall not be operated for more than 6 hours at <50% load (2.2 MW) without loading the Diesel Generator to ≥3.3 MW for 15-30 minutes, to minimize buildup of unburned exhaust products.

3.1.7 When EDG is connected to the grid, always maintain outgoing reactive load (MVAR) and at least 0.1 MW real load to prevent a reverse power trip. EDG may trip if not loaded within 5 seconds after its output breaker is closed.

3.1.8 If possible, then do not operate unit when a shutdown occurs until the cause has been found and corrected.

3.1.9 The mechanical stops on EDG A(B) CCW Flow Control, CC-413A(B), shall not be adjusted without SM/CRS permission.

3.1.10 Do not use Maintenance Lube Oil Tank to store lube oil. This is applicable at all times.

3.1.11 If the Lube Oil System has been drained and refilled, then operate the Lube Oil Pumps for at least 5 minutes prior to energizing Lube Oil Heaters.

3.1.12 If the Fuel Oil System has been drained and refilled, then vent the Standby Fuel Oil Pump suction piping from the following points:

- EGF-12210A(B) EG A(B) Standby Fuel Oil Pump Suction Vent
- EGF-12210-A1(B1) EG A(B) Fuel Oil Strainer Inlet Line Vent
- EGF-12210-A2(B2) EG A(B) Fuel Oil Strainer Outlet Line Vent

EGF-MSTRN-001A(B) in service:

- EGF-1222-A1(B1) EG A(B) Fuel Oil Strainer Bowl Vent

EGF-MSTRN-002A(B) in service:

- EGF-1222-A2(B2) EG A(B) Fuel Oil Strainer Bowl Vent

3.1.13 EDG B should not be operated in parallel with the Main Generator when Main Generator voltage is >25.95 KV as indicated by PID A58003. Reactive load (MVAR) may be lowered to reduce Main Generator Voltage. Operating EDG B in parallel with the Main Generator when Main Generator voltage is >25.95 KV has the potential to cause the 3B32 bus breakers, upon a fault, to structurally decompose and explode. **[CR-WF3-2004-02220]**

3.1.14 Overfilling Main Governor with oil during EDG operation can adversely affect EDG performance by causing sluggish governor operation. 10 ml of oil will change sightglass level by roughly 1/16 of an inch.

3.1.15 To ensure the fuel oil consumption analysis remains valid, EDG frequency must be maintained ≤60.1 Hz. **[EC-11723, CR-WF3-2008-05183]**

3.1.16 EDG's have had a calculation performed that states the EDGs could run without CCW for up to 10.7 minutes at 3.23 MW and up to 20.9 minutes unloaded should the output breaker fail to close without causing damage to the EDGs. **[ECM12-001, EC-56635]**

3.1.17 EDG A(B) Fuel Rack Override Lever position must be Vertical and Latched. **[CR-WF3-2014-00737]**

3.2 LIMITATIONS

3.2.1 With one Emergency Diesel Generator Inoperable, the Operable Emergency Diesel Generator should not be paralleled to offsite or non-vital loads.

3.2.2 Continuously monitor Emergency Diesel Generator when operating. Monitoring an Emergency Diesel Generator while it is in operation does not require the assigned operator’s physical presence in the room on a continuous basis. However, the operator's activities should be limited to ensure 1) an adequate assessment of engine operation and 2) timely identification and correction of problems. **[P-5549]**

3.2.3 If DC power is secured or lost to EDG A(B) Control Panel through EDG A(B) Control Panel Feeder #1, EG-EBKR-A(B)-11, then EG A(B) Fuel Oil Transfer Pump, EGF-EBKR-312A(B)-3F, should be Opened to prevent overflowing Feed Tank.

3.2.4 Do not run both Emergency Diesel Generators in test mode simultaneously, except when performing testing pursuant to Technical Specification Surveillance requirement 4.8.1.1.2.g.

3.2.5 During normal operation, Emergency Diesel Generator ratings of 4.4 MW for continuous loading and 4.84 MW for 2 hours out of any 24 hours should not be exceeded.

3.2.6 If during normal Emergency Diesel Generator operation, there is a significantly noticeable diesel exhaust plume visible for >6 minutes in any consecutive 60 minute period, then contact the Environmental Engineer to determine appropriate action by qualified personnel or comply with UNT-006-010, Event Notification and Reporting. Startup, shutdown, and emergency periods are exempt from this requirement. Smoke opacity can be accurately determined only during daylight conditions.

3.2.7 If an Emergency Diesel Generator starts in response to a loss of offsite power or other valid event, then ensure that makeup is available to the Emergency Diesel Generator Jacket Water System (EGC) from any source prior to shutting down the Emergency Diesel Generator and allowing it to cool.

3.2.8 When practical, the Diesel Generator should be operated in accordance with the following chart to minimize thermal stresses on the Diesel Engine to ensure optimum engine life and performance :

Diesel Generator Load ①	Hold Time
Start Unloaded	5 minutes
≥1.0 MW to 1.2 MW	5 minutes
≥2.1 MW to 2.3 MW	10 minutes
≥3.2 MW to 3.4 MW	10 minutes
≥4.0 MW to 4.4 MW	≥3.5 hours or at SM/CRS direction
0.5 MW to 1.0 MW	15 minutes

① The Emergency Diesel Generator should be loaded at a rate of approximately 0.5 MW/minute.

3.2.9 All shutdowns, with the exception of the overspeed and generator differential, are locked out during the Emergency Mode of Operation.

3.2.10 If control air is lost during any Emergency Diesel Generator run, then the Fuel Rack Override lever must be used to shutdown the Emergency Diesel Generator.

3.2.11 The Emergency Diesel Generator may continue to operate for up to 7 days following a loss of control air. Continuous operation exceeding 7 days may cause damage to the Turbocharger.

3.2.12 The Emergency Diesel Generator may be started for any non-emergency start with lube oil temperature <120°F but ≥70°F if the following conditions are met and restrictions observed:

- The pre-lube system should be operating for at least 30 minutes prior to starting the Emergency Diesel Generator.
- Lube oil temperature of ≥100°F is required to ensure a start of <10 seconds.
- The start may be conducted with Lube oil temperature ≥70°F but <100°F when a timed start is not required (i.e. post maintenance start).
- The engine should not be loaded above 0.44 MW until lube oil and jacket water temperatures are ≥120°F.

3.2.13 Diesel Fuel Oil Storage Tank minimum levels are listed in the following table. Level may be as low as the 5-Day Minimum values for up to 5 days, provided replacement Fuel Oil is on site within the first 48 hours.
[TS 3.8.1.3, P-26756]

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60120, C60220	≥40,088 gallons	≥37,773 gallons
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B)	≥98.8% level	≥93.1% level
EGF-ILI-6993A(B)*	≥44’-6”	≥42’-0”

* EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.14 The fill limits for the Diesel Fuel Oil Storage Tanks are as follows:

Lower fill limit: **[TS 3.8.1.3, P-26756]**

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,210 gallons (98.68% Full)
- Using EGF-ILI-6995A(B): 98.9%

Upper fill limit:

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,480 gallons (99.34% Full)
- Using EGF-ILI-6995A(B): 99.3%
- Using EGF-ILI-6993A(B)*: 45’-9”

  * EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.15 The Emergency Diesel Generator may be started with the jacket water temperature <120°F for any non-emergency start. The engine should not be loaded above 0.44 MW until the jacket water temperature is ≥120°F.

3.2.16 Emergency Diesel Generator fuel oil storage has very little margin to support the Design Basis Accident loadings for seven days. EC-24379 provides guidance on additional margin for Engineering and Operations to establish operability of the EDG in the event of a fuel oil leak.

6.3 MANUAL REMOTE START

6.3.1 Verify RTGB light Illuminated on CP-1.

6.3.2 Dispatch an Operator to the Diesel Room to observe Start sequence.

6.3.3 Perform Emergency Diesel Generator pre-startup checks in accordance with Subsection 6.1, Emergency Diesel Generator Pre-Startup Checks.

NOTE

(1) The Starting sequence is listed in Attachment 11.6, Starting Sequence, for reference.

(2) Receipt of Starting Air System Malfunction alarm during start sequence may be indication of failed starting air solenoid or starting air control valves.

(3) During engine operation, oil or water may be observed dripping from EG A(B) Left and Right Intercooler Drains, EGA-201A(B) and EGA-202A(B).

CAUTION

(1) MINIMIZE THE TIME THE DIESEL GENERATOR IS OPERATED AT UNLOADED OR LOW LOAD CONDITIONS.

(2) BOTH EMERGENCY DIESEL GENERATOR'S SHALL NOT BE OPERATED IN THE TEST MODE SIMULTANEOUSLY, EXCEPT WHEN PERFORMING TESTING PURSUANT TO TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENT 4.8.1.1.2.G.

(3) STEP 6.3.4 REQUIRES THE USE OF TWO STOPWATCHES AND OPERATORS FOR TWO DIFFERENT TIME REQUIREMENTS. M&TE DATES ARE RECORDED ON ATTACHMENT11.9, DIESEL GENERATOR RUNNING LOG.

6.3.4 Simultaneously position the Engine Control Switch to Start on CP-1, and start timing:

6.3.4.1 When the Emergency Diesel Generator voltage and frequency achieve 3920 VAC and 58.8 Hz, then stop timing.

6.3.4.1.1 Document Emergency Diesel Generator voltage and frequency achievement times on Attachment 11.8, Emergency Diesel Generator Start Evaluation and Attachment 11.9, Diesel Generator Running Log.

6.3.4.2 When the Emergency Diesel Generator voltage and frequency settle between 3920 - 4580 VAC and 58.8 - 61.2 Hz, then stop timing.

6.3.4.2.1 Document Emergency Diesel Generator voltage and frequency settle times on Attachment 11.8, Emergency Diesel Generator Start Evaluation and Attachment 11.9, Diesel Generator Running Log.

NOTE

HVR-501A(B) limit switch positions are also shown on PMC mimic HVR3.

6.3.5 Verify EDG A(B) room ventilation has started and operates properly as follows:

6.3.5.1 Verify Diesel Generator A(B) Exh Fan, HVR-0025A(B), has started.

6.3.5.2 Verify EG A(B) Room Outside Air Intake Damper, HVR-501A(B), Open using the following PMC PID points and indications:

EDG A

- D60404 EDG A RM VENT OAI DMPR HVR501A.................OPEN
- D60405 EDG A RM OAI DMPR HVR501A ....NT CLSD
- EDG A Room Verify Dampers HVR 501(A1)(A2)(A3)(A4) ..... ALL OPEN

EDG B

- D60418 EDG B RM VENT OAI DMPR HVR501B.................OPEN
- D60419 EDG B RM OAI DMPR HVR501B ....NT CLSD

6.3.5.2.1 Document proper damper operation on Attachment 11.9, Diesel Generator Running Logs.

6.3.5.2.2 Monitor the applicable PMC PIDs above to ensure EG A(B) Room Outside Air Intake Damper, HVR-501A(B), remains open during EDG A(B) operation.

NOTE

Local indicators HVR-IFS-5023A or HVR-IFS-5023B may be used to verify proper fan operation if the associated EDG computer point is suspect or not operating properly. In this case a DP reading greater than 1.0 INWC may be used as a substitute of verifying PMC points). **[CR-2013-02530 CA-32]**

6.3.5.3 Verify proper operation of EDG A(B) Room Exhaust Fan by verifying the following indicate NT LO for the applicable EDG: **[CR 2013-02530 CA-32]**:

EDG A

- D60403 EDG A RM Fan E-28A Air DP

EDG B

- D60417 EDG B RM Exh Fan E-28 Air DP

6.3.6 Verify Emergency Diesel Generator parameters are within acceptable ranges 15 minutes after start and every 30 minutes thereafter in accordance with Attachment 11.9, Diesel Generator Running Log.

6.3.6.1 If any parameters are found to be outside of acceptable ranges (Full Load Expected Value) at any time during operation of the EDG at full load, then notify Systems Engineering and generate a CR.

6.4 Emergency Diesel Generator Synchronization and Loading

NOTE

(1) Diesel Generator load changes can be accomplished by performing the following:

- Manual voltage control, when in parallel, will raise or lower reactive load.
- Manual voltage control, when not in parallel, will raise or lower generator voltage.
- While in parallel engine speed control is used to raise or lower generator load.

(2) The operations necessary to synchronize the Diesel Generator either from the Control Room or locally are identical. The point of control is determined by whether the Control mode is selected for Local or RTGB (Control Room). Switch positions for the local control panel are in parentheses.

CAUTION

WHENEVER POSSIBLE THE EMERGENCY DIESEL GENERATOR SHOULD BE OPERATED FOR 5 MINUTES PRIOR TO LOADING. THIS WILL HELP TO MINIMIZE THERMAL STRESS ON THE ENGINE TO ENSURE OPTIMUM ENGINE LIFE AND PERFORMANCE.

6.4.1 Verify Emergency Diesel Generator operating with voltage 3920 - 4580 VAC and frequency 58.8 - 61.2 Hz.

6.4.2 Verify Volt Regulator Mode Select (Sevr Manual/Auto) Switch is in Auto.

CAUTION

RELAY DAMAGE MAY RESULT IF SYNCHRONIZER IS ENERGIZED FOR LONGER THAN 5 MINUTES.

WARNING

EMERGENCY DIESEL GENERATOR B SHOULD NOT BE OPERATED IN PARALLEL WITH THE MAIN GENERATOR WHEN MAIN GENERATOR VOLTAGE IS >25.95 KV AS INDICATED BY PID A58003. REACTIVE LOAD (MVAR) MAY BE LOWERED TO REDUCE MAIN GENERATOR VOLTAGE. OPERATING EDG B IN PARALLEL WITH THE MAIN GENERATOR WHEN MAIN GENERATOR VOLTAGE IS >25.95 KV HAS THE POTENTIAL TO CAUSE THE 3B32 BUS BREAKERS, UPON A FAULT, TO STRUCTURALLY DECOMPOSE AND EXPLODE. [CR-WF3-2004-02220]

6.4.3 Position the Emergency Diesel Generator A(B) Synchronizer Switch (Man/Off/Auto Synch Switch) to Gen Man (Man).

6.4.4 Verify proper voltage response using the Volt Adjust (Sevr Potentiometer Adjust), then adjust Emergency Diesel Generator A(B) voltage to slightly higher than system voltage.

6.4.5 Verify proper frequency response using the Speed Adjust (Engine Speed Adjustment), then adjust engine speed until the synchroscope is rotating slowly in the clockwise direction.

NOTE

If the Red Start light is out, then the Emergency Diesel Generator control circuit may not be lined up to automatically shift to the Test Mode of operation when the Emergency Diesel Generator output breaker is Closed. This may make the Emergency Diesel Generator trip when the Emergency Diesel Generator output breaker is closed.

6.4.6 Verify Emergency Diesel Generator A(B) Red Start Light Illuminated.

NOTE

Do not simultaneously connect both Emergency Diesel Generator A(B) to their respective busses during non-emergency conditions or with offsite power available.

CAUTION

WHEN EMERGENCY DIESEL GENERATOR IS CONNECTED TO THE GRID, MAINTAIN OUTGOING REACTIVE LOAD (MVAR) AND AT LEAST 0.1 MW REAL LOAD TO PREVENT A REVERSE POWER TRIP.

6.4.7 Observing Synchroscope rotating slowly in the clockwise direction, Close the Diesel Generator output breaker at the 5 minutes to twelve position on the synchroscope.

6.4.8 Immediately apply a small load, approximately 0.1 MW, to the Emergency Diesel Generator A(B) using the Speed Adjust (Engine Speed Adjustment) Control Switch.

6.4.9 Position the Emergency Diesel Generator A(B) Synchronizer Switch (Man/Off/Auto Synch Switch) to OFF.

CAUTION

WHILE ADJUSTING MVAR DO NOT EXCEED BUS VOLTAGE OF 4470 VAC.

6.4.10 Adjust the Volt Adjust to obtain 1 MVAR.

NOTE

(1) During normal operations, the diesel generator ratings of 4.4 MW continuous load and 4.84 MW for 2 hours out of any 24 hour period should not be exceeded.

(2) The following chart is the recommended Emergency Diesel Generator loading sequence:

Diesel Generator Load ①	Hold Time
Start Unloaded	5 minutes
≥1.0 MW to 1.2 MW	5 minutes
≥2.1 MW to 2.3 MW	10 minutes
≥3.2 MW to 3.4 MW	10 minutes
≥4.0 MW to 4.4 MW	≥3.5 hours or at SM/CRS direction
0.5 MW to 1.0 MW	15 minutes

① The Diesel Generator should be loaded at a rate of approximately 0.5 MW/minute.

6.4.11 Adjust Emergency Diesel Generator A(B) real load (MW) and reactive load (MVAR) as directed by the SM/CRS.

6.4.12 If in Test Mode and paralleled to offsite, then for each 6 hour interval the Diesel Generator operates at <50% load (2.2 MW) perform the following:

6.4.12.1 Raise load to ≥3.3 MW for 15 - 30 minutes.

9.0 AUTOMATIC FUNCTIONS

9.1 EDG Trip (all modes)

9.1.1 Engine Overspeed, EGF-ISSCV-3006.1A(B) .... 660 RPM

9.1.2 Generator Differential, EG-EREL-2316(EDG A),

EG- EREL-2366(EDG B) .... 0.14 AMPS

9.2 EDG Trip (except in Emergency Mode)

9.2.1 Engine Lube Oil Pressure Low, EGL-IPEV-3014A(B) ...... 30 PSIG

9.2.2 Turbo Lube Oil Press Low, EGL-IPDEV-3018A(B) .... 3 PSIG

9.2.3 Main & Conn Rod Brg Temp High, EG-ITS-3002A(B) ...... MAIN – 228°F

.... CONN ROD 197°F

9.2.4 Turbo Thrust Brg Fail, EG-ITS-3001A(B) .... 228°F

9.2.5 High Jacket Water Temp, EGC-ITEV-3017A(B) .... 205°F

9.2.6 Generator Fault, EG-EREL-4766J1(2) .... Various

9.2.7 Jacket Water Low Press, EGC-IPEV-3028A(B) .... 5 PSIG

9.2.8 Lube Oil Temp High, EGL-ITEV-3031A(B) .... 185°F

9.2.9 Generator Outboard Brg Temp Hi, EG-ITEV-3019A(B) .... 228°F

9.2.10 Generator Overcurrent, EG-EREL-4766F1 (G1)

EG-EREL-4766F2 (G2), EG-EREL-4766H1 (H2) .... 4 Amps/104 Volts

9.3	EDG Air Compr. Auto Start/Stop, EGA-IPS-1990A1 (A2), ...		Start: 242 PSIG
	EGA-IPS-1990B1 (B2)		Stop: 257 PSIG
9.4	EDG Standpipe M/U Valve, CMU-524A(B), EGC-ILS-1980A(B)		Open: 16”
	....		Close: 22”
9.5	EDG Fuel Oil XFR Pump: EGF-ILS-6907 A(B), EGF-ILS-6908 A(B)		Start: -30” ≈ Indic level 58.3%/3.5 Ft
	....		Stop: -6” ≈ Indic level 91.7%/5.5 Ft
9.6	EDG Fuel Oil Booster Pump: EGF-IPS-3032A1 (B1), EGF-IPS-3032A2 (B2)		Start: 25 PSIG
	....		Stop: 50 PSIG
9.7	EDG Jacket Water Circ. Pump, EGC-ITS-6951A(B)....................		Start: 120°F
	....		Stop: 130°F
9.8	EDG Jacket Water Heater, EGC-ITS-6951A(B)...........................		On: 120°F
	....		Off: 130°F
9.9	EDG Lube Oil Heater, EGL-ITS-6950A(B)..................................		On: 120°F
	....		Off: 135°F
9.10	Diesel Generator A(B) Exh Fan, HVRMFAN0025A(B), ...		Start in conjunction with EDGs

REQUEST/APPROVAL PAGE

# SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-903-068		REVISION: 317

TITLE: Emergency Diesel Generator and Subgroup Relay Operability Verification

PROCEDURE OWNER (Position Title) : Operations Manager - Support

TERM (check one) : ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 1/12/2017

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

Rearranged Steps 7.3.15 and 7.3.16 in Section 7.3 and 7.4.15 and 7.4.16 in Section 7.4. This change provides for better efficiency by allowing the control room to reduce load of the Emergency Diesel Generator prior to stationing a NAO in the field to verify HPSI and LPSI pumps ready for a start. This change does not alter the intent of the procedure but merely streamlines the utilization of resources. This change meets the criteria of an Editorial Correction.

☐ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			Nicole Blank	1/9/2017
EC SUPERVISOR		Administrative Review and Approval	(sign) [signature]	1/10/17
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐	PA Exclusion ☐	N/A	
TECHNICAL	Review ☐	Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐		N/A	
GROUP/DEPT. HEAD	Review ☐	Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 For ESFAS Test Module starts:

3.1.1.1 Verify proper ESFAS Test Module switch alignment prior to actuating components.

3.1.1.2 This procedure returns all actuated components to a normal operating alignment. Final component configuration may be determined by the SM/CRS dependent upon plant conditions.

3.1.1.3 Verify that all control switches are returned to their Norm (Auto) position, as applicable.

3.1.1.4 If HPSI Pump AB is aligned to replace HPSI Pump A or B, then the HPSI Pump AB will be actuated during this test and the intent of the procedure will be met.

3.1.2 Caution should be taken not to allow a Diesel Generator to run for an extended period of time unloaded. At no time shall a Diesel Generator run more than 6 hours while it is at less than 50% load (2.2 MW) without loading the diesel to at least 3.3 MW for 15-30 minutes.

3.1.3 Monitoring an Emergency Diesel Generator while it is in operation does not require the physical presence in the room on a continuous basis. However, the assigned operator's activities should be limited to ensure: 1) an adequate assessment of engine operation and 2) timely identification and correction of problems.

3.1.4 When Emergency Diesel Generator is connected to the grid, always maintain outgoing reactive load (MVARs) and at least 0.1 MW real load to prevent a reverse power trip.

3.1.5 If sections, subsections, or selected steps are being used as post-maintenance retest, then the following conditions shall be checked:

- All prerequisite conditions for selected component actuations are met
- Components actuated will not jeopardize personnel or plant safety
- The steps being performed clearly demonstrate the operability of the equipment relative to the maintenance performed

3.1.6 To ensure the fuel oil consumption analysis remains valid, EDG frequency must be maintained ≤60.1 Hz. **[EC-11723, CR-WF3-2008-05183]**

3.1.7 Prior to draining the A(B) Diesel Feed Tank back to the EDG A(B) FOST, ensure that the cover of the manway on the roof of the tank is installed to prevent any splashing.

3.2 LIMITATIONS

3.2.1 Upon release of the Initiate Actuation pushbutton, there is a one minute time delay before the test circuit can be actuated again.

3.2.2 Those ESFAS subgroup relays which are not tested by this procedure are tested during power operation by OP-903-094, ESFAS Subgroup Relay Test - Operating.

3.2.3 This test shall not automatically fail nor be declared unsatisfactory if individual relays are out of service for repair or fail during the performance of this procedure. In order to make a determination of ESFAS Operability, the entire ESFAS must be evaluated against the criteria of Technical Specifications, Tables 3.3-3 and 4.3-2.

3.2.4 Component Cooling Water Pumps A and B must be in service while performing Sections 7.3 or 7.4 to properly test all CCW Pumps Suction and Discharge Crossconnect Valves.

3.2.5 During normal operation the Emergency Diesel Generator ratings of 4.4 MW for continuous loading and 4.84 MW for two (2) hours out of any 24 hour period should not be exceeded.

3.2.6 If during normal operation of the Emergency Diesel Generator there is a significantly noticeable diesel exhaust plume that is visible for >6 minutes in any consecutive 60 minute period, contact the Environmental Engineer to determine appropriate action by qualified personnel or comply with Attachment 6.9, Emergency Opacity Noncompliance Report Checklist, of UNT-006-010, Event Notification and Reporting. Startup, shutdown and emergency periods are exempt from this requirement. Smoke opacity can be accurately determined only during daylight conditions.

3.2.7 Diesel Fuel Oil Storage Tank minimum levels are listed in the following table. Level may be as low as the 5-Day Minimum values for up to 5 days, provided replacement Fuel Oil is on site within the first 48 hours.
[TS 3.8.1.3, P-26756]

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60120, C60220	≥40,088 gallons	≥37,773 gallons
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B):	≥98.8% level	≥93.1% level
EGF-ILI-6993A(B)	≥44'-6"	≥42'-0"

* EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.8 The fill limits for the Diesel Fuel Oil Storage Tanks are as follows:

Lower fill limit: **[TS 3.8.1.3, P-26756]**

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,210 gallons (98.68% Full)
- Using EGF-ILI-6995A(B): 98.9%

Upper fill limit:

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,480 gallons (99.34% Full)
- Using EGF-ILI-6995A(B): 99.3%
- Using EGF-ILI-6993A(B)*: 45'-9"

  * EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.9 Do not run both Emergency Diesel Generators in the test mode simultaneously, except when performing testing pursuant to Technical Specification Surveillance requirement 4.8.1.1.2.g.

3.2.10 The EDGs may be run without CCW without damage for 10.7 minutes at 3.23 MW and 20.9 minutes unloaded should the output breaker fail to close. **[EC-56635, ECM12-001]**

7.0 PROCEDURE

7.1 EMERGENCY DIESEL GENERATOR OPERABILITY TEST LOADED

NOTE

(1) Refer to Limitation 3.2.7 for Diesel Oil Feed Tank level requirements. **[TS 3.8.1.3, P-26756]**

(2) Both EDGs shall not be operated in the TEST mode simultaneously except when performing testing pursuant to Technical Specification Surveillance requirement 4.8.1.1.2.g.

7.1.1 Obtain SM/CRS permission to perform test and document on Attachment 10.1, Loaded Emergency Diesel Generator Surveillance Data Sheet.

7.1.2 Verify DFOST A(B) level meets the 7-Day Minimum requirements as listed in the following table: **[TS 3.8.1.3, P-26756]**

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B)	≥98.8% level	≥93.1% level

7.1.2.1 Record on Attachment 10.1.

7.1.2.2 If DFOST A(B) level does not meet the 5-Day Minimum requirements, then refer to Technical Specification 3.8.1.3 for Operability.

7.1.2.3 If DFOST A(B) level meets the 5-Day Minimum requirements but not the 7-Day Minimum requirements, then Diesel Fuel must be ordered. Refer to Technical Specification 3.8.1.3 for time requirements.

CAUTION

DIESEL OIL FEED TANKS OVERFLOW WHEN LEVEL EXCEEDS SIX (6) FEET

7.1.3 At the discretion of the SM/CRS, take credit for the Diesel Oil Feed Tank A(B) level rise during the loaded run.

7.1.4 <u>If</u> <u>not</u> taking credit for the Diesel Oil Feed Tank A(B) level rise during the loaded run <u>then</u> perform the following:

7.1.4.1 Drain the Diesel Oil Feed Tank to a level of ≥4.5 feet as indicated on Diesel Oil Feed Tank A(B) Level Indicator, EGF-ILI-6903A(B) by performing the following:

7.1.4.1.1 Unlock <u>and</u> Close EG A(B) Fuel Oil Injector Drain Header Isolation, EGF-123A(B).

7.1.4.1.2 Unlock <u>and</u> Close EG A(B) Fuel Oil Injector Drain Header Isolation, EGF-124A(B).

<u>CAUTION</u>

PRIOR TO DRAINING THE A(B) DIESEL FEED TANK BACK TO THE EDG A(B) FOST, ENSURE THAT THE COVER OF THE MANWAY ON THE ROOF OF THE TANK IS INSTALLED TO PREVENT ANY SPLASHING.

7.1.4.1.3 Unlock <u>and</u> Open EG A(B) Feed Tank Outlet Isol to F.O. Gravity Drain Hdr, EGF-122A(B).

7.1.4.2 <u>When</u> the desire level is reached, <u>then</u> perform the following:

7.1.4.2.1 Close <u>and</u> Lock EG A(B) Feed Tk Outlet Isol to F.O. Gravity Drain Hdr, EGF-122A(B).

7.1.4.2.2 Open <u>and</u> Lock EG A(B) Fuel Oil Injector Drain Header Isolation, EGF-123A(B).

7.1.4.2.3 Open <u>and</u> Lock EG A(B) Fuel Oil Injector Drain Header Isolation, EGF-124A(B).

7.1.4.2.4 Record on Attachment 10.1.

7.1.4.3 At the local Emergency Diesel Generator Control Panel, place the Fuel Oil Transfer Pump A(B) control switch to ON.

7.1.4.4 At CP-1, monitor level rise on Diesel Oil Feed Tank A(B) Level Indicator, EGF-ILI-6903A(B).

7.1.4.4.1 Raise level 0.5 to 0.8 feet.

7.1.4.5 When the desired level rise is reached, then perform the following:

7.1.4.5.1 At the local Emergency Diesel Generator Control Panel, place the Fuel Oil Transfer Pump A(B) control switch to AUTO.

7.1.4.5.2 Verify the Fuel Oil Transfer Pump A(B) Stops.

7.1.4.6 Record on Attachment 10.1.

NOTE

(1) Timing shall be started when the Emergency Diesel Generator is started. Timing shall be stopped when the EDG voltage reaches 3920 VAC and frequency reaches 58.8 Hz.

(2) A Chart Recorder may be substituted, under an approved WA, for recording EDG start time(s) at the discretion of the SM/CRS.

7.1.5 Perform a start of the Emergency Diesel Generator A(B) using one of the following methods:

- Manual, in accordance with OP-009-002, Emergency Diesel Generator.
- Simulated loss-of-offsite-power by itself, in accordance with OP-903-115 (OP-903-116), Train A(B) Integrated Emergency Diesel Generator/Engineered Safety Features Test.
- Simulated loss-of-offsite-power in conjunction with an ESF actuation test signal, in accordance with OP-903-115 (OP-903-116), Train A(B) Integrated Emergency Diesel Generator/Engineered Safety Features Test.

7.1.6 Verify that the Emergency Diesel Generator A(B) steady state voltage and frequency are maintained between 3920 to 4580 VAC and 58.8 to 61.2 Hz respectively.

7.1.7 Record start times on Attachment 10.1.

7.1.8 Operate Emergency Diesel Generator A(B) unloaded for 5 minutes.

CAUTION

DO NOT EXCEED 4.84 MW FOR MORE THAN TWO HOURS OUT OF ANY 24 HOUR PERIOD.

7.1.9 Synchronize the Emergency Diesel Generator A(B) to Offsite Power and load to ≥1.0 MW and ≤1.2 MW, in accordance with OP-009-002, Emergency Diesel Generator.

7.1.9.1 Maintain this load for 5 minutes.

7.1.10 Raise Emergency Diesel Generator A(B) load to ≥2.1 MW and ≤2.3 MW, and maintain load for 10 minutes.

7.1.11 Raise Emergency Diesel Generator A(B) load to ≥3.2 MW and ≤3.4 MW, and maintain load for 10 minutes.

7.1.12 Raise Emergency Diesel Generator A(B) load to ≥4.0 MW and ≤4.4 MW.

NOTE

EDG must be run for at least 60 minutes at full load for Technical Specification 4.8.1.1.2.a.5. The 3.5 hour run at full load is desired to ensure optimum engine life and performance.

7.1.13 Operate the Emergency Diesel Generator A(B) at a load ≥4.0 and ≤4.4 MW for at least 60 minutes.

7.1.13.1 Record time and load on Attachment 10.1.

7.1.14 Lower the Emergency Diesel Generator A(B) load to ≥0.5 and ≤1.0 MW for 15 minutes in accordance with OP-009-002, Emergency Diesel Generator.

7.1.15 Stop the Emergency Diesel Generator A(B) and place in Standby in accordance with OP-009-002, Emergency Diesel Generator.

7.1.15.1 Document on Attachment 10.1.

7.1.16 At CP-1, verify Diesel Oil Feed Tank A(B) Level Indicator, EGF-ILI-6903A(B), indicates ≥4.5 feet.

7.1.16.1 Record results on Attachment 10.1.

7.1.17 Verify DFOST A(B) level meets the 5-Day Minimum requirements as listed in the following table: **[TS 3.8.1.3, P-26756]**

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B)	≥98.8% level	≥93.1% level

7.1.17.1 Record on Attachment 10.1.

7.1.17.2 If DFOST A(B) level does not meet the 5-Day Minimum requirements, then refer to Technical Specification 3.8.1.3 for Operability.

7.1.17.3 If DFOST A(B) level meets the 5-Day Minimum requirements but not the 7-Day Minimum requirements, then Diesel Fuel must be ordered. Refer to Technical Specification 3.8.1.3 for time requirements.

7.1.18 If a Fuel Oil Storage Tank A(B) sample is requested by Chemistry, then obtain a sample in accordance with OP-009-002, Emergency Diesel Generator.

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S7

Reset High Containment Pressure ESFAS Trip

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Reset High Containment Pressure ESFAS Trip

Task Standard: High Containment Pressure ESFAS trip signal reset in accordance with OP-902-009, Standard Appendices, Attachment 5-D.

References: OP-902-009, Standard Appendices, Rev. 315

Alternate Path: No Time Critical: No Validation Time: 10 mins.

K/A 012 A4.04, Bistable, trips, reset and test switches

Importance Rating 3.3 / 3.3
RO/SRO

Safety Function 7

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ______________________

____

____

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-902-009, Standard Appendices, Attachment 5-D (Handout)

Description:
Applicant will reset a high containment pressure ESFAS trip signal by performing OP-902-009, Standard Appendices, Attachment 5-D, SIAS/CIAS/MSIS Containment Pressure Reset procedure. This JPM is run in parallel with JPM S4.

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

Reset to IC-177

There are no Malfunctions or Overrides for this JPM.
This JPM is run in parallel with JPM S4 (Reset of EFW Pump AB).
Rescale the Containment pressure trend on CP-3 (15.5 to 16.5 psia).

Booth Operator needs to verify that all keys used during this JPM are returned to their appropriate key locker location when the JPM is complete.

Setup with specific IC unavailable or for non NRC exams:

1. *Reset the simulator to an IC at 100%*
2. *Insert steam line break inside containment (MS11A with 0.5 severity - small enough to prevent PZR Lo Pressure and SG Lo Pressure trips)*
3. *Trip the reactor*
4. *Reset PZR Lo Press and SG Lo Press if necessary.*
5. *When Containment pressure exceeds 17.1 psia, delete the malfunction.*
6. *Start both CS Pumps and open CS-125A & B to lower containment pressure below 16.1 psia (this takes about 2 hrs).*
7. *Secure CS and return to normal standby condition.*
8. *Allow conditions to stabilize.*
9. *Reset Channels A, B, and C using OP-902-009, Att. 5-D.*
10. *Freeze and save IC.*

Examiner Note
Cue the Simulator Operator to place the Simulator in RUN.

Examiner Note
The applicant is given instructions to reset the last of 4 channels (Channel D) and complete the reset procedure. Channel D controls (black reset pushbuttons & permissive key switch) are the furthest to the right at CP-10. There is a white lamp above the buttons labeled "RESET ACTUATION TRIP PATH NO. 4".

TASK ELEMENT 1	STANDARD
Procedure Note: High CNTMT Pressure reset is 16.1 PSIA.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
1. <u>Reset</u> SIAS, CIAS and MSIS Initiation relays on **ALL** four channels (A, B, C, D) as follows: a. <u>Place</u> the Reset Permissive switch to "UNLK" position on CP-10. (Key 218)	Channel D Reset Permissive key-switch is placed in "UNLK"
Comment:	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
b. <u>Press</u> the following Reset pushbuttons on CP-10: • SIAS • CIAS • MSIS	SIAS, CIAS, and MSIS reset pushbuttons on Channel D are depressed
Comment:	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
c. Verify the initiation relay indicator (Red, Yellow, Green, Blue) is illuminated on the ENGINEERED SAFETY FEATURES SYSTEM mimic at CP-10.	Verified initiation relay indicators on CP-10 illuminated.
Comment: Examiner Note: Channel D indicators are the blue lamps located on the top portion of CP-10.	**SAT / UNSAT**

TASK ELEMENT 5	STANDARD
d. Place the Reset permissive switch to “LK” position.	Channel D Reset Permissive key-switch is placed in “LK” position
Comment:	**SAT / UNSAT**

TASK ELEMENT 6	STANDARD
2. Reset SIAS, CIAS and MSIS actuation logic on **BOTH** trains (A, B) as follows: a. Press the following Reset pushbuttons on CP-33: • SIAS • CIAS • MSIS	SIAS, CIAS and MSIS actuation logic reset pushbuttons on Train A and Train B depressed.
Comment: Examiner Note: A total of six pushbuttons on CP-33 must be depressed (SIAS, CIAS & MSIS for Train A and B).	**Critical** **SAT / UNSAT**

TASK ELEMENT 7	STANDARD
b. Verify the actuation relay indicators (1, 3 and 2, 4) (white) (A, B) are illuminated on the ENGINEERED SAFETY FEATURES SYSTEM mimic at CP-10.	Verified actuation relay indicators are illuminated at CP-10
Comment:	**SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

RETURN ALL HANDOUTS & THIS CUE SHEET TO EXAMINER UPON COMPLETION OF TASK

INITIAL CONDITIONS:

- The plant is shutdown and recovering from a Loss of Coolant Accident.
- Containment pressure is less than 16.1 PSIA and stable
- OP-902-009, Standard Appendices, Attachment 5-D, SIAS/CIAS/MSIS CNTMT Pressure Reset Procedure is in progress. Channels A, B, and C have been reset by another operator.

INITIATING CUE(S):

The CRS directs you to complete OP-902-009, Standard Appendices, Attachment 5-D, SIAS/CIAS/MSIS CNTMT Pressure Reset Procedure by resetting Channel D and completing the rest of the procedure.

JPM S7 Handout

ESFAS Reset

Attachment 5-D: SIAS/CIAS/MSIS CNTMT Pressure Reset Procedure

INSTRUCTIONS

-- **NOTE** --

High CNTMT Pressure reset is 16.1 PSIA.

----

1. Reset SIAS, CIAS, and MSIS Initiation relays on **ALL** four channels (A, B, C, D) as follows:

   a. Place the Reset Permissive switch to “UNLK” position on CP-10. (Key 218)

   b. Press the following Reset pushbuttons on CP-10:

      - SIAS
      - CIAS
      - MSIS

   c. Verify the initiation relay indicator (Red, Yellow, Green, Blue) is illuminated on the ENGINEERED SAFETY FEATURES SYSTEM mimic at CP-10.

   d. Place the Reset permissive switch to “LK” position.

2. Reset SIAS, CIAS and MSIS actuation logic on **BOTH** trains (A, B) as follows:

   a. Press the following Reset pushbuttons on CP-33:

      - SIAS
      - CIAS
      - MSIS

   b. Verify the actuation relay indicators (1, 3 and 2, 4) (white) (A, B) are illuminated on the ENGINEERED SAFETY FEATURES SYSTEM mimic at CP-10.

INSTRUCTIONS

3. Restore SIAS, CIAS and MSIS actuated components as desired.

End of Appendix 5-D

ESFAS Reset

Attachment 5-D: SIAS/CIAS/MSIS CNTMT Pressure Reset Procedure

INSTRUCTIONS

NOTE

High CNTMT Pressure reset is 16.1 PSIA.

---

1. Reset SIAS, CIAS, and MSIS Initiation relays on **ALL** four channels (A, B, C, D) as follows:

   a. Place the Reset Permissive switch to “UNLK” position on CP-10. (Key 218)

   b. Press the following Reset pushbuttons on CP-10:

      - SIAS
      - CIAS
      - MSIS

   c. Verify the initiation relay indicator (Red, Yellow, Green, Blue) is illuminated on the ENGINEERED SAFETY FEATURES SYSTEM mimic at CP-10.

   d. Place the Reset permissive switch to “LK” position.

2. Reset SIAS, CIAS and MSIS actuation logic on **BOTH** trains (A, B) as follows:

   a. Press the following Reset pushbuttons on CP-33:

      - SIAS
      - CIAS
      - MSIS

   b. Verify the actuation relay indicators (1, 3 and 2, 4) (white) (A, B) are illuminated on the ENGINEERED SAFETY FEATURES SYSTEM mimic at CP-10.

INSTRUCTIONS

3. Restore SIAS, CIAS and MSIS actuated components as desired.

End of Appendix 5-D

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S8

Split CCW Headers

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task:	Split CCW headers in accordance with OP-901-510, CCW System Malfunction, Section E2, step 8.
Task Standard:	CCW cross-connect valves, CC-127A/115A and CC-200A/727 are closed and CCW flow to the Spent Fuel Pool Heat Exchanger is restored by opening CC-620.
References:	OP-901-510, Component Cooling Water System Malfunction, Rev. 303

Alternate Path: No Time Critical: No Validation Time: 10 min

K/A 008 A4.01, CCW indications and controls Importance Rating 3.3 / 3.1
RO/SRO

Safety Function 8

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- None

Description:
Applicant will recognize CCW pump AB is replacing B based on CP-8 indications and close the appropriate cross-connect valves (CC-127A/115A and CC-200A/727) to split CCW Headers. The applicant will also restore CCW flow to the Spent Fuel Pool Heat Exchanger by resetting an auto close interlock and opening CC-620.

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

Reset to IC-178

Place EFW Back Up FCV Controllers in Auto and remove Caution Tags.
Place CCW pump B control switch in OFF with a Danger Tag.

Verify the following Malfunction (saved in IC):

- CC01A (CCW Pump A Trip) – Active

Verify the following Remote (saved in IC):

- CCR46 to Rackout

Setup with specific IC unavailable or for non NRC exams:

1. *Reset the simulator to any IC in Mode 3 with AB buses on B side.*
2. *Secure RCPs 1A & 2A (leave 1B & 2B running). This prevents low CCW flow alarms on CP-18 during JPM performance.*
3. *Align CCW pump AB to replace B per OP-002-003.*
4. *Insert remote CCR46 to RKOUT (CCW pump B breaker), place C/S in OFF with danger tag.*
5. *Insert malfunction CC01A (CCW pump A trip) and place C/S in OFF.*
6. *Allow plant conditions to stabilize.*
7. *Place simulator in freeze and save IC*

Examiner Note
Cue the Simulator Operator to place the Simulator in RUN.

Examiner Note
The Applicant should be able to determine CCW System status by checking CP-8. If the Applicant requests information about system status, cue: “Status is as seen on the control boards”. Allow the applicant to walk down CP-8 (<u><</u>5 min) prior to starting JPM.

TASK ELEMENT 1	STANDARD
8. <u>IF</u> only one Component Cooling Water Pump is operating, <u>THEN</u> split CCW headers as follows: 8.1 <u>IF</u> CCW Pump A is operating, <u>THEN</u> Close CCW SUCT & DISCH HEADER TIE VALVES: • CC 126A/114A, AB TO A • CC 200B/563, B TO AB	Recognized CCW pump A is tripped.
Comment: Examiner Note: This step is N/A.	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
8.2 <u>IF</u> CCW Pump AB is operating, replacing CCW Pump A, <u>THEN</u> Close CCW SUCT & DISCH HEADER TIE VALVES: • CC 126B/114B, AB TO B • CC 200B/563, B TO AB	Recognized CCW pump AB is NOT replacing A
Comment: Examiner Note: This step is N/A.	**SAT / UNSAT**

TASK ELEMENT 3	STANDARD
8.3 <u>IF</u> CCW Pump B is operating, <u>THEN</u> Close CCW SUCT & DISCH HEADER TIE VALVES: • CC 127B/115B, AB TO B • CC 200A/727, A TO AB	Recognized CCW pump B is tagged out.
Comment: Examiner Note: This step is N/A.	**SAT / UNSAT**

TASK ELEMENT 4	STANDARD
8.4 <u>IF</u> CCW Pump AB is operating, replacing CCW Pump B, <u>THEN</u> Close CCW SUCT & DISCH HEADER TIE VALVES: • CC 127A/115A, AB TO A • CC 200A/727, A TO AB	CC-127A/115A <u>and</u> CC-200A/727 are closed
Comment: Examiner Note: This task element contains two critical steps. <u>Both</u> sets of valves must be closed. CC-127A & 115A have a common control switch. CC-200A & 727 have a common control switch. Both control switches must be manipulated to close all four valves. **Examiner Cue: If the applicant wants to address alarms on other panels, cue that another operator will address alarms on other panels.**	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
8.5 Restore CCW flow to the SFP HX by opening CC-620, Fuel Pool Heat Exch's Temperature Control.	The A side control switch for CC-620 is taken to 'Close' and then back to 'Control'
Comment: Examiner Note: CC-620 has two control switches (A and B Train control switches). The applicant may operate both control switches which is not a problem as long as both switches are returned to the 'Control' position. The A side control switch (on left hand side of CP-8) must be operated to reset interlock.	**<u>Critical</u>** **SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

RETURN ALL HANDOUTS & THIS CUE SHEET TO EXAMINER UPON COMPLETION OF TASK

INITIAL CONDITIONS:

- The plant is in MODE 3.
- The crew has entered OP-901-510, Component Cooling Water System Malfunction.

INITIATING CUE(S):

The CRS directs you to split CCW headers in accordance with OP-901-510, Component Cooling Water System Malfunction, Section E2, step 8.

PLACEKEEPER
START DONE

8. IF only one Component Cooling Water Pump is operating, THEN split CCW headers as follows: ☐ ☐

8.1 IF CCW Pump A is operating, THEN Close CCW SUCT & DISCH HEADER TIE VALVES: ☐ ☐

- CC 126A/114A, AB TO A ☐
- CC 200B/563, B TO AB ☐

8.2 IF CCW Pump AB is operating, replacing CCW Pump A, THEN Close CCW SUCT & DISCH HEADER TIE VALVES: ☐ ☐

- CC 126B/114B, AB TO B ☐
- CC 200B/563, B TO AB ☐

8.3 IF CCW Pump B is operating, THEN Close CCW SUCT & DISCH HEADER TIE VALVES: ☐ ☐

- CC 127B/115B, AB TO B ☐
- CC 200A/727, A TO AB ☐

8.4 IF CCW Pump AB is operating, replacing CCW Pump B, THEN Close CCW SUCT & DISCH HEADER TIE VALVES: ☐ ☐

- CC 127A/115A, AB TO A ☐
- CC 200A/727, A TO AB ☐

		PLACEKEEPER START	DONE
8.5	Restore CCW flow to the SFP HX by opening CC-620, Fuel Pool Heat Exch's Temperature Control.	☐	☐
9.	IF flow is lost to CCW Safety Header A, THEN perform the following:	☐	☐
9.1	Pull Emergency Diesel Generator A Overspeed Trip Device.	☐	☐
9.2	Verify ACCW Pump A Operating.		☐
9.2.1	Place Train A CHILLER CCW COOLING MODE Control Switch to WET Tower position.		☐
9.3	Verify Essential Chiller A Operating.		☐
9.4	Refer to Technical Specifications for determination of Operability for the ACCW Pump AND associated Essential Chiller.	☐	☐
9.5	Verify the following equipment Secured:	☐	☐
	• SI-0002A HPSI PUMP A		☐
	• SI-0001A LPSI PUMP A		☐
	• CS-0001A CNTMT SPRAY PUMP A		☐
	• Post Accident Sampling System		☐
9.6	Verify CCS-0003B, CONTAINMENT FAN COOLER B, AND CCS-0003D, CONTAINMENT FAN COOLER D, Operating.		☐

REQUEST/APPROVAL PAGE

SAFETY RELATED
PROCEDURE

Normal Review Class (check one):

☐ **OSRC**

☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-901-510	REVISION: 303
TITLE: Component Cooling Water System Malfunction	
PROCEDURE OWNER (Position Title): Operations Manager - Support	

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 12/17/14

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

(a) In step E2.8 change the text "If unable to start a second Component Cooling Water Pump, then…" to "If only one Component Cooling Water Pump is operating, then…" The text of this conditional statement is improved by eliminating negative phrasing. The meaning of the text remains the same. This change only serves to clarify existing information and therefore meets Editorial Correction criteria.

(b) In the substeps of step E2.8 revised one header valve isolation that is closed in two of the different pump operating configurations. In the case where CCW Pump AB is operating replacing CCW Pump A, changed the AB to B tie that is used for isolation from CC-115B to CC-114B. In the case where CCW Pump B is operating, changed the AB to B tie that is used for isolation from CC-114B to CC-115B. These changes use an equivalent isolation in each instance.

☑ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☑ **Editorial Correction** (Revisions Only) ☐ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES		PRINT NAME OR SIGNATURE	DATE
PREPARER		William M Crowley	12/16/2014
EC SUPERVISOR	Administrative Review and Approval	(sign)	12-16-14
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	Operations [Licensed Operator Peer Review]	Brett Griffith	12/16/2014
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
	N/A	N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☐ PA Exclusion ☐	N/A	
TECHNICAL	Review ☐ Verification ☐	N/A	
QUALIFIED REVIEWER	Review ☐	N/A	
GROUP/DEPT. HEAD	Review ☐ Approval ☐	(sign) N/A	
GM, PLANT OPERATIONS	Review ☐ Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS	Approval ☐	(sign) N/A	

E SUBSEQUENT OPERATOR ACTIONS

E_0 GENERAL

PLACEKEEPER
START DONE

1. IF ANY of the following occur, THEN GO TO Subsection E_1, System Leakage: ☐ ☐
   - CCW Surge Tank level dropping ☐
   - CCW Dry Cooling Towers isolated due to low CCW Surge Tank level ☐
   - CMU-226, WATER STORAGE MAKEUP CCW SURGE TANK, cycling frequently ☐
   - CCW header isolates due to low CCW Surge Tank level ☐
   - Local observation of CCW leak reported to Control Room ☐

2. IF ANY of the following occur, THEN GO TO Subsection E_2, Loss of CCW Pump(s): ☐ ☐
   - CCW system OR component flows low ☐
   - Amber trip/trouble light on CCW PUMP A(B)(AB) Control Switch ☐

3. IF EITHER of the following indications occur, THEN GO TO Subsection E_3, High System Temperature: ☐ ☐
   - CCW temperature rising/high ☐
   - High temperatures on components cooled by CCW ☐

E$_2$ LOSS OF CCW PUMP(S)

	PLACEKEEPER START	PLACEKEEPER DONE
1. IF CCW is lost to in-service Shutdown Cooling train, THEN implement OP-901-131, SHUTDOWN COOLING MALFUNCTION, AND perform concurrently with this procedure.	☐	☐
2. IF Component Cooling Water Pump AB has tripped, THEN Start standby CCW Pump.		☐
2.1 Place CCW ASSIGNMENT Switch to NORM Position.		☐
3. IF Component Cooling Water Pump A has tripped, THEN align CCW Pump AB for Operation as follows:	☐	☐
3.1 Place CCW ASSIGNMENT Switch to A position.		☐
3.2 Verify Open the following valves:		
• CC-126A/CC-114A — CCW SUCT & DISCH HEADER TIE VALVES AB TO A		☐
• CC-127A/CC-115A — CCW SUCT & DISCH HEADER TIE VALVES AB TO A		☐
3.3 Start CC-0001AB, CCW PUMP AB.		☐
3.4 Evaluate AB Electrical Bus alignment for Technical Specification Operability requirements.		☐

	PLACEKEEPER START	DONE
4. IF Component Cooling Water Pump B has tripped, THEN align CCW Pump AB for Operation as follows:	☐	☐
4.1 Position CCW ASSIGNMENT switch to B position.		☐
4.2 Verify Open the following valves:		
• CC-126B/CC-114B CCW SUCT & DISCH HEADER TIE VALVES AB TO B		☐
• CC-127B/CC-115B CCW SUCT & DISCH HEADER TIE VALVES AB TO B		☐
4.3 Start CC-0001AB, COMPONENT COOLING WATER PUMP AB.		☐
4.4 Evaluate AB Electrical Bus alignment for Technical Specification Operability requirements.		☐
5. IF NO CCW Pumps are operating AND Reactor Coolant Pumps are Operating, THEN within 3 minutes of loss of CCW flow perform the following:	☐	☐
5.1 Trip the Reactor.		☐
5.2 Stop ALL Reactor Coolant Pumps.		☐
5.3 Implement OP-902-000, STANDARD POST TRIP ACTIONS, concurrently with this procedure.		☐
6. IF NO CCW Pumps are operating AND RCS temperature >130°F, THEN perform the following:	☐	☐
6.1 Close CVC-101, LETDOWN STOP VALVE.		☐
6.2 Operate Charging Pumps as necessary to maintain Pressurizer level in accordance with OP-902-000, STANDARD POST TRIP ACTIONS.	☐	Cont

PLACEKEEPER
START DONE

6.3 Close the following valves: ☐ ☐

• PSL-105	RCS SAMPLE ISOL HOT LEG (IN)	☐
• PSL-203	RCS SAMPLE ISOL PZR SURGE (IN)	☐
• PSL-303	RCS SAMPLE ISOL PZR ISOL VLV (IN)	☐
• SSL-8004A	SAMPLING ISOLATION SG 1	☐
• SSL-8004B	SAMPLING ISOLATION SG 2	☐
• SSL-301B	SAMPLING ISOLATION MAIN STM LINE 2	☐
• PSL-107	RCS SAMPLE ISOL HOT LEG (OUT)	☐
• PSL-204	RCS SAMPLE ISOL PZR SURGE (OUT)	☐
• PSL-304	RCS SAMPLE ISOL PZR STEAM (OUT)	☐
• SSL-8006A	SAMPLING ISOLATION SG 1	☐
• SSL-8006B	SAMPLING ISOLATION SG 2	☐
• SSL-301A	SAMPLING ISOLATION MAIN STM LINE 1	☐

6.4 Locally Secure Operating Boric Acid Concentrators in accordance with OP-007-001, BORON MANAGEMENT SYSTEM. ☐ ☐

6.5 Locally place <u>BOTH</u> Waste Gas Compressor Control Switches to Off. ☐ ☐

7. <u>IF</u> unable to restore at least one CCW pump, <u>THEN</u>, perform OP-901-513, SPENT FUEL POOL COOLING MALFUNCTION, concurrently with this procedure. ☐ ☐
[INPO IER 11-2 Recommendation 4]

	PLACEKEEPER START	PLACEKEEPER DONE
8. <u>IF</u> only one Component Cooling Water Pump is operating, <u>THEN</u> split CCW headers as follows:	☐	☐
8.1 <u>IF</u> CCW Pump A is operating, <u>THEN</u> Close CCW SUCT & DISCH HEADER TIE VALVES:	☐	☐
• CC 126A/114A, AB TO A		☐
• CC 200B/563, B TO AB		☐
8.2 <u>IF</u> CCW Pump AB is operating, replacing CCW Pump A, <u>THEN</u> Close CCW SUCT & DISCH HEADER TIE VALVES:	☐	☐
• CC 126B/114B, AB TO B		☐
• CC 200B/563, B TO AB		☐
8.3 <u>IF</u> CCW Pump B is operating, <u>THEN</u> Close CCW SUCT & DISCH HEADER TIE VALVES:	☐	☐
• CC 127B/115B, AB TO B		☐
• CC 200A/727, A TO AB		☐
8.4 <u>IF</u> CCW Pump AB is operating, replacing CCW Pump B, <u>THEN</u> Close CCW SUCT & DISCH HEADER TIE VALVES:	☐	☐
• CC 127A/115A, AB TO A		☐
• CC 200A/727, A TO AB		☐

PLACEKEEPER
START DONE

8.5 Restore CCW flow to the SFP HX by opening CC-620, Fuel Pool Heat Exch's Temperature Control. ☐ ☐

9. IF flow is lost to CCW Safety Header A, THEN perform the following: ☐ ☐

9.1 Pull Emergency Diesel Generator A Overspeed Trip Device. ☐ ☐

9.2 Verify ACCW Pump A Operating. ☐

9.2.1 Place Train A CHILLER CCW COOLING MODE Control Switch to WET Tower position. ☐

9.3 Verify Essential Chiller A Operating. ☐

9.4 Refer to Technical Specifications for determination of Operability for the ACCW Pump AND associated Essential Chiller. ☐ ☐

9.5 Verify the following equipment Secured: ☐ ☐

- SI-0002A HPSI PUMP A ☐
- SI-0001A LPSI PUMP A ☐
- CS-0001A CNTMT SPRAY PUMP A ☐
- Post Accident Sampling System ☐

9.6 Verify CCS-0003B, CONTAINMENT FAN COOLER B, AND CCS-0003D, CONTAINMENT FAN COOLER D, Operating. ☐

		PLACEKEEPER START	PLACEKEEPER DONE
10.	IF flow is lost to CCW Safety Header B, THEN perform the following:	☐	☐
10.1	Pull Emergency Diesel Generator B Overspeed Trip Device.	☐	☐
10.2	Verify ACCW Pump B Operating.		☐
10.2.1	Place Train B CHILLER CCW COOLING MODE Control Switch to WET Tower position.		☐
10.3	Verify Essential Chiller B Operating.		☐
10.4	Refer to Technical Specifications for determination of Operability for the ACCW Pump AND associated Essential Chiller.	☐	☐
10.5	Verify the following equipment Secured:	☐	☐
	• SI-0002B HPSI PUMP B		☐
	• SI-0001B LPSI PUMP B		☐
	• CS-0001B CNTMT SPRAY PUMP B		☐
	• Post Accident Sampling System		☐
10.6	Verify CCS-0003A, CONTAINMENT FAN COOLER A, AND CCS-0003C, CONTAINMENT FAN COOLER C, Operating.		☐

	PLACEKEEPER START	DONE
11. WHEN flow is restored to isolated CCW Safety Header, THEN perform the following:	☐	☐
• Reset Emergency Diesel Generator Overspeed Trip Device.		☐
• Restore Essential Chiller CCW Cooling Mode to DRY TOWER position AND Control Switch in AUTO.		☐
• Align Containment Fan Coolers in accordance with OP-008-003, CONTAINMENT COOLING SYSTEM.		☐
• Align ACCW Pumps in accordance with OP-002-001, AUXILIARY COMPONENT COOLING WATER SYSTEM.		☐
• Restore Charging AND Letdown in accordance with OP-002-005, CHEMICAL AND VOLUME CONTROL.		☐

END

JPM S-1

JPM S-1 was revised by licensee shortly after draft operating test submittal due to procedure changes that affected the performance of the JPM. Revision 1 to JPM S-1 follows.

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

S1

Place Reactor Cutback in service and perform Immediate Operator Actions

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Place Reactor Cutback (RXC) in service and perform Immediate Operator Actions following a Cutback with an unanalyzed rod configuration.

Task Standard: Applicant manually selects subgroups 5 & 11 for RXC actuation for Large Load Reject and Loss of Feed Pump. Places RXC in service and manually trips the reactor when unanalyzed rod configuration is detected.

References: OP-004-015, Reactor Power Cutback System (Rev 17)
OP-901-101, Reactor Power Cutback (Rev 8)

Alternate Path: Yes Time Critical: No Validation Time: 7 min

K/A 001 GEN 2.2.49 The ability to perform without reference to procedures those actions that require immediate operation of system comp. & controls.

Importance Rating 4.6 / 4.4
RO/SRO

Safety Function 1

Applicant: ______________________________

Time Start: __________________ Time Finish: __________________

Performance Time: __________________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____

____

____

Examiner: ______________________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-004-015, Reactor Power Cutback System (Handout)

Description:
This task is performed at CP-2. The applicant performs required manipulations to manually select subgroup 5 and 11 for RXC events for large loss of load and loss of a Feedwater pump. When the applicant places RXC in service, a Main Feedwater pump will trip resulting in a RXC. During the cutback, an incorrect CEA will drop. The applicant will be required to recognize the incorrect rod configuration and manually trip the reactor.

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. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

SIMULATOR OPERATOR INSTRUCTIONS

Reset to IC-171

Verify the following event inserted (should be setup in IC):

- AUTO ACTUATE OUT OF SERVICE. Code is ZDIPWAUTOACT==1

Verify the following is inserted and assigned to Trigger 1 with a 3 and 10 second delay respectively:

- FW03A MFW PUMP A OVERSPEED TRIP (3 sec)
- RD02A03 DROPPED CEA 03 (10 sec)

Do not place the Simulator in Run until the applicant is ready to perform the task and cued by examiner.

Setup with specific IC unavailable or for non NRC exams:

1. *Reset the simulator to an IC at 100% power*
2. *Remove Reactor cutback from service using section 7.1 of OP-004-015*
3. *Perform standby alignment of RXC using section 5.1 of OP-004-015*
4. *Perform steps 6.1.1 through 6.1.7 of OP-004-015*
5. *Insert commands listed above*
6. *Place simulator in FREEZE and snap a new IC or perform the JPM*

Examiner Note
Cue the Simulator Operator to place the Simulator in RUN.

TASK ELEMENT 1	STANDARD
Procedure Note: When aligning CEA subgroups for both RXC events, the Large Load Reject event shall always be assigned prior to the Loss of Feed Pump event. Assigning subgroups for the Large Load Reject event clears the subgroup assignment for the Loss of Feed Pump event.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
6.1.10 If determined from Attachment 11.1 to manually align CEA subgroups for a Large Load Reject, then perform as follows: 6.1.10.1 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
6.1.10.2 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.	Subgroups 5 & 11 pushbuttons depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
6.1.10.3 Depress LARGE LOAD REJECT pushbutton and verify pushbutton illuminates.	Pushbutton Depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
6.1.10.4 When the SUBGROUP SELECT and LARGE LOAD REJECT pushbuttons have Extinguished (after approximately 60 seconds), then perform the following: 6.1.10.4.1 Depress DISPLAY SUBGRP SELECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**SAT / UNSAT**

TASK ELEMENT 6	STANDARD
6.1.10.4.2 Depress LARGE LOAD REJECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**SAT / UNSAT**

TASK ELEMENT 7	STANDARD
6.1.10.4.3 Verify correct CEA subgroup pattern is displayed.	Subgroups 5 & 11 checked
Comment:	**SAT / UNSAT**

TASK ELEMENT 8	STANDARD
6.1.10.4.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).	Subgroup pushbuttons verified extinguished.
Comment:	**SAT / UNSAT**

TASK ELEMENT 9	STANDARD
6.1.10.4.5 Manually align CEA subgroups for a Loss of Feed Pump per Step 6.1.11.	Continues on to next step.
Comment:	**SAT / UNSAT**

TASK ELEMENT 10	STANDARD
Procedure Note: When aligning CEA subgroups for both RXC events, the Large Load Reject event <u>shall</u> <u>always</u> be assigned prior to the Loss of Feed Pump event. Assigning subgroups for the Large Load Reject event clears the subgroup assignment for the Loss of Feed Pump event.	Note reviewed
Comment:	**SAT / UNSAT**

TASK ELEMENT 11	STANDARD
6.1.11 <u>If</u> determined from Attachment 11.1 to manually align CEA subgroups for a Loss of Feed Pump, <u>then</u> perform as follows: 6.1.11.1 Verify <u>both</u> Main Feedwater Pumps operating.	Feed pumps checked
Comment: Examiner Note: At a minimum, red running lights on Feed Pump control switches should be checked on CP-1.	**SAT / UNSAT**

TASK ELEMENT 12	STANDARD
6.1.11.2 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 13	STANDARD
6.1.11.3 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.	Subgroups 5 & 11 pushbuttons depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 14	STANDARD
6.1.11.4 Depress LOSS OF FEED PUMP pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**Critical** **SAT / UNSAT**

TASK ELEMENT 15	STANDARD
6.1.11.5 When the SUBGROUP SELECT and LOSS OF FEED PUMP pushbuttons have Extinguished (after approximately 60 seconds), then perform the following: 6.1.11.5.1 Depress DISPLAY SUBGRP SELECT pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**SAT / UNSAT**

TASK ELEMENT 16	STANDARD
6.1.11.5.2 Depress LOSS OF FEED PUMP pushbutton and verify pushbutton Illuminates.	Pushbutton Depressed
Comment:	**SAT / UNSAT**

TASK ELEMENT 17	STANDARD
6.1.11.5.3 Verify correct CEA subgroup pattern is displayed.	Subgroups 5 & 11 checked
Comment:	**SAT / UNSAT**

TASK ELEMENT 18	STANDARD
6.1.11.5.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).	Subgroup pushbuttons verified extinguished.
Comment:	**SAT / UNSAT**

TASK ELEMENT 19	STANDARD
Procedure Note: The AUTO ACTUATE OUT OF SERVICE pushbutton should only be illuminated if RXC was previously out of service.	Note reviewed
Comment:	**SAT / UNSAT**

ALTERNATE PATH STARTS HERE
Alternate Path begins here and transition to OP-901-101, Reactor Power Cutback occurs.

RX

TASK ELEMENT 20	STANDARD
6.1.12 If AUTO ACTUATE OUT OF SERVICE pushbutton is illuminated, then Depress AUTO ACTUATE OUT OF SERVICE pushbutton and verify pushbutton Extinguishes.	Pushbutton Depressed
Comment: EXAMINER NOTE: Feedwater Pump A will trip (after 3 second time delay) when pushbutton is depressed.	**Critical** **SAT / UNSAT**

TASK ELEMENT 21	STANDARD
Recognize Reactor Power Cutback	Recognize cutback actuation
Comment: **EXAMINER CUE: Direct applicant to perform immediate actions.**	**SAT / UNSAT**

TASK ELEMENT 22	STANDARD
1. Place Control Element Drive Mechanism Mode Select switch to AS.	Place CEDMCS mode select switch in AS
Comment: EXAMINER NOTE: It is not required to perform this step as the incorrect rod pattern is inserted.	**SAT / UNSAT**

TASK ELEMENT 23	STANDARD
2. Verify selected subgroups dropped.	Recognizes that subgroups 5 & 11 dropped along with an additional CEA.
Comment:	**SAT / UNSAT**

TASK ELEMENT 24	STANDARD
Manually Trip the Reactor	Reactor Tripped
Comment:	**Critical** **SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

RETURN ALL HANDOUTS & THIS CUE SHEET TO EXAMINER UPON COMPLETION OF TASK

INITIAL CONDITIONS:

- The plant is at 100% power.
- Section 5.1, Reactor Power Cutback System Standby Alignment of OP-004-015, Reactor Power Cutback System has been completed.
- Attachment 11.1 has been completed and subgroups 5 & 11 have been determined to be the required subgroups for both Reactor Power Cutback (RXC) events.

INITIATING CUE(S):

Align Reactor Power Cutback for manual CEA subgroup selection for both RXC events by performing section 6.1 of OP-004-015, Reactor Power Cutback System starting at step 6.1.10.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 Prior to placing the Reactor Power Cutback System (RXC) in service, verify that both Main Feedwater Pumps are operating.

3.1.2 With both CEACs Inoperable, Reactor Power Cutback shall be removed from service within four hours. **[TS 3.3.1]**

3.1.3 Selection of only the Large Load Reject event for RXC in service would result in a Turbine Setback/Runback upon a FW Pump trip with no rod insertion. This would result in a reactor trip on high Pzr Pressure. Therefore RXC shall not be placed in service for only the Large Load Reject event. **[CR-WF3-2016-07340]**

3.2 LIMITATIONS

3.2.1 A selected CEA subgroup will not drop during a RXC actuation if that subgroup is on the CEDMCS hold bus. Likewise, the next sequential subgroup will not insert in Auto Sequential if the subgroup is on the hold bus. When a Reactor Power Cutback selected subgroup, or next sequential subgroup, is placed on the CEDMCS hold bus, then remove Reactor Power Cutback System from service in accordance with Section 7.1, Removing Reactor Power Cutback System from Service.

3.2.2 The auto CEA subgroup select function is not available for the Reactor Power Cutback System.

3.2.3 Turbine DEH System Program has a minimum floor of 20% power. Reactor Cutback Rod Configuration should not be selected which would drop Reactor Power below 20% in the event of a Reactor Cutback.

3.2.4 All referenced pushbutton controls are on the Power Cutback module on CP-2, unless otherwise stated.

3.2.5 Full steam bypass capability is 59.3% of rated thermal power. Selection of cutback groups that will initially exceed this capacity is allowed based on calculations showing that trip setpoints will not be exceeded during the transient [DAR-OA-08-02]. Additionally, subsequent subgroup insertion in Auto Sequential will assist in lowering power as needed. As specified in Attachment 11.1, for the Large Load Reject event, this limitation may only be utilized when all 6 SBCS valves are available.

6.0 NORMAL OPERATIONS

6.1 ALIGNING REACTOR POWER CUTBACK FOR MANUAL CEA SUBGROUP SELECTION

NOTE

The purpose of this section is to select which events (Large Load Reject/Loss of Feed Pump) will initiate a Reactor Power Cutback (RXC), and to select the CEA subgroups for each event. Section 6.3 should only be used when changing selected subgroups for an event which is already in service.

CAUTION

RX

THIS SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

[INPO 06-006]

CAUTION

SELECTION OF ONLY THE LARGE LOAD REJECT EVENT FOR RXC IN SERVICE WOULD RESULT IN A TURBINE SETBACK/RUNBACK UPON A FW PUMP TRIP WITH NO ROD INSERTION. THIS WOULD RESULT IN A REACTOR TRIP ON HIGH PZR PRESSURE. THEREFORE RXC SHALL NOT BE PLACED IN SERVICE FOR ONLY THE LARGE LOAD REJECT EVENT. **[CR-WF3-2016-07340]**

6.1.1 Determine the appropriate CEA subgroup selections by performing Attachment 11.1, Manual CEA Subgroup Selection.

6.1.2 N / A If Attachment 11.1 determines that Reactor Power Cutback cannot be aligned for a Loss of Feed pump Event, then go to Section 7.1, Removing Reactor Power Cutback System. Do not continue with the remainder of this section.

6.1.3 N / A If Attachment 11.1 determines that only the Loss of Feed Pump event will be aligned for Reactor Power Cutback, then prior to proceeding with the remainder of this section, perform Section 7.1, Removing Reactor Power Cutback System from Service.

6.1.4 If Reactor Power Cutback is being restored to service following RXC system maintenance or plant outage, then Verify Section 5.1, Reactor Power Cutback System Standby Alignment, completed.

6.1.5 Perform a lamp test by depressing and releasing the LAMP TEST pushbutton and verify all pushbuttons illuminate.

6.1.6 If the TEST RESET pushbutton is illuminated, then depress the TEST RESET pushbutton and verify pushbutton extinguishes.

6.1.7 Verify Reactor Pwr Cutback Actuation (K-5, Cabinet H) annunciator Clear.

6.1.8 Verify Reactor Pwr Cutback Single Chnl Trouble (L-5, Cabinet H) annunciator Clear.

6.1.8.1 N/A <u>If</u> Reactor Pwr Cutback Single Chnl Trouble (L-5, Cabinet H) annunciator is <u>not</u> Clear, <u>then</u> realign Reactor Power Cutback in accordance with Section 5.1.

6.1.9 Verify MANUAL SELECT Illuminated on AUTO SELECT /MANUAL SELECT pushbutton.

NOTE

When aligning CEA subgroups for both RXC events, the Large Load Reject event <u>shall always</u> be assigned prior to the Loss of Feed Pump event. Assigning subgroups for the Large Load Reject event clears the subgroup assignment for the Loss of Feed Pump event.

6.1.10 <u>If</u> determined from Attachment 11.1 to manually align CEA subgroups for a Large Load Reject, <u>then</u> perform as follows:

6.1.10.1 Depress ENTER MANUAL SUBGRPS SELECT pushbutton <u>and</u> verify pushbutton Illuminates.

6.1.10.2 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons <u>and</u> verifying <u>each</u> selected pushbutton Illuminates.

6.1.10.3 Depress LARGE LOAD REJECT pushbutton <u>and</u> verify pushbutton Illuminates.

6.1.10.4 <u>When</u> the SUBGROUP SELECT <u>and</u> LARGE LOAD REJECT pushbuttons have Extinguished (after approximately 60 seconds), <u>then</u> perform the following:

6.1.10.4.1 Depress DISPLAY SUBGRP SELECT pushbutton <u>and</u> verify pushbutton Illuminates.

6.1.10.4.2 Depress LARGE LOAD REJECT pushbutton <u>and</u> verify pushbutton Illuminates.

6.1.10.4.3 Verify correct CEA subgroup pattern is displayed.

6.1.10.4.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).

6.1.10.4.5 Manually align CEA subgroups for a Loss of Feed Pump per Step 6.1.11.

NOTE

When aligning CEA subgroups for both RXC events, the Large Load Reject event shall always be assigned prior to the Loss of Feed Pump event. Assigning subgroups for the Large Load Reject event clears the subgroup assignment for the Loss of Feed Pump event.

6.1.11 If determined from Attachment 11.1 to manually align CEA subgroups for a Loss of Feed Pump, then perform as follows:

6.1.11.1 Verify both Main Feedwater Pumps operating.

6.1.11.2 Depress ENTER MANUAL SUBGRPS SELECT pushbutton and verify pushbutton Illuminates.

6.1.11.3 Establish CEA subgroup pattern by Depressing desired SUBGROUP SELECT pushbuttons and verifying each selected pushbutton Illuminates.

6.1.11.4 Depress LOSS OF FEED PUMP pushbutton and verify pushbutton Illuminates.

6.1.11.5 When the SUBGROUP SELECT and LOSS OF FEED PUMP pushbuttons have Extinguished (after approximately 60 seconds), then perform the following:

6.1.11.5.1 Depress DISPLAY SUBGRP SELECT pushbutton and verify pushbutton Illuminates.

6.1.11.5.2 Depress LOSS OF FEED PUMP pushbutton and verify pushbutton Illuminates.

6.1.11.5.3 Verify correct CEA subgroup pattern is displayed.

6.1.11.5.4 Verify CEA subgroup pushbutton lights have extinguished (after approximately 60 seconds).

NOTE

The AUTO ACTUATE OUT OF SERVICE pushbutton should only be illuminated if RXC was previously out of service.

RX

6.1.12 If AUTO ACTUATE OUT OF SERVICE pushbutton is illuminated, then Depress AUTO ACTUATE OUT OF SERVICE pushbutton and verify pushbutton Extinguishes.

6.1.13 If CEA subgroup(s) were selected for the Large Load Reject cutback event, then remove Reactor Trip on Turbine Trip from service as follows:

RX 6.1.13.1 On CP-2, place LOSS OF LOAD keyswitch to RPC.

6.1.13.2 On CP-7, place all four LOSS OF TURB BYPASS keyswitches to BYPASS.

6.1.13.3 Verify all four red BYPASS lamps Illuminate.

RX 6.1.13.4 On CP-2, place LOSS OF TURBINE TRIP keyswitch to DISABLE.

6.1.14 As Reactor Power and Core EFPD change, reevaluate manual CEA subgroup selection and change as necessary in accordance with Section 6.3, Changing Manual CEA Subgroup Selection. **[P-21931]**

9.0 AUTOMATIC FUNCTIONS

9.1	Selected CEA subgroups drop on large load reject	SBCS Quick Open Demand Signals (2/2)
9.2	Selected CEA subgroups drop on loss of Feed Pump A (FW-IPS-3001-A1 and FW-IPS-3001-A2)....................................	<60 PSIG Control Oil Pressure (2/2)
9.3	Selected CEA subgroups drop on loss of Feed Pump B (FW-IPS-3001-B1 and FW-IPS-3001-B2)....................................	<60 PSIG Control Oil Pressure (2/2)

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

P1 – Train A

Transfer EFW Pump Suctions to the Wet Cooling Tower after Condensate Storage Pool Depletion

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Transfer EFW Pump Suctions to the Wet Cooling Tower after Condensate Storage Pool Depletion

Task Standard: Applicant aligns EFW Pump suction to the Auxiliary Component Cooling Water system.

References: OP-902-009, Standard Appendices (rev 315)
Appendix 10, Transferring EFW Pump Suction
ECS98-001, EOP Action Value Basis Document (rev 5)

Alternate Path: No Time Critical: Yes Validation Time: 10 min

K/A 076 K1.20 AFW

Importance Rating 3.4 / 3.4
RO/SRO

Safety Function 4S

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: 30 minutes

Performance Rating: SAT UNSAT

Comments: ______________________________

____

____

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-902-009, Appendix 10 (Handout)

Description:
This is a time critical task performed inside the RCA on the -35 level. Do not start the JPM until after you have entered the RCA.
The applicant must align EFW Pumps Suction to Auxiliary Component Cooling Water. The procedure directs this to be accomplished on only 1 train. This will be performed on Train A. Step 2 is a 30 minute hold step. The evaluator will tell the applicant that 30 minutes has elapsed at this point.
PSA-W3-01-001, WSES-3 PSA Level-1 Model R4C1 Summary Report lists aligning EFW suction to the Wet Cooling Tower after CSP depletion as 1 of the top operator actions to prevent core damage.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All steps for this JPM will be simulated, do not manipulate any plant components. Make all necessary communications to me. I will provide initiating cues and reports on other actions when directed by you. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

NOTE for JPM Validation Only
When performing JPM validation, actions are necessary to ensure exam security is maintained. Prior to commencing in-plant JPM validation, contact Radiation Protection (RP) and direct them to disable all cameras in the RCA in a manner that prevents anyone from viewing any of the RCA cameras.

After all in plant JPMs are completed, contact RP to restore the disabled cameras.

Evaluator Note
This JPM is time critical and takes place inside the RCA. Do not start the JPM until after you have entered the RCA.

Evaluator Note
Locks are used on certain components as a physical restraint to inhibit operation. Locks are used to assure that only authorized personnel will operate the component. Although this is important for plant operation, installation of valve locks is not critical to pass the JPM.

Start Time: _______________

TASK ELEMENT 1	STANDARD
Procedure Note: • CSP Indicated level will be lower than actual when drawing suction from the CSP. CSP Indicated level will be higher than actual when drawing suction from the ACCW system. • When EFW suction is drawn from the CSP, consideration should be given to reducing flow to less than 500 gpm to read CSP level. • Transfer of EFW Pump suction should be completed by a CSP level of 11% to prevent cavitation of EFW pumps.	Reviewed note.
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
1. <u>Transfer</u> Emergency Feedwater Pump suction to **ONE** side of the Auxiliary Component Cooling System as follows: **<u>Train A</u>** a. <u>Verify</u> Auxiliary Component Cooling Water Pump A operating.	This should be done by simulating a call to the Control Room.
Comment: **Examiner Cue: Respond as the CRS, and reply that ACCW Pump A is running.**	**SAT / UNSAT**

TASK ELEMENT 3	STANDARD
b. <u>Close</u> ACC-115A, ACC Header A to Emergency Feedwater Drain.	Valve is closed.
Comment:	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
c. <u>Unlock</u> and <u>open</u> **BOTH** Auxiliary Component Cooling valves: • ACC-116A, ACC Header A to Emergency Feedwater Isol • ACC-114A, ACC Header A to EFW Isolation	Both valves are open.
Comment: **Examiner Cue: If the applicant listens for flow noise, say that flow noise is heard.**	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
2. **WHEN** 30 minutes has elapsed, **THEN** <u>close</u> and <u>lock</u> the valves for the Train aligned in step 1: • ACC-116A, ACC Header A to Emergency Feedwater Isol • ACC-114A, ACC Header A to EFW Isolation • ACC-116B, ACC Header B to Emergency Feedwater Isol • ACC-114B, ACC Header B to EFW Isolation	ACC-116A and 114A are closed.
Comment: The applicant should operate the A train valves only. **Examiner Cue: Prompt the applicant that 30 minutes has elapsed when this step is reached.**	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 6	STANDARD
3. Open ACC Header to Emergency Feedwater Drain valve for the Train aligned in step 1: • ACC-115A, ACC Header A to Emergency Feedwater Drain • ACC-115B, ACC Header B to Emergency Feedwater Drain	ACC-115A is open.
Comment: The applicant should operate the A train valve only. **Examiner Cue: If the applicant asks about indications on the drain hose, cue that water issued from the hose for about 10 seconds and then stopped.**	**<u>Critical</u>** **SAT / UNSAT**

END OF TASK

Stop Time: _______________

APPLICANT CUE SHEET

Do Not Manipulate Any Plant Components

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

This is a time critical task. Timing will start after the Initial Conditions and Initiating Cue have been read and this cue sheet is handed to you.

INITIAL CONDITIONS:

- A loss of Feedwater event is in progress.
- The CRS has entered OP-902-006, Loss of Feedwater Recovery.
- Condensate Storage Pool Level is 25% and lowering.

INITIATING CUE:

The CRS directs you to transfer EFW Pump suction to Auxiliary Component Cooling Water on Train A in accordance with OP-902-009, Appendix 10.

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

P1 – Train B

Transfer EFW Pump Suctions to the Wet Cooling Tower after Condensate Storage Pool Depletion

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Transfer EFW Pump Suctions to the Wet Cooling Tower after Condensate Storage Pool Depletion

Task Standard: Applicant aligns EFW Pump suction to the Auxiliary Component Cooling Water system.

References: OP-902-009, Standard Appendices (rev 315)
Appendix 10, Transferring EFW Pump Suction
ECS98-001, EOP Action Value Basis Document (rev 5)

Alternate Path: No Time Critical: Yes Validation Time: 10 min

K/A 076 K1.20 AFW Importance Rating 3.4 / 3.4
RO/SRO

Safety Function 4S

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: 30 minutes

Performance Rating: SAT UNSAT

Comments: ____

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-902-009, Appendix 10 (Handout)

Description:
This is a time critical task performed inside the RCA on the -35 level. Do not start the JPM until after you have entered the RCA.
The applicant must align EFW Pumps Suction to Auxiliary Component Cooling Water. The procedure directs this to be accomplished on only 1 train. This will be performed on Train B. Step 2 is a 30 minute hold step. The evaluator will tell the applicant that 30 minutes has elapsed at this point.
PSA-W3-01-001, WSES-3 PSA Level-1 Model R4C1 Summary Report lists aligning EFW suction to the Wet Cooling Tower after CSP depletion as 1 of the top operator actions to prevent core damage.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All steps for this JPM will be simulated, do not manipulate any plant components. Make all necessary communications to me. I will provide initiating cues and reports on other actions when directed by you. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

NOTE for JPM Validation Only
When performing JPM validation, actions are necessary to ensure exam security is maintained. Prior to commencing in-plant JPM validation, contact Radiation Protection (RP) and direct them to disable all cameras in the RCA in a manner that prevents anyone from viewing any of the RCA cameras.

After all in plant JPMs are completed, contact RP to restore the disabled cameras.

Evaluator Note
This JPM is time critical and takes place inside the RCA. Do not start the JPM until after you have entered the RCA.

Evaluator Note
Locks are used on certain components as a physical restraint to inhibit operation. Locks are used to assure that only authorized personnel will operate the component. Although this is important for plant operation, installation of valve locks is not critical to pass the JPM.

Start Time: _______________

TASK ELEMENT 1	STANDARD
Procedure Note: • CSP Indicated level will be lower than actual when drawing suction from the CSP. CSP Indicated level will be higher than actual when drawing suction from the ACCW system. • When EFW suction is drawn from the CSP, consideration should be given to reducing flow to less than 500 gpm to read CSP level. • Transfer of EFW Pump suction should be completed by a CSP level of 11% to prevent cavitation of EFW pumps.	Reviewed note.
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
1. <u>Transfer</u> Emergency Feedwater Pump suction to **ONE** side of the Auxiliary Component Cooling System as follows: **<u>Train B</u>** a. <u>Verify</u> Auxiliary Component Cooling Water Pump B operating.	This should be done by simulating a call to the Control Room.
Comment: **Examiner Cue: Respond as the CRS, and reply that ACCW Pump B is running.**	**SAT / UNSAT**

TASK ELEMENT 3	STANDARD
b. <u>Close</u> ACC-115B, ACC Header B to Emergency Feedwater Drain.	Valve is closed.
Comment:	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
c. Unlock and open **BOTH** Auxiliary Component Cooling valves: • ACC-116B, ACC Header B to Emergency Feedwater Isol • ACC-114B, ACC Header B to EFW Isolation	Both valves are open.
Comment: **Examiner Cue: If the applicant listens for flow noise, say that flow noise is heard.**	**Critical** **SAT / UNSAT**

TASK ELEMENT 5	STANDARD
2. **WHEN** 30 minutes has elapsed, **THEN** close and lock the valves for the Train aligned in step 1: • ACC-116A, ACC Header A to Emergency Feedwater Isol • ACC-114A, ACC Header A to EFW Isolation • ACC-116B, ACC Header B to Emergency Feedwater Isol • ACC-114B, ACC Header B to EFW Isolation	ACC-116B and 114B are closed.
Comment: The applicant should operate the A train valves only. **Examiner Cue: Prompt the applicant that 30 minutes has elapsed when this step is reached.**	**Critical** **SAT / UNSAT**

TASK ELEMENT 6	STANDARD
3. Open ACC Header to Emergency Feedwater Drain valve for the Train aligned in step 1: • ACC-115A, ACC Header A to Emergency Feedwater Drain • ACC-115B, ACC Header B to Emergency Feedwater Drain	ACC-115B is open.
Comment: The applicant should operate the A train valve only. **Examiner Cue: If the applicant asks about indications on the drain hose, cue that water issued from the hose for about 10 seconds and then stopped.**	**Critical** **SAT / UNSAT**

END OF TASK

Stop Time: _______________

APPLICANT CUE SHEET

Do Not Manipulate Any Plant Components

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

This is a time critical task. Timing will start after the Initial Conditions and Initiating Cue have been read and this cue sheet is handed to you.

INITIAL CONDITIONS:

- A loss of Feedwater event is in progress.
- The CRS has entered OP-902-006, Loss of Feedwater Recovery.
- Condensate Storage Pool Level is 25% and lowering.

INITIATING CUE:

The CRS directs you to transfer EFW Pump suction to Auxiliary Component Cooling Water on Train B in accordance with OP-902-009, Appendix 10.

10.0 Transferring EFW Pump Suction

INSTRUCTIONS

--- **NOTE** ---

- CSP Indicated level will be lower than actual when drawing suction from the CSP. CSP Indicated level will be higher than actual when drawing suction from the ACCW system.
- When EFW suction is drawn from the CSP, consideration should be given to reducing flow to less than 500 gpm to read CSP level.
- Transfer of EFW Pump suction should be completed by a CSP level of 11% to prevent cavitation of EFW pumps.

---

1. <u>Transfer</u> Emergency Feedwater Pump suction to **ONE** side of the Auxiliary Component Cooling System as follows:

   <u>Train A</u>

   a. <u>Verify</u> Auxiliary Component Cooling Water Pump A operating.

   b. <u>Close</u> ACC-115A, ACC Header A to Emergency Feedwater Drain.

   c. <u>Unlock</u> and <u>open</u> **BOTH** Auxiliary Component Cooling valves:

      - ACC-116A, ACC Header A to Emergency Feedwater Isol
      - ACC-114A, ACC Header A to EFW Isolation

   <u>Train B</u>

   a. <u>Verify</u> Auxiliary Component Cooling Water Pump B operating.

   b. <u>Close</u> ACC-115B, ACC Header B to Emergency Feedwater Drain.

   c. <u>Unlock</u> and <u>open</u> **BOTH** Auxiliary Component Cooling valves:

      - ACC-116B, ACC Header B to Emergency Feedwater Isol
      - ACC-114B, ACC Header B to EFW Isolation

INSTRUCTIONS

2. **WHEN** 30 minutes has elapsed,
   THEN close and lock the valves for the Train aligned in step 1:

   - ACC-116A, ACC Header A to Emergency Feedwater Isol
   - ACC-114A, ACC Header A to EFW Isolation
   - ACC-116B, ACC Header B to Emergency Feedwater Isol
   - ACC-114B, ACC Header B to EFW Isolation

3. Open ACC Header to Emergency Feedwater Drain
   valve for the Train aligned in step 1:

   - ACC-115A, ACC Header A to Emergency Feedwater Drain
   - ACC-115B, ACC Header B to Emergency Feedwater Drain

4. Inform TSC to evaluate Ultimate Heat Sink inventory.

End of Appendix 10

10.0 Transferring EFW Pump Suction

INSTRUCTIONS

NOTE

- CSP Indicated level will be lower than actual when drawing suction from the CSP. CSP Indicated level will be higher than actual when drawing suction from the ACCW system.
- When EFW suction is drawn from the CSP, consideration should be given to reducing flow to less than 500 gpm to read CSP level.
- Transfer of EFW Pump suction should be completed by a CSP level of 11% to prevent cavitation of EFW pumps.

---

1. Transfer Emergency Feedwater Pump suction to **ONE** side of the Auxiliary Component Cooling System as follows:

Train A

a. Verify Auxiliary Component Cooling Water Pump A operating.

b. Close ACC-115A, ACC Header A to Emergency Feedwater Drain.

c. Unlock and open **BOTH** Auxiliary Component Cooling valves:

- ACC-116A, ACC Header A to Emergency Feedwater Isol
- ACC-114A, ACC Header A to EFW Isolation

Train B

a. Verify Auxiliary Component Cooling Water Pump B operating.

b. Close ACC-115B, ACC Header B to Emergency Feedwater Drain.

c. Unlock and open **BOTH** Auxiliary Component Cooling valves:

- ACC-116B, ACC Header B to Emergency Feedwater Isol
- ACC-114B, ACC Header B to EFW Isolation

INSTRUCTIONS

2. **WHEN** 30 minutes has elapsed,
THEN close and lock the valves for the Train aligned in step 1:

- ACC-116A, ACC Header A to Emergency Feedwater Isol
- ACC-114A, ACC Header A to EFW Isolation
- ACC-116B, ACC Header B to Emergency Feedwater Isol
- ACC-114B, ACC Header B to EFW Isolation

3. Open ACC Header to Emergency Feedwater Drain
valve for the Train aligned in step 1:

- ACC-115A, ACC Header A to Emergency Feedwater Drain
- ACC-115B, ACC Header B to Emergency Feedwater Drain

4. Inform TSC to evaluate Ultimate Heat Sink inventory.

End of Appendix 10

EOP VALUE BASIS DOCUMENT
APPLICATION L.02

		INSTRUMENT ID #s	COMPUTER POINT ID #s	EOP #s
PARAMETER:	CSP Level	EFW ILI 9013A	QSPDS	OP-902-002
DESCRIPTION:	Transfer	EFW ILI 9013B	A45102	OP-902-003
	EFW		C26264	OP-902-004
	Suction to			OP-902-006
	WCT			OP-902-007
	Basin			OP-902-008
VALUE:	25 %			
AV ID #:	L.02			

CATEGORY: 02
USE CODE: 09

REFERENCES:

General Background / Developmental

1.) CEN-152, "Combustion Engineering Emergency Procedure Guidelines," Revision 5.3.
2.) CE-NPSD-1009, "I&C Engineering Limits and Bases in EOPs, Including Evaluations of Instrument Uncertainties," Revision 1, November 1996.

Specific

3.) EC-I91-003, "Emergency Feedwater Condensate Storage Pool Level Loop Uncertainty," Revision 2, November 7, 2000
4) W3-DBD-004, "Component Cooling Water, Auxiliary Component Cooling Water Design Basis Document," Section 2.2.2, Revision 301, 5/21/09. Section 4.1.3.
5.) Not Used
6.) WSES-UFSAR "Updated Final Safety Analysis Report," Table 10.4.9A-2 (Sheet 7 of 11), "Primary AFW Water Source Low Level Alarm."
6a) NUREG 635, page X-119
7.) EC-M84-001 Rev. 6 Change 2, "Tank Volume / Level Tables," October 2, 1996
8.) EC-M97-006, "Design Basis for CCW Makeup," Revision 1, 3/8/06

EOP VALUE BASIS DOCUMENT
APPLICATION L.02

DESCRIPTION:

This application is used to initiate operator action to transfer the Emergency Feedwater (EFW) Pump suction path from the Condensate Storage Pool (CSP) to one of the operating Auxiliary Component Cooling Water (ACCW) loops. The water source for the ACCW is the Wet Cooling Tower basin. Per Reference 4, realignment of the suction path to the ACCW is required for meeting long term cooling plans where the CSP inventory alone is not adequate. The engineering limit for this application is the lowest CSP level at which the operators can, within 30 minutes (based on requirements of reference 6a), transfer the suction of the EFW without loss of head due to vortexing. Per Reference 3, the vortexing limit for CSP level is 9 inches (3.57% indicated level). Per Reference 6, 30,000 gallons or 35.9 additional inches are required to allow the operators 30 minutes. Therefore, a total of 44.9 inches or 17.8% indicated level is required. Transfer to the ACCW prior to reaching this limit will provide the operators with sufficient time to perform the alignment and will ensure that a continual source of secondary heat sink exists.

Per Reference 3, EFW Pump A/B runout flow is 1000 GPM. Operation at this flowrate for 30 minutes will reduce CSP volume by 30,000 gallons which is a reduction in indicated level of 14.28% per Reference 7. Reference 3 also addresses water usage by the Component Cooling Water (CCW) Makeup System of 3500 gallons (1.67% level reduction). As stated above, the lowest allowable indicated level in the CSP to prevent vortexing is 3.57%. Therefore, Reference 3 establishes the EOP Action analysis limit, before the application of any uncertainty, as the sum of these three components (14.28% + 1.67% + 3.57%) which is equal to 19.52%.

The assumption in Reference 3 of 1000 gpm for EFW flow is excessively conservative since flow at the time when level is approaching 25% in the CSP will be much lower. At 6 hours after reactor trip, the EFW flow required to match decay heat is less than 250 gpm. Thus, realistically, only 7500 gallons of water would be used in 30 minutes, resulting in a reduction in the CSP level of 3.6% for this volume (Ref. 7). The limit prior to applying uncertainty for this **realistic case** would be 8.8% (3.6% + 1.67% + 3.57%).

This application is important to the safe cooldown and de-pressurization of the plant; therefore, based on the definitions in Reference 2, this application is classified as Use Code 09, Category Code 02. Therefore, instrument uncertainties must be considered for this instrument application.

Per Reference 3, the CSP Level transmitters are located in the Reactor Auxiliary Building and thus are protected from adverse environmental occurrences. However, Reference 3 does evaluate accident conditions, which elevate the temperatures for these transmitters.

EOP VALUE BASIS DOCUMENT
APPLICATION L.02

The accident instrument uncertainty associated with these control room indication loops is +5.70 % Span. Applying this uncertainty to the level limits described above yields:

Based on Reference 3:

Value requirement ≥ 19.52 % + 5.70 %

Value requirement ≥ 25.22 %

Based on a more **realistic** EFW flow assumption:

Value requirement ≥ 8.8 % + 5.70 %

Value requirement ≥ 14.5 %

As shown, the requirement based on Reference 3 is the most limiting. According to Reference 8, maximum CCW makeup usage is actually 2017 gallons instead of the assumed quantity of 3500 gallons used in Reference 3. The difference of 1483 gallons equates to 0.7% indicated level in the CSP. Correcting the 25.22% value shown above to account for this difference yields 24.52% level. This is considered a worst case value since EFW Pump A/B will not be operated at runout conditions and considerably less than 30,000 gallons will be used from the CSP in the 30 minute timeframe assumed for transfer of suction from the CSP to the WCT basins. Using a value of 25% level provides the Operator with more than 30 minutes to transfer EFW suction to the WCT basin with a large margin.

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

P2 – Train A

Reset emergency Diesel Generator A following an Overspeed Trip with a LOOP

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Reset emergency Diesel Generator A following an Overspeed Trip with a LOOP

Task Standard: Applicant resets Emergency Diesel Generator A in accordance with OP-009-002, Emergency Diesel Generator.

References: OP-009-002, Emergency Diesel Generator (rev 336)

Alternate Path: No Time Critical: No Validation Time: 12 min

K/A 064 EPE 055 EA1.06 Restoration of power with one ED/G

Importance Rating 4.1 / 4.5
RO/SRO

Safety Function 6

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ______________________

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-009-002, Emergency Diesel Generator, section 8.8. (Handout)

Description:
This task is performed on the +21 level in Emergency Diesel Generator Room A. The applicant will simulate all actions in the EDG Room A. Manipulations 1 and 2 take place on the upper level of EDG A. The last manipulation takes place at the EDG A control panel.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All steps for this JPM will be simulated, do not manipulate any plant components. Make all necessary communications to me. I will provide initiating cues and reports on other actions when directed by you. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

NOTE for JPM Validation Only

When performing JPM validation, actions are necessary to ensure exam security is maintained. Prior to commencing in-plant JPM validation, contact Radiation Protection (RP) and direct them to disable all cameras in the RCA in a manner that prevents anyone from viewing any of the RCA cameras.

After all in plant JPMs are completed, contact RP to restore the disabled cameras.

Evaluator Note
This JPM takes place inside the RCA on the +21 level in Emergency Diesel Generator Room A.

TASK ELEMENT 1	STANDARD
Procedure note: (1) If the EDG was running in Emergency Mode and the signal for the EDG to Start still exists, then the EDG will automatically start when Steps 8.8.1 & 8.8.2 are completed. (2) Resetting the Combustion Air Intake Butterfly valve may take up to 30 seconds.	Note reviewed.
Comment: Examiner Note: The cue sheet states that there is a loss of off-site power, so the applicant should conclude his actions will cause the EDG to start in Emergency mode. If asked, both EDG Starting Air Receivers pressure are as they are currently indicated.	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
8.8.1: Reset the Turbocharger Butterfly Valve by performing one of the following: • Depress and hold the EG A Combustion Air Overspeed Trip Reset, EGA-418A, pushbutton on the Governor until the Combustion Air Intake Butterfly Valve is reset. (pushbutton is located below the overspeed trip plunger on the side of the Overspeed Trip Block) or • Manually at the Combustion Air Intake Butterfly Valve.	Butterfly valve is reset.
Comment: Examiner Note: The button is on the upper level of the EDG. **Examiner Cue: When the reset push-button is depressed, cue that the trip linkage moves slightly and a "click" is heard from the opposite side of the EDG.** **Examiner Cue: If the applicant checks the butterfly valve after the reset button is pushed, cue that it is as he/she sees it.**	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
8.8.2: Reset the Fuel Oil Overspeed Trip by pushing in the plunger on the Governor Overspeed Trip Block.	Plunger is pushed in.
Comment: Examiner Note: The reset plunger is on the upper level of the EDG. After this is reset, the EDG will crank and start. If the applicant failed to accomplish the preceding step, then the EDG will not start. **Examiner Cue: If task elements 2 and 3 are performed correctly, then cue that the EDG starts up.**	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
Procedure note: (1) Depressing the System Reset Pushbutton following restart of the EDG in Emergency Mode will prevent an EDG trip when the engine goes from Emergency Mode to Test Mode during paralleling operations. (2) <u>If</u> the EDG is <u>not</u> running but is still coasting down, depressing the System Reset pushbutton before the EDG has come to a complete stop may cause the unit to attempt to crank.	Note reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 5	STANDARD
8.8.3: <u>When</u> Emergency Diesel Generator A has come to a complete stop <u>or</u> <u>if</u> EDG A restarted in Emergency Mode following reset of Overspeed Trip, <u>then</u> depress the System Reset pushbutton on the Emergency Diesel Generator A Control Panel.	Reset button is pressed.
Comment: Examiner Note: The system reset button is located on the EDG Control Panel in the Diesel Room. **Examiner Cue: If applicant asks if any alarms are locked in, say that all alarms are clear except "Starting Air System Press Lo" (F-4).** Examiner Note: "Starting Air System Press Lo" is an expected alarm right after an EDG start. Alarm clears several minutes later.	**SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

Do Not Manipulate Any Plant Components

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- The plant has experienced a loss of off site power.
- Emergency Diesel Generator A tripped on overspeed.

INITIATING CUE(S):

The CRS has directed you to reset Emergency Diesel Generator A.

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

P2 – Train B

Reset emergency Diesel Generator B following an Overspeed Trip with a LOOP

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Reset emergency Diesel Generator B following an Overspeed Trip with a LOOP

Task Standard: Applicant resets Emergency Diesel Generator B in accordance with OP-009-002, Emergency Diesel Generator.

References: OP-009-002, Emergency Diesel Generator (rev 336)

Alternate Path: No Time Critical: No Validation Time: 12 min

K/A 064 EPE 055 EA1.06 Restoration of power with one ED/G

Importance Rating 4.1 / 4.5
RO/SRO

Safety Function 6

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: N/A minutes

Performance Rating: SAT UNSAT

Comments: ____

____

____

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-009-002, Emergency Diesel Generator, section 8.8. (Handout)

Description:
This task is performed on the +21 level in Emergency Diesel Generator Room B. The applicant will simulate all actions in the EDG Room B. Manipulations 1 and 2 take place on the upper level of EDG B. The last manipulation takes place at the EDG B control panel.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All steps for this JPM will be simulated, do not manipulate any plant components. Make all necessary communications to me. I will provide initiating cues and reports on other actions when directed by you. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

NOTE for JPM Validation Only
When performing JPM validation, actions are necessary to ensure exam security is maintained. Prior to commencing in-plant JPM validation, contact Radiation Protection (RP) and direct them to disable all cameras in the RCA in a manner that prevents anyone from viewing any of the RCA cameras.

After all in plant JPMs are completed, contact RP to restore the disabled cameras.

Evaluator Note
This JPM takes place inside the RCA on the +21 level in Emergency Diesel Generator Room B.

TASK ELEMENT 1	STANDARD
Procedure note: (1) If the EDG was running in Emergency Mode and the signal for the EDG to Start still exists, then the EDG will automatically start when Steps 8.8.1 & 8.8.2 are completed. (2) Resetting the Combustion Air Intake Butterfly valve may take up to 30 seconds.	Note reviewed.
Comment: Examiner Note: The cue sheet states that there is a loss of off-site power, so the applicant should conclude his actions will cause the EDG to start in Emergency mode. If asked, both EDG Starting Air Receivers pressure are as they are currently indicated.	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
8.8.1: Reset the Turbocharger Butterfly Valve by performing one of the following: • Depress and hold the EG B Combustion Air Overspeed Trip Reset, EGA-418B, pushbutton on the Governor until the Combustion Air Intake Butterfly Valve is reset. (pushbutton is located below the overspeed trip plunger on the side of the Overspeed Trip Block) or • Manually at the Combustion Air Intake Butterfly Valve.	Butterfly valve is reset.
Comment: Examiner Note: The button is on the upper level of the EDG. **Examiner Cue: When the reset push-button is depressed, cue that the trip linkage moves slightly and a "click" is heard from the opposite side of the EDG.** **Examiner Cue: If the applicant checks the butterfly valve after the reset button is pushed, cue that it is as he/she sees it.**	**Critical** **SAT / UNSAT**

TASK ELEMENT 3	STANDARD
8.8.2: Reset the Fuel Oil Overspeed Trip by pushing in the plunger on the Governor Overspeed Trip Block.	Plunger is pushed in.
Comment: Examiner Note: The reset plunger is on the upper level of the EDG. After this is reset, the EDG will crank and start. If the applicant failed to accomplish the preceding step, then the EDG will not start. **Examiner Cue: If task elements 2 and 3 are performed correctly, then cue that the EDG starts up.**	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
Procedure note: (1) Depressing the System Reset Pushbutton following restart of the EDG in Emergency Mode will prevent an EDG trip when the engine goes from Emergency Mode to Test Mode during paralleling operations. (2) <u>If</u> the EDG is <u>not</u> running but is still coasting down, depressing the System Reset pushbutton before the EDG has come to a complete stop may cause the unit to attempt to crank.	Note reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 5	STANDARD
8.8.3: <u>When</u> Emergency Diesel Generator B has come to a complete stop <u>or</u> <u>if</u> EDG B restarted in Emergency Mode following reset of Overspeed Trip, <u>then</u> depress the System Reset pushbutton on the Emergency Diesel Generator B Control Panel.	Reset button is pressed.
Comment: Examiner Note: The system reset button is located on the EDG Control Panel in the Diesel Room. **Examiner Cue: If applicant asks if any alarms are locked in, say that all alarms are clear except "Starting Air System Press Lo" (F-4).** Examiner Note: "Starting Air System Press Lo" is an expected alarm right after an EDG start. Alarm clears several minutes later.	**SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

Do Not Manipulate Any Plant Components

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

- The plant has experienced a loss of off site power.
- Emergency Diesel Generator B tripped on overspeed.

INITIATING CUE(S):

The CRS has directed you to reset Emergency Diesel Generator B.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 If the Jacket Water System has been drained and refilled, then the following should be performed:

3.1.1.1 Vent the Jacket Water tubing for the Woodward Speed Control Governor Oil Cooler using EG A(B) Governor Oil Cooler Jacket Water Outlet Vent, EGC-119 A(B). This is the high point vent for the Woodward Speed Control Governor Oil Cooler tubing.

3.1.1.2 Operate the Jacket Water Pumps for at least 5 minutes prior to energizing Jacket Water Heaters.

3.1.2 The Emergency Diesel Generator shall not be started with lube oil temperature <70°F, to prevent damage to the main lube oil filter elements.

3.1.3 Do not perform a rapid load of an EDG before verifying engine warmed up to ≥120°F and proper operation of Jacket Water Circulating Pump, Pre-Lube Oil Pump, and associated heaters.

3.1.4 Caution should be taken not to allow a Diesel Generator to run longer than required at unloaded or low load conditions.

3.1.5 When the EDG is operating unloaded or at low load conditions, then fuel injection pump temperatures may become too hot to comfortably hold your hand on, due to the pump not circulating fuel that would normally cool it. The time in this condition should be minimized for consideration of long term reliability of the fuel injection pumps.

3.1.6 When in Test Mode and paralleled to offsite, then the Diesel Generator shall not be operated for more than 6 hours at <50% load (2.2 MW) without loading the Diesel Generator to ≥3.3 MW for 15-30 minutes, to minimize buildup of unburned exhaust products.

3.1.7 When EDG is connected to the grid, always maintain outgoing reactive load (MVAR) and at least 0.1 MW real load to prevent a reverse power trip. EDG may trip if not loaded within 5 seconds after its output breaker is closed.

3.1.8 If possible, then do not operate unit when a shutdown occurs until the cause has been found and corrected.

3.1.9 The mechanical stops on EDG A(B) CCW Flow Control, CC-413A(B), shall not be adjusted without SM/CRS permission.

3.1.10 Do not use Maintenance Lube Oil Tank to store lube oil. This is applicable at all times.

3.1.11 If the Lube Oil System has been drained and refilled, then operate the Lube Oil Pumps for at least 5 minutes prior to energizing Lube Oil Heaters.

3.1.12 If the Fuel Oil System has been drained and refilled, then vent the Standby Fuel Oil Pump suction piping from the following points:

- EGF-12210A(B) EG A(B) Standby Fuel Oil Pump Suction Vent
- EGF-12210-A1(B1) EG A(B) Fuel Oil Strainer Inlet Line Vent
- EGF-12210-A2(B2) EG A(B) Fuel Oil Strainer Outlet Line Vent

EGF-MSTRN-001A(B) in service:

- EGF-1222-A1(B1) EG A(B) Fuel Oil Strainer Bowl Vent

EGF-MSTRN-002A(B) in service:

- EGF-1222-A2(B2) EG A(B) Fuel Oil Strainer Bowl Vent

3.1.13 EDG B should not be operated in parallel with the Main Generator when Main Generator voltage is >25.95 KV as indicated by PID A58003. Reactive load (MVAR) may be lowered to reduce Main Generator Voltage. Operating EDG B in parallel with the Main Generator when Main Generator voltage is >25.95 KV has the potential to cause the 3B32 bus breakers, upon a fault, to structurally decompose and explode. **[CR-WF3-2004-02220]**

3.1.14 Overfilling Main Governor with oil during EDG operation can adversely affect EDG performance by causing sluggish governor operation. 10 ml of oil will change sightglass level by roughly 1/16 of an inch.

3.1.15 To ensure the fuel oil consumption analysis remains valid, EDG frequency must be maintained ≤60.1 Hz. **[EC-11723, CR-WF3-2008-05183]**

3.1.16 EDG's have had a calculation performed that states the EDGs could run without CCW for up to 10.7 minutes at 3.23 MW and up to 20.9 minutes unloaded should the output breaker fail to close without causing damage to the EDGs. **[ECM12-001, EC-56635]**

3.1.17 EDG A(B) Fuel Rack Override Lever position must be Vertical and Latched. **[CR-WF3-2014-00737]**

3.2 Limitations

3.2.1 With one Emergency Diesel Generator Inoperable, the Operable Emergency Diesel Generator should not be paralleled to offsite or non-vital loads.

3.2.2 Continuously monitor Emergency Diesel Generator when operating. Monitoring an Emergency Diesel Generator while it is in operation does not require the assigned operator’s physical presence in the room on a continuous basis. However, the operator's activities should be limited to ensure 1) an adequate assessment of engine operation and 2) timely identification and correction of problems. **[P-5549]**

3.2.3 If DC power is secured or lost to EDG A(B) Control Panel through EDG A(B) Control Panel Feeder #1, EG-EBKR-A(B)-11, then EG A(B) Fuel Oil Transfer Pump, EGF-EBKR-312A(B)-3F, should be Opened to prevent overflowing Feed Tank.

3.2.4 Do not run both Emergency Diesel Generators in test mode simultaneously, except when performing testing pursuant to Technical Specification Surveillance requirement 4.8.1.1.2.g.

3.2.5 During normal operation, Emergency Diesel Generator ratings of 4.4 MW for continuous loading and 4.84 MW for 2 hours out of any 24 hours should not be exceeded.

3.2.6 If during normal Emergency Diesel Generator operation, there is a significantly noticeable diesel exhaust plume visible for >6 minutes in any consecutive 60 minute period, then contact the Environmental Engineer to determine appropriate action by qualified personnel or comply with UNT-006-010, Event Notification and Reporting. Startup, shutdown, and emergency periods are exempt from this requirement. Smoke opacity can be accurately determined only during daylight conditions.

3.2.7 If an Emergency Diesel Generator starts in response to a loss of offsite power or other valid event, then ensure that makeup is available to the Emergency Diesel Generator Jacket Water System (EGC) from any source prior to shutting down the Emergency Diesel Generator and allowing it to cool.

3.2.8 When practical, the Diesel Generator should be operated in accordance with the following chart to minimize thermal stresses on the Diesel Engine to ensure optimum engine life and performance :

Diesel Generator Load ①	Hold Time
Start Unloaded	5 minutes
≥1.0 MW to 1.2 MW	5 minutes
≥2.1 MW to 2.3 MW	10 minutes
≥3.2 MW to 3.4 MW	10 minutes
≥4.0 MW to 4.4 MW	≥3.5 hours or at SM/CRS direction
0.5 MW to 1.0 MW	15 minutes

① The Emergency Diesel Generator should be loaded at a rate of approximately 0.5 MW/minute.

3.2.9 All shutdowns, with the exception of the overspeed and generator differential, are locked out during the Emergency Mode of Operation.

3.2.10 If control air is lost during any Emergency Diesel Generator run, then the Fuel Rack Override lever must be used to shutdown the Emergency Diesel Generator.

3.2.11 The Emergency Diesel Generator may continue to operate for up to 7 days following a loss of control air. Continuous operation exceeding 7 days may cause damage to the Turbocharger.

3.2.12 The Emergency Diesel Generator may be started for any non-emergency start with lube oil temperature <120°F but ≥70°F if the following conditions are met and restrictions observed:

- The pre-lube system should be operating for at least 30 minutes prior to starting the Emergency Diesel Generator.
- Lube oil temperature of ≥100°F is required to ensure a start of <10 seconds.
- The start may be conducted with Lube oil temperature ≥70°F but <100°F when a timed start is not required (i.e. post maintenance start).
- The engine <u>should</u> <u>not</u> be loaded above 0.44 MW until lube oil <u>and</u> jacket water temperatures are ≥120°F.

3.2.13 Diesel Fuel Oil Storage Tank minimum levels are listed in the following table. Level may be as low as the 5-Day Minimum values for up to 5 days, provided replacement Fuel Oil is on site within the first 48 hours.
[TS 3.8.1.3, P-26756]

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60120, C60220	≥40,088 gallons	≥37,773 gallons
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B)	≥98.8% level	≥93.1% level
EGF-ILI-6993A(B)*	≥44'-6"	≥42'-0"

* EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.14 The fill limits for the Diesel Fuel Oil Storage Tanks are as follows:

<u>Lower fill limit:</u> **[TS 3.8.1.3, P-26756]**

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,210 gallons (98.68% Full)
- Using EGF-ILI-6995A(B): 98.9%

<u>Upper fill limit:</u>

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,480 gallons (99.34% Full)
- Using EGF-ILI-6995A(B): 99.3%
- Using EGF-ILI-6993A(B)*: 45'-9"

  * EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.15 The Emergency Diesel Generator may be started with the jacket water temperature <120°F for any non-emergency start. The engine should not be loaded above 0.44 MW until the jacket water temperature is ≥120°F.

3.2.16 Emergency Diesel Generator fuel oil storage has very little margin to support the Design Basis Accident loadings for seven days. EC-24379 provides guidance on additional margin for Engineering and Operations to establish operability of the EDG in the event of a fuel oil leak.

8.8 RESETTING EMERGENCY DIESEL GENERATOR AFTER AN OVERSPEED TRIP

NOTE

(1) If the EDG was running in Emergency Mode and the signal for the EDG to Start still exists, then the EDG will automatically start when Steps 8.8.1 and 8.8.2 are completed.

(2) Resetting the Combustion Air Intake Butterfly valve may take up to 30 seconds.

8.8.1 Reset the Turbocharger Butterfly Valve by performing one of the following:

- Depress and hold the EG A(B) Combustion Air Overspeed Trip Reset, EGA-418A(B), pushbutton on the Governor until the Combustion Air Intake Butterfly Valve is reset. (pushbutton is located below the overspeed trip plunger on the side of the Overspeed Trip Block)

  or

- Manually at the Combustion Air Intake Butterfly Valve.

8.8.2 Reset the Fuel Oil Overspeed Trip by pushing in the plunger on the Governor Overspeed Trip Block.

NOTE

(1) Depressing the System Reset Pushbutton following restart of the EDG in Emergency Mode will prevent an EDG trip when the engine goes from Emergency Mode to Test Mode during paralleling operations.

(2) If the EDG is not running but is still coasting down, depressing the System Reset pushbutton before the EDG has come to a complete stop may cause the unit to attempt to crank. **[CR-WF3-2005-00807]**

8.8.3 When Emergency Diesel Generator A(B) has come to a complete stop or if EDG A(B) restarted in Emergency Mode following reset of Overspeed Trip, then depress the System Reset pushbutton on the Emergency Diesel Generator A(B) Control Panel.

9.0 AUTOMATIC FUNCTIONS

9.1 EDG Trip (all modes)

9.1.1 Engine Overspeed, EGF-ISSCV-3006.1A(B).................... 660 RPM

9.1.2 Generator Differential, EG-EREL-2316(EDG A),

EG- EREL-2366(EDG B) .... 0.14 AMPS

9.2 EDG Trip (except in Emergency Mode)

9.2.1 Engine Lube Oil Pressure Low, EGL-IPEV-3014A(B) ...... 30 PSIG

9.2.2 Turbo Lube Oil Press Low, EGL-IPDEV-3018A(B) .... 3 PSIG

9.2.3 Main & Conn Rod Brg Temp High, EG-ITS-3002A(B) ...... MAIN – 228°F

.... CONN ROD 197°F

9.2.4 Turbo Thrust Brg Fail, EG-ITS-3001A(B) .... 228°F

9.2.5 High Jacket Water Temp, EGC-ITEV-3017A(B) .... 205°F

9.2.6 Generator Fault, EG-EREL-4766J1(2) .... Various

9.2.7 Jacket Water Low Press, EGC-IPEV-3028A(B) .... 5 PSIG

9.2.8 Lube Oil Temp High, EGL-ITEV-3031A(B) .... 185°F

9.2.9 Generator Outboard Brg Temp Hi, EG-ITEV-3019A(B)..... 228°F

9.2.10 Generator Overcurrent, EG-EREL-4766F1 (G1)

EG-EREL-4766F2 (G2), EG-EREL-4766H1 (H2).............. 4 Amps/104 Volts

9.3	EDG Air Compr. Auto Start/Stop, EGA-IPS-1990A1 (A2), ...	Start: 242 PSIG
	EGA-IPS-1990B1 (B2)	Stop: 257 PSIG
9.4	EDG Standpipe M/U Valve, CMU-524A(B), EGC-ILS-1980A(B)	Open: 16”
	....	Close: 22”
9.5	EDG Fuel Oil XFR Pump: EGF-ILS-6907 A(B), EGF-ILS-6908 A(B)..	Start: -30” ≈ Indic level 58.3%/3.5 Ft
	....	Stop: -6” ≈ Indic level 91.7%/5.5 Ft
9.6	EDG Fuel Oil Booster Pump: EGF-IPS-3032A1 (B1), EGF-IPS-3032A2 (B2)	Start: 25 PSIG
	....	Stop: 50 PSIG
9.7	EDG Jacket Water Circ. Pump, EGC-ITS-6951A(B)....................	Start: 120°F
	....	Stop: 130°F
9.8	EDG Jacket Water Heater, EGC-ITS-6951A(B)...........................	On: 120°F
	....	Off: 130°F
9.9	EDG Lube Oil Heater, EGL-ITS-6950A(B)..................................	On: 120°F
	....	Off: 135°F
9.10	Diesel Generator A(B) Exh Fan, HVRMFAN0025A(B),................	Start in conjunction with EDGs

REQUEST/APPROVAL PAGE

SAFETY RELATED PROCEDURE	Normal Review Class (check one): ☐ **OSRC** ☑ **QUALIFIED REVIEWER**

PROCEDURE NUMBER: OP-009-002		REVISION: 336

TITLE: Emergency Diesel Generator

PROCEDURE OWNER (Position Title): Operations Manager - Support

TERM (check one): ☑ **Permanent** ☐ **Temporary**

Effective Date / Milestone (if applicable): 11/10/2016

Expiration Date / Milestone (if applicable): N/A

PROCEDURE ACTION (Check one):

☑ **Revision** ☐ **Deletion** ☐ **New Procedure**

DESCRIPTION AND JUSTIFICATION:

(a) Added the following Source References in Section 10.2:

* EC-62346, EDG FOST Level Indication Changes to Address Potential Vortexing (Parent EC)
* EC-63914, Child EC for EGFIL6995A Alarm Setpoint Change (Parent EC 62346)
* EC-63915, Child EC for EGFIL6995B Alarm Setpoint Change (Parent EC 62346)

Addition of document references meets Editorial Correction criteria.

☒ Request/Approval Page Continuation Sheet(s) attached.

REVIEW PROCESS (CHECK ONE): ☐ **Normal** ☐ **Editorial Correction** (Revisions Only) ☑ **Technical Verification** (Revisions Only)

REVIEW AND APPROVAL ACTIVITIES			PRINT NAME OR SIGNATURE	DATE
PREPARER			David R. Voisin	11/8/2016
EC SUPERVISOR	Administrative Review and Approval		(sign) N/A	
CROSS-DISCIPLINE and INTERNAL REVIEWS (List Groups, Functions, Positions, etc.)	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
	N/A		N/A	
PROCESS APPLICABILITY DETERMINATION	Performed ☑	PA Exclusion ☐	James W. Hoss	7/5/2016
TECHNICAL	Review ☐	Verification ☑	David F. Litolff	11/8/2016
QUALIFIED REVIEWER	Review ☐		N/A	
GROUP/DEPT. HEAD	Review ☐	Approval ☑	(sign) [illegible]	11/9/16
GM, PLANT OPERATIONS	Review ☐	Approval ☐	(sign) N/A	
VICE PRESIDENT, OPERATIONS		Approval ☐	(sign) N/A	

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

3.1.1 If the Jacket Water System has been drained and refilled, then the following should be performed:

3.1.1.1 Vent the Jacket Water tubing for the Woodward Speed Control Governor Oil Cooler using EG A(B) Governor Oil Cooler Jacket Water Outlet Vent, EGC-119 A(B). This is the high point vent for the Woodward Speed Control Governor Oil Cooler tubing.

3.1.1.2 Operate the Jacket Water Pumps for at least 5 minutes prior to energizing Jacket Water Heaters.

3.1.2 The Emergency Diesel Generator shall not be started with lube oil temperature <70°F, to prevent damage to the main lube oil filter elements.

3.1.3 Do not perform a rapid load of an EDG before verifying engine warmed up to ≥120°F and proper operation of Jacket Water Circulating Pump, Pre-Lube Oil Pump, and associated heaters.

3.1.4 Caution should be taken not to allow a Diesel Generator to run longer than required at unloaded or low load conditions.

3.1.5 When the EDG is operating unloaded or at low load conditions, then fuel injection pump temperatures may become too hot to comfortably hold your hand on, due to the pump not circulating fuel that would normally cool it. The time in this condition should be minimized for consideration of long term reliability of the fuel injection pumps.

3.1.6 When in Test Mode and paralleled to offsite, then the Diesel Generator shall not be operated for more than 6 hours at <50% load (2.2 MW) without loading the Diesel Generator to ≥3.3 MW for 15-30 minutes, to minimize buildup of unburned exhaust products.

3.1.7 When EDG is connected to the grid, always maintain outgoing reactive load (MVAR) and at least 0.1 MW real load to prevent a reverse power trip. EDG may trip if not loaded within 5 seconds after its output breaker is closed.

3.1.8 If possible, then do not operate unit when a shutdown occurs until the cause has been found and corrected.

3.1.9 The mechanical stops on EDG A(B) CCW Flow Control, CC-413A(B), shall not be adjusted without SM/CRS permission.

3.1.10 Do not use Maintenance Lube Oil Tank to store lube oil. This is applicable at all times.

3.1.11 If the Lube Oil System has been drained and refilled, then operate the Lube Oil Pumps for at least 5 minutes prior to energizing Lube Oil Heaters.

3.1.12 If the Fuel Oil System has been drained and refilled, then vent the Standby Fuel Oil Pump suction piping from the following points:

- EGF-12210A(B) EG A(B) Standby Fuel Oil Pump Suction Vent
- EGF-12210-A1(B1) EG A(B) Fuel Oil Strainer Inlet Line Vent
- EGF-12210-A2(B2) EG A(B) Fuel Oil Strainer Outlet Line Vent

EGF-MSTRN-001A(B) in service:

- EGF-1222-A1(B1) EG A(B) Fuel Oil Strainer Bowl Vent

EGF-MSTRN-002A(B) in service:

- EGF-1222-A2(B2) EG A(B) Fuel Oil Strainer Bowl Vent

3.1.13 EDG B should not be operated in parallel with the Main Generator when Main Generator voltage is >25.95 KV as indicated by PID A58003. Reactive load (MVAR) may be lowered to reduce Main Generator Voltage. Operating EDG B in parallel with the Main Generator when Main Generator voltage is >25.95 KV has the potential to cause the 3B32 bus breakers, upon a fault, to structurally decompose and explode. **[CR-WF3-2004-02220]**

3.1.14 Overfilling Main Governor with oil during EDG operation can adversely affect EDG performance by causing sluggish governor operation. 10 ml of oil will change sightglass level by roughly 1/16 of an inch.

3.1.15 To ensure the fuel oil consumption analysis remains valid, EDG frequency must be maintained ≤60.1 Hz. **[EC-11723, CR-WF3-2008-05183]**

3.1.16 EDG's have had a calculation performed that states the EDGs could run without CCW for up to 10.7 minutes at 3.23 MW and up to 20.9 minutes unloaded should the output breaker fail to close without causing damage to the EDGs. **[ECM12-001, EC-56635]**

3.1.17 EDG A(B) Fuel Rack Override Lever position must be Vertical and Latched. **[CR-WF3-2014-00737]**

3.2 LIMITATIONS

3.2.1 With one Emergency Diesel Generator Inoperable, the Operable Emergency Diesel Generator should not be paralleled to offsite or non-vital loads.

3.2.2 Continuously monitor Emergency Diesel Generator when operating. Monitoring an Emergency Diesel Generator while it is in operation does not require the assigned operator's physical presence in the room on a continuous basis. However, the operator's activities should be limited to ensure 1) an adequate assessment of engine operation and 2) timely identification and correction of problems. **[P-5549]**

3.2.3 If DC power is secured or lost to EDG A(B) Control Panel through EDG A(B) Control Panel Feeder #1, EG-EBKR-A(B)-11, then EG A(B) Fuel Oil Transfer Pump, EGF-EBKR-312A(B)-3F, should be Opened to prevent overflowing Feed Tank.

3.2.4 Do not run both Emergency Diesel Generators in test mode simultaneously, except when performing testing pursuant to Technical Specification Surveillance requirement 4.8.1.1.2.g.

3.2.5 During normal operation, Emergency Diesel Generator ratings of 4.4 MW for continuous loading and 4.84 MW for 2 hours out of any 24 hours should not be exceeded.

3.2.6 If during normal Emergency Diesel Generator operation, there is a significantly noticeable diesel exhaust plume visible for >6 minutes in any consecutive 60 minute period, then contact the Environmental Engineer to determine appropriate action by qualified personnel or comply with UNT-006-010, Event Notification and Reporting. Startup, shutdown, and emergency periods are exempt from this requirement. Smoke opacity can be accurately determined only during daylight conditions.

3.2.7 If an Emergency Diesel Generator starts in response to a loss of offsite power or other valid event, then ensure that makeup is available to the Emergency Diesel Generator Jacket Water System (EGC) from any source prior to shutting down the Emergency Diesel Generator and allowing it to cool.

3.2.8 When practical, the Diesel Generator should be operated in accordance with the following chart to minimize thermal stresses on the Diesel Engine to ensure optimum engine life and performance :

Diesel Generator Load ①	Hold Time
Start Unloaded	5 minutes
≥1.0 MW to 1.2 MW	5 minutes
≥2.1 MW to 2.3 MW	10 minutes
≥3.2 MW to 3.4 MW	10 minutes
≥4.0 MW to 4.4 MW	≥3.5 hours or at SM/CRS direction
0.5 MW to 1.0 MW	15 minutes

① The Emergency Diesel Generator should be loaded at a rate of approximately 0.5 MW/minute.

3.2.9 All shutdowns, with the exception of the overspeed and generator differential, are locked out during the Emergency Mode of Operation.

3.2.10 If control air is lost during any Emergency Diesel Generator run, then the Fuel Rack Override lever must be used to shutdown the Emergency Diesel Generator.

3.2.11 The Emergency Diesel Generator may continue to operate for up to 7 days following a loss of control air. Continuous operation exceeding 7 days may cause damage to the Turbocharger.

3.2.12 The Emergency Diesel Generator may be started for any non-emergency start with lube oil temperature <120°F but ≥70°F if the following conditions are met and restrictions observed:

- The pre-lube system should be operating for at least 30 minutes prior to starting the Emergency Diesel Generator.
- Lube oil temperature of ≥100°F is required to ensure a start of <10 seconds.
- The start may be conducted with Lube oil temperature ≥70°F but <100°F when a timed start is not required (i.e. post maintenance start).
- The engine should not be loaded above 0.44 MW until lube oil and jacket water temperatures are ≥120°F.

3.2.13 Diesel Fuel Oil Storage Tank minimum levels are listed in the following table. Level may be as low as the 5-Day Minimum values for up to 5 days, provided replacement Fuel Oil is on site within the first 48 hours.
[TS 3.8.1.3, P-26756]

INSTRUMENT	7-DAY MINIMUM	5-DAY MINIMUM
PMC PIDs C60120, C60220	≥40,088 gallons	≥37,773 gallons
PMC PIDs C60121, C60221	≥98.39% full	≥92.70% full
EGF-ILI-6995A(B)	≥98.8% level	≥93.1% level
EGF-ILI-6993A(B)*	≥44'-6"	≥42'-0"

* EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.14 The fill limits for the Diesel Fuel Oil Storage Tanks are as follows:

Lower fill limit: **[TS 3.8.1.3, P-26756]**

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,210 gallons (98.68% Full)
- Using EGF-ILI-6995A(B): 98.9%

Upper fill limit:

- Using PMC PIDs C60120 and C60220 (C60121 and C60221): 40,480 gallons (99.34% Full)
- Using EGF-ILI-6995A(B): 99.3%
- Using EGF-ILI-6993A(B)*: 45'-9"

  * EGF-ILI-6993A(B) should be used in the event of a loss of offsite power or if all other indicators are unavailable.

3.2.15 The Emergency Diesel Generator may be started with the jacket water temperature <120°F for any non-emergency start. The engine should not be loaded above 0.44 MW until the jacket water temperature is ≥120°F.

3.2.16 Emergency Diesel Generator fuel oil storage has very little margin to support the Design Basis Accident loadings for seven days. EC-24379 provides guidance on additional margin for Engineering and Operations to establish operability of the EDG in the event of a fuel oil leak.

8.8 RESETTING EMERGENCY DIESEL GENERATOR AFTER AN OVERSPEED TRIP

NOTE

(1) If the EDG was running in Emergency Mode and the signal for the EDG to Start still exists, then the EDG will automatically start when Steps 8.8.1 and 8.8.2 are completed.

(2) Resetting the Combustion Air Intake Butterfly valve may take up to 30 seconds.

8.8.1 Reset the Turbocharger Butterfly Valve by performing one of the following:

- Depress and hold the EG A(B) Combustion Air Overspeed Trip Reset, EGA-418A(B), pushbutton on the Governor until the Combustion Air Intake Butterfly Valve is reset. (pushbutton is located below the overspeed trip plunger on the side of the Overspeed Trip Block)

  or

- Manually at the Combustion Air Intake Butterfly Valve.

8.8.2 Reset the Fuel Oil Overspeed Trip by pushing in the plunger on the Governor Overspeed Trip Block.

NOTE

(1) Depressing the System Reset Pushbutton following restart of the EDG in Emergency Mode will prevent an EDG trip when the engine goes from Emergency Mode to Test Mode during paralleling operations.

(2) If the EDG is not running but is still coasting down, depressing the System Reset pushbutton before the EDG has come to a complete stop may cause the unit to attempt to crank. **[CR-WF3-2005-00807]**

8.8.3 When Emergency Diesel Generator A(B) has come to a complete stop or if EDG A(B) restarted in Emergency Mode following reset of Overspeed Trip, then depress the System Reset pushbutton on the Emergency Diesel Generator A(B) Control Panel.

9.0 AUTOMATIC FUNCTIONS

9.1 EDG Trip (all modes)

9.1.1 Engine Overspeed, EGF-ISSCV-3006.1A(B) .... 660 RPM

9.1.2 Generator Differential, EG-EREL-2316(EDG A),

EG- EREL-2366(EDG B) .... 0.14 AMPS

9.2 EDG Trip (except in Emergency Mode)

9.2.1 Engine Lube Oil Pressure Low, EGL-IPEV-3014A(B) ...... 30 PSIG

9.2.2 Turbo Lube Oil Press Low, EGL-IPDEV-3018A(B) .... 3 PSIG

9.2.3 Main & Conn Rod Brg Temp High, EG-ITS-3002A(B) ...... MAIN – 228°F

.... CONN ROD 197°F

9.2.4 Turbo Thrust Brg Fail, EG-ITS-3001A(B) .... 228°F

9.2.5 High Jacket Water Temp, EGC-ITEV-3017A(B) .... 205°F

9.2.6 Generator Fault, EG-EREL-4766J1(2) .... Various

9.2.7 Jacket Water Low Press, EGC-IPEV-3028A(B) .... 5 PSIG

9.2.8 Lube Oil Temp High, EGL-ITEV-3031A(B) .... 185°F

9.2.9 Generator Outboard Brg Temp Hi, EG-ITEV-3019A(B) .... 228°F

9.2.10 Generator Overcurrent, EG-EREL-4766F1 (G1)

EG-EREL-4766F2 (G2), EG-EREL-4766H1 (H2) .... 4 Amps/104 Volts

9.3	EDG Air Compr. Auto Start/Stop, EGA-IPS-1990A1 (A2), ...	Start: 242 PSIG
	EGA-IPS-1990B1 (B2)	Stop: 257 PSIG
9.4	EDG Standpipe M/U Valve, CMU-524A(B), EGC-ILS-1980A(B)	Open: 16”
	....	Close: 22”
9.5	EDG Fuel Oil XFR Pump: EGF-ILS-6907 A(B), EGF-ILS-6908 A(B)	Start: -30” ≈ Indic level 58.3%/3.5 Ft
	....	Stop: -6” ≈ Indic level 91.7%/5.5 Ft
9.6	EDG Fuel Oil Booster Pump: EGF-IPS-3032A1 (B1), EGF-IPS-3032A2 (B2)	Start: 25 PSIG
	....	Stop: 50 PSIG
9.7	EDG Jacket Water Circ. Pump, EGC-ITS-6951A(B)....................	Start: 120°F
	....	Stop: 130°F
9.8	EDG Jacket Water Heater, EGC-ITS-6951A(B)...........................	On: 120°F
	....	Off: 130°F
9.9	EDG Lube Oil Heater, EGL-ITS-6950A(B)...................................	On: 120°F
	....	Off: 135°F
9.10	Diesel Generator A(B) Exh Fan, HVRMFAN0025A(B), ...	Start in conjunction with EDGs

Waterford 3

2017 NRC RO/SRO Exam

JOB PERFORMANCE MEASURE

P3

Isolate RWSP from Purification in accordance with OP-902-009, EOP Standard Appendices, Appendix 40

Applicant: ______________________________

Examiner: ______________________________

JOB PERFORMANCE MEASURE
DATA PAGE

Task: Isolate RWSP from Purification in accordance with OP-902-009, EOP Standard Appendices.

Task Standard: Applicant isolates RWSP from Purification in accordance with OP-902-009, EOP Standard Appendices.

References: OP-902-009 Appendix 40, Isolate RWSP from Purification (rev 315)
ILN03-0022 (License Amendment 186 SER)

Alternate Path: Yes Time Critical: Yes Validation Time: 15 min

K/A EPE 011 EK3.12 Actions contained in EOP for emergency LOCA (large break)

Importance Rating 4.4 / 4.6
RO/SRO

Safety Function 2

Applicant: ______________________

Time Start: ______________ Time Finish: ______________

Performance Time: ______________ minutes
Critical Time: 54 minutes

Performance Rating: SAT UNSAT

Comments: ____

Examiner: ______________________ Date: ______________
Signature

EXAMINER COPY ONLY

Tools/Equipment/Procedures Needed:

- OP-902-009 Attachment 40: Isolate RWSP from Purification (Handout)

Description:
This is a time critical task performed inside the RCA on the -4 & -35 Wing Areas. Do not start the JPM until after you have entered the RCA.
The applicant will attempt to isolate the RWSP by closing two valves on the -4 but one of the valves will not be able to be closed and require the applicant to close a valve on the -35 level.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All steps for this JPM will be simulated, do not manipulate any plant components. Make all necessary communications to me. I will provide initiating cues and reports on other actions when directed by you. Indicate to me when you understand your assigned task.

(Read the Initial Condition and Cues from the GREEN Applicant Cue Sheet, and then give the cue sheet to the applicant.)

NOTE for JPM Validation Only
When performing JPM validation, actions are necessary to ensure exam security is maintained. Prior to commencing in-plant JPM validation, contact Radiation Protection (RP) and direct them to disable all cameras in the RCA in a manner that prevents anyone from viewing any of the RCA cameras.

After all in plant JPMs are completed, contact RP to restore the disabled cameras.

Evaluator Note
This JPM is time critical and takes place inside the RCA. Do <u>not</u> start the JPM until after you have entered the RCA.

Evaluator Note
Locks are used on certain components as a physical restraint to inhibit operation. Locks are used to assure that only authorized personnel will operate the component. Although this is important for plant operation, installation of valve locks is not critical to pass the JPM.

Start Time: _______________

TASK ELEMENT 1	STANDARD
Procedure note: This attachment is performed when the Purification system is aligned to the RWSP. The requirement is to isolate the RWSP from non-safety, non-seismic piping during a SIAS.	Note reviewed.
Comment:	**SAT / UNSAT**

TASK ELEMENT 2	STANDARD
1. <u>Close</u> FS-423, RWSP Purification Pump Suction Isolation. (-4 Wing Area, Centerline 7A)	Attempts to close valve.
Comment: Examiner Note: FS-423 is expected to be open with its lock off the hand-wheel. FS-423 is a remote (reach rod) operated manual valve. **Examiner Cue: If the applicant asks for initial indications on the valve, cue that the position indicating pin is at the upper position with ~0.25 inch clearance between the pin and the top of the slot and the lock is off the hand-wheel.** **Examiner Cue: When the applicant attempts to close FS-423, cue that the valve hand-wheel will not rotate. If the applicant pursues the use of a torque amplifying device (TAD), allow the use, but any attempts to close FS-423 will result in the valve not being able to be rotated.**	**SAT / UNSAT**

ALTERNATE PATH STARTS HERE
Alternate Path starts when FS-423 is not able to be closed.

TASK ELEMENT 3	STANDARD
a. **IF** unable to close FS-423, **THEN** close **ANY** of the following: • FS-425, RWSP Purification Pump Suction Isolation (-35 Wing Area, West side) • FS-428, RWSP Purification Pump Discharge Isolation (-35 Wing Area, West side)	At least one valve (FS-425 or FS-428) is closed.
Comment: Examiner note: This step requires the applicant to travel down to the -35 RCA Wing Area. FS-425 & 428 are expected to be open with their locks off the hand-wheels. Examiner note: The applicant may decide to take the RWSP Purification pump's control switch (located near pump on column 3A&M) to "OFF" at this point. **Examiner Cue: If the applicant checks to see if the RWSP Purification pump is running, then cue that the pump is running.** **Examiner Cue: When the applicant turns either valve <u>clockwise</u>, cue that the valve rotates and after several turns the valve becomes tight and the stem has moved in.** **Examiner Cue: If the applicant takes the RWSP purification pump control switch to "OFF", cue that the pump stops running.**	**<u>Critical</u>** **SAT / UNSAT**

TASK ELEMENT 4	STANDARD
2. <u>Close</u> FS-404, Fuel Pool Ion Exchanger to RWSP Isolation. (-4 Wing Area, Centerline 8A)	Valve (FS-404) closed.
Comment: Examiner note: This step requires the applicant to travel back up to the -4 RCA Wing Area. FS-404 is expected to be open with its lock off the hand-wheel. **Examiner Cue: When the applicant turns the valve <u>clockwise</u>, cue that the valve rotates and after several turns the valve becomes tight and the stem has moved in.**	**<u>Critical</u>** **SAT / UNSAT**

Stop Time when FS-404 is closed: _______________ (Critical time is 54 minutes)

TASK ELEMENT 5	STANDARD
3. At Control Room discretion as time, resources and accessibility allow, <u>perform</u> the following: a. <u>Secure</u> RWSP Purification pump by **ONE** of the following: • <u>Place</u> RWSP Purification pump control switch in OFF. • Place FS-EBKR-312A-10F, RWSP Purification pump breaker in OFF. b. <u>Secure</u> Fuel Pool Purification pump by **ONE** of the following: • <u>Place</u> Fuel Pool Purification pump control switch in OFF. • <u>Place</u> FS-EBKR-314A-5D, RWSP Purification pump breaker in OFF. c. <u>Secure</u> purification lineups using OP-002-006 “Fuel Pool Cooling and Purification,” Attachment 8.15, “Isolation of FS to RWSP on RWSP Leakage or SIAS.”	RWSP Purification pump control switch is taken to “OFF” or its breaker (FS-EBKR-312A-10F) is taken to “OFF”.
Comment: Examiner note: End JPM after step 3.a is completed. **Examiner Cue: If applicant calls the Control Room for direction on whether to perform step 3, cue the applicant to perform step 3.a. Another operator will perform steps 3.b and 3.c.** **Examiner Cue: If the applicant takes the pump’s control switch to “OFF” (located on column 3A&M near the pump), cue that the pump stops running.** **Examiner Cue: If the applicant requests another Operator to open the RWSP Purification pump breaker (FS-EBKR-312A-10F), acknowledge request, wait a moment and reply that you have done so and cue that the pump stops running.**	**SAT / UNSAT**

END OF TASK

APPLICANT CUE SHEET

Do Not Manipulate Any Plant Components

(RETURN ALL HANDOUTS TO EXAMINER UPON COMPLETION OF TASK)

This is a time critical task. Timing will start after the Initial Conditions and Initiating Cue have been read and this cue sheet is handed to you.

INITIAL CONDITIONS:

- RWSP Purification is in service.
- An SIAS has occurred.

INITIATING CUE(S):

The CRS has directed you to isolate the RWSP from purification in accordance with OP-902-009, Attachment 40: Isolate RWSP from Purification.

40.0 Isolate RWSP from Purification

INSTRUCTIONS

------------------------------------ **NOTE** ------------------------------------

This attachment is performed when the Purification system is aligned to the RWSP. The requirement is to isolate the RWSP from non-safety, non-seismic piping during a SIAS.

----

1. Close FS-423, RWSP Purification Pump Suction Isolation. (-4 Wing Area, Centerline 7A)

   a. **IF** unable to close FS-423,
   THEN close **ANY** of the following:

   - FS-425, RWSP Purification Pump Suction Isolation (-35 Wing Area, West side)
   - FS-428, RWSP Purification Pump Discharge Isolation (-35 Wing Area, West side)

2. Close FS-404, Fuel Pool Ion Exchanger to RWSP Isolation. (-4 Wing Area, Centerline 8A)

3. At Control Room discretion as time, resources and accessibility allow, perform the following:

   a. Secure RWSP Purification pump by **ONE** of the following:

   - Place RWSP Purification pump control switch in OFF.
   - Place FS-EBKR-312A-10F, RWSP Purification pump breaker in OFF.

   b. Secure Fuel Pool Purification pump by **ONE** of the following:

   - Place Fuel Pool Purification pump control switch in OFF.
   - Place FS-EBKR-314A-5D, Fuel Pool Purification pump breaker in OFF.

   c. Secure purification lineups using OP-002-006 “Fuel Pool Cooling and Purification,” Attachment 8.15, “Isolation of FS to RWSP on RWSP Leakage or SIAS.”

End of Appendix 40

40.0 Isolate RWSP from Purification

INSTRUCTIONS

---------- **NOTE** ----------

This attachment is performed when the Purification system is aligned to the RWSP. The requirement is to isolate the RWSP from non-safety, non-seismic piping during a SIAS.

----

1. Close FS-423, RWSP Purification Pump Suction Isolation. (-4 Wing Area, Centerline 7A)

   a. **IF** unable to close FS-423,
   THEN close **ANY** of the following:

   - FS-425, RWSP Purification Pump Suction Isolation (-35 Wing Area, West side)
   - FS-428, RWSP Purification Pump Discharge Isolation (-35 Wing Area, West side)

2. Close FS-404, Fuel Pool Ion Exchanger to RWSP Isolation. (-4 Wing Area, Centerline 8A)

3. At Control Room discretion as time, resources and accessibility allow, perform the following:

   a. Secure RWSP Purification pump by **ONE** of the following:

   - Place RWSP Purification pump control switch in OFF.
   - Place FS-EBKR-312A-10F, RWSP Purification pump breaker in OFF.

   b. Secure Fuel Pool Purification pump by **ONE** of the following:

   - Place Fuel Pool Purification pump control switch in OFF.
   - Place FS-EBKR-314A-5D, Fuel Pool Purification pump breaker in OFF.

   c. Secure purification lineups using OP-002-006 “Fuel Pool Cooling and Purification,” Attachment 8.15, “Isolation of FS to RWSP on RWSP Leakage or SIAS.”

End of Appendix 40

Facility: Waterford 3 Scenario No.: **1** Op Test No.: 1

Examiners: ______ Operators: ______

Initial Conditions: Reactor power is 100%. AB Buses are aligned to Train B.

Turnover:

Protected Train is B; Maintain 100%. High Pressure Safety Injection Pump A is out of service.

Event No.	**Malf. No.**	**Event Type***	**Event Description**
1	CV12A1	I – ATC I – SRO	VCT level instrument CVC-ILT-0227 Fails high diverting letdown to the Boron Management system. OP-901-113, Volume Control Tank Makeup Control Malfunction
2	RC19C	I – BOP I – SRO TS – SRO	Safety Channel C RCS Cold Leg instrument RC-ITI-0102CC (Loop T112C) fails high requiring TS 3.3.1 entry and bypassing affected bistables.
3	CV01B	C – ATC C – SRO TS – SRO	Charging Pump B trips on overcurrent requiring implementation of OP-901-112, Charging or Letdown malfunction. (TS 3.1.2.4)
4	SG05B	I – BOP I – SRO	Steam Generator 2 Level Control Transmitter, SG-ILT-1106, fails low requiring implementation of OP-901-201, Steam Generator Level Control Malfunction and manual control of SG level.
5	FW21A FW21AA	R- ATC N-BOP N-SRO	Lowering Main Condenser vacuum requiring implementation of OP-901-220, Loss of Condenser Vacuum and a plant power reduction in accordance with OP-901-212, Rapid Plant Power Reduction.
6	RP02A-D RC03C	M – All	RCP 2A sustains a locked rotor and an automatic reactor trip does not occur. Manual action is needed to trip the reactor (**CT 1, manually trip the reactor**)
7	MS13A	M – All	Main Steam Line Break outside Containment, SG 1, OP-902-004, Excess Steam Demand Recovery. (**CT 2, stabilize RCS temperature and pressure**)
8	RP08C	I – ATC I – BOP I – SRO	Relay K202A fails, CVC-401, CVC-109, IA-909, and FP-601A fail to close automatically

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

The crew assumes the shift at 100% power with instructions to maintain 100% power. High Pressure Safety Injection (HPSI) pump A is out of service.

After taking the shift, Volume Control Tank (VCT) level instrument CVC-ILT-0227 fails high resulting in valve CVC-169 diverting letdown to the Boron Management System. The SRO should enter into procedure OP-901-113, Volume Control Tank Makeup Control Malfunction, and direct the ATC to place valve CVC-169 to the VCT position.

After the crew addresses the VCT instrument malfunction, RCS Cold Leg instrument RC-ITI-0102CC on CP-7 fails high. The crew will enter TS 3.3.1 action 2 and bypass bistables 3 & 4 on channel C on CP-10.

After Technical Specifications are addressed and Channel C bistables bypassed, Charging Pump B trips on overcurrent. The SRO will implement OP-901-112, Charging or Letdown Malfunction, Section E_1, Charging Malfunction. The SRO should direct the ATC to start a standby charging pump after verifying a suction path available or isolate Letdown using CVC-101, Letdown Stop Valve. If Letdown is isolated, Charging and Letdown will be re-initiated using Attachment 2 of OP-901-112. The SRO should review and enter Technical Specification 3.1.2.4. Technical Specification 3.1.2.4 may be exited after aligning Charging Pump AB to replace Charging Pump B. The SRO may implement EN-OP-200, Transient Response Rules.

After the crew addresses the Charging pump malfunction, Steam Generator 2 Level Control Transmitter, SG-ILT-1106 fails low. The SRO should direct the BOP to take manual control of SG2 level 50-70% Narrow Range and establish contingency actions. The SRO will enter OP-901-201, Steam Generator Level Control Malfunction and implement Attachment 1, General Actions. Manual action by the BOP to control SG2 level will be required during the subsequent plant shutdown and reactor trip.

After the crew completes actions in OP-901-201, a leak in the Main Condenser develops and Main Condenser vacuum begins to drop. The SRO will enter OP-901-220, Loss of Condenser Vacuum. Main Condenser vacuum will drop below 25 inches, requiring a rapid plant power reduction. The SRO will enter OP-901-212, Rapid Plant Power Reduction and should implement EN-OP-200, Transient Response Rules. Vacuum will drop below 25 inches but remain above 20 inches, the procedure trigger for tripping the Reactor. For the power reduction, the ATC will perform direct boration to the RCS as well as ASI control with CEAs and Pressurizer boron equalization. The BOP will manipulate the controls to reduce Main Turbine load.

After the reactivity manipulation is satisfied, Reactor Coolant Pump 2A rotor seizes and the RCP breaker trips. The Reactor Protection System fails to open the required Reactor Trip Breakers and an ATWS condition exists. The ATC should recognize that an automatic protection system has failed to occur and manually trip the reactor by depressing both Reactor Trip pushbuttons (A and D) on CP-2 **(CRITICAL TASK 1)**. The Reactor will be successfully tripped from CP-2 and the SRO will enter OP-902-000, Standard Post Trip Actions.

During the performance of Standard Post Trip Actions (RCS Heat Removal checks), an excess steam demand event will occur on SG 1 outside containment upstream of the MSIV. The SRO will direct the ATC/BOP to initiate Safety Injection, Containment Isolation and Main Steam Isolation. The SRO will direct action to establish RCS Temperature and Pressure control using SG 2 **(CRITICAL TASK 2)** when CET temperature and PZR pressure begins to rise indicating a blown dry SG. Relay K202A will fail to actuate resulting in CVC-109, Letdown Outside Containment Isolation, CVC-401, Controlled Bleedoff Outside Containment Isolation, IA-909, Instrument Air Containment Isolation and FP-601A, Fire Water A Containment Isolation, valves not going to their required positions. The ATC and BOP will take action to close these valves. The crew should diagnose to OP-902-004, Excess Steam Demand Recovery and isolate Steam Generator 1.

The scenario can be terminated after the crew has isolated Steam Generator 1 or at the lead examiner's discretion.

Critical Task		
Number	Description	Basis
1	Establish Reactivity Control This task is satisfied by manually tripping the reactor using the manual pushbuttons, Diverse Reactor Trip, or de-energizing bus 32A and 32B within 1 minute of exceeding a PPS limit. This task becomes applicable following the RCP trip. (OP-902-000, 1.a.1)	Failure to trip the reactor when an automatic PPS signal has failed to actuate can lead to degradation of fission product barriers. OPS Management Expectation of 1 minute is determined to be a reasonable time limit to identify and take action for satisfactory performance. (TM-OP-100-03, CT-1)
2	Establish RCS Pressure and Temperature Control This task is satisfied by manually feeding and steaming the unaffected Steam Generator to stabilize RCS temperature and pressure prior to exiting the step to stabilize RCS temperature in OP-902-004, Excess Steam Demand Recovery and take action to achieve and maintain less than 1600 PSID across the affected Steam Generator. This task becomes applicable once CET temperature and PZR pressure begins to rise following the ESDE. (OP-902-004, step 18 or OP-902-009, App. 13)	An ESDE will result in a rapid cooldown and depressurization of the RCS. After the Steam Generator dries out, RCS temperature and pressure will begin to recover. Operator action is required to stabilize RCS pressure and temperature to prevent a situation that may cause pressurized thermal shock which could jeopardize the RCS integrity. A large D/P across the Steam Generator tubes will make a subsequent SGTR more likely. (TM-OP-100-03, CT-7)
* **Critical Task** (As defined in NUREG 1021 Appendix D) ** Per NUREG-1021, Appendix D, If an operator or the crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review.		

Scenario Quantitative Attributes

1. Malfunctions after EOP entry (1–2)	1
2. Abnormal events (2–4)	4
3. Major transients (1–2)	2
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	0
6. EOP based Critical tasks (2–3)	2

SCENARIO SETUP

A. Reset Simulator to IC-161.

B. Verify Scenario Malfunctions, Remotes, and Overrides are loaded, as listed in the Scenario Timeline.

C. Verify HPSI pump A is removed from service as follows:

   1. Insert **SIR29** (HPSI pump A breaker) to RKOUT

   2. Place C/S in OFF with a Danger Tag.

D. Verify all EFW Flow Control Valves are in Auto and Caution Tags removed.

E. Ensure Protected Train B sign is placed in SM office window.

F. Verify EOOS is 8.7 Yellow with HPSI pump A out of service.

G. Protected Equipment covers on running SFP pump and HPSI Pump B control switches.

H. Complete the simulator setup checklist.

I. Start Insight, open file Crew Performance.tis.

SIMULATOR BOOTH INSTRUCTIONS

Event 1 VCT level instrument, CVC-ILT-0227, Fails High

1. On Lead Examiner's cue, initiate Event **Trigger 1**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.

Event 2 Safety Channel C RCS Cold Leg Temperature, RC-ITI-0112CC fails high

1. On Lead Examiner's cue, initiate Event **Trigger 2**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.
3. If sent to LCP-43, wait 3 minutes and report all Cold Leg temperatures on LCP-43 read approximately 545F.

Event 3 Charging Pump B Trip

1. On Lead Examiner's cue, initiate Event **Trigger 3**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Charging Pump room and breaker.
3. If called as NAO to investigate the breaker, wait 3 minutes and report overcurrent flags are dropped for all 3 phases for Charging Pump B
4. If called as NAO to investigate the pump, wait 3 minutes and report that there are some indications of charring at the motor vent area, and an acrid odor is present but there is no fire.
5. If directed to perform prestart checks for the A or AB Charging pump, wait 2 minutes and report the following for directed pump:
    a. Suction and discharge valves are open
    b. Proper oil level exists
    c. Motor vents unobstructed
    d. All personnel clear of the pump
6. If directed to check a started Charging pump for proper operation following start, wait 1 minute and report the following:
    a. Suction and discharge valves are open
    b. Proper oil pressure and seal water flow exist
    c. No abnormal vibrations or noises present

Event 4 Steam Generator 2 Level Control Transmitter, SG-ILT-1106, fails low

1. On Lead Examiner's cue, initiate Event **Trigger 4**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.

Event 5 Main Condenser Leak, Rapid Power Reduction

1. On Lead Examiner's cue, initiate Event **Trigger 5**.
2. If called as TGB watch report all Air Evacuation Pumps look normal, Vacuum pump separators are greater than ½ full and there are no indications of a leak.
3. Approximately 5 minutes after being called to investigate, TGB watch should report finding a non-isolable leak up-stream of AE-401 A, Condenser Vacuum Breaker A. Location of failure is preventing any successful repair efforts.
4. If called as other watch standers to assist, respond that you are going to the TGB to assist.
5. If Work Week Manager is called, inform the caller that a team will be sent to the Turbine Building to assist.

Event 6 RCP 2A locked rotor and an automatic Reactor trip does not occur

1. On Lead Examiner's cue, initiate Event **Trigger 6**.
2. No expected communications for this event.

Event 7 Main Steam Line Break outside Containment, SG 1

1. On Lead Examiner's cue, initiate Event **Trigger 7.**
2. If the Duty Plant Manager is called, inform the caller that you will make the necessary calls.
3. If Chemistry is called to perform samples acknowledge the request.
4. If requested to check Emergency Diesel Generators (EDG), wait 3 minutes and report EDGs are operating properly. Initiate event triggers 20 & 21 to acknowledge local annunciator panels.
5. If called as an NAO to check for steam outside, wait 2 minutes, report that a large amount of steam is issuing from the west MSIV area.

Event 8 Relay K202A fails, CVC-401, CVC-109, IA-909, and FP-601A fail to close automatically

1. No communications should occur for this event.

At the end of the scenario, before resetting, end data collection and save the file as 2017 Scenario 1-(start-end time).tid. Export to .csv file. Save the file into the folder for the appropriate crew.

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SCENARIO TIMELINE

EVENT	KEY	DESCRIPTION	TRIGGER	DELAY HH:MM:SS	RAMP HH:MM:SS	FINAL
EVENT DESCRIPTION						
1	**CV12A1**	**VCT LEVEL XMTR CVC-ILIC-0227 FAILS HI**	**1**	**00:00:00**	**00:00:00**	**ACTIVE**
VCT LEVEL TRANSMITTER FAILS HIGH						
2	**RC19C**	**RCS COLD LEG 1A SAFETY TT 0112C FAILS (0-100%)**	**2**	**00:00:00**	**00:00:00**	**100**
SAFETY CHANNEL C RCS COLD LEG TEMPERATURE (RC-ITI-0102CC)						
3	**CV01B**	**CHARGING PUMP B TRIPPED**	**3**	**00:00:00**	**00:00:00**	**ACTIVE**
CHARGING PUMP B TRIP						
4	**SG05B**	**SG LEVEL ILT-1106 FAIL (0-100%)**	**4**	**00:00:00**	**00:00:10**	**0**
STEAM GENERATOR 2 LEVEL CONTROL TRANSMITTER, SG-ILT-1106, FAILS LOW						
5	**FW21A**	**CONDENSER A AIR INLEAK (100%=100% OF VAC BKR)**	**5**	**00:00:00**	**00:03:00**	**20**
	FW21AA	**CONDENSER A AIR INLEAK VACUUM SETPOINT**	**5**	**00:00:00**	**00:03:00**	**23.3**
MAIN CONDENSER LEAK, RAPID POWER REDUCTION						
6	**RC03C**	**RCP RC-MPMP-0002A SHAFT SEIZURE**	**6**	**00:00:00**	**00:00:00**	**ACTIVE**
	RP02A	**RPS CH A AUTO TRIP FAILURE**	**N/A**	**00:00:00**	**00:00:00**	**ACTIVE**
	RP02B	**RPS CH B AUTO TRIP FAILURE**	**N/A**	**00:00:00**	**00:00:00**	**ACTIVE**
	RP02C	**RPS CH C AUTO TRIP FAILURE**	**N/A**	**00:00:00**	**00:00:00**	**ACTIVE**
	RP02D	**RPS CH D AUTO TRIP FAILURE**	**N/A**	**00:00:00**	**00:00:00**	**ACTIVE**
RCP 2A LOCKED ROTOR AND AN AUTOMATIC REACTOR TRIP DOES NOT OCCUR						
7	**MS13A**	**MS A BREAK OUTSIDE CNTMT BEFORE MSIV (0-100%)**	**7**	**00:00:00**	**00:00:00**	**8%**
MAIN STEAM LINE BREAK OUTSIDE CONTAINMENT, SG 1						
8	**RP08C**	**RELAY K202 FAILED, CIAS TRAIN A (CVC/IA/FP)**	**N/A**	**00:00:00**	**00:00:00**	**ACTIVE**
CVC-401, CVC-109, IA-909, AND FP-601A FAIL TO CLOSE AUTOMATICALLY						
N/A	**EGR26**	**EDG A LOCAL ANNUN ACK**	**20**	**00:00:00**	**00:00:00**	**ACKN**
LOCAL EDG ANNUNCIATOR ACKNOWLEDGE						

EVENT	KEY	DESCRIPTION	TRIGGER	DELAY HH:MM:SS	RAMP HH:MM:SS	FINAL
EVENT DESCRIPTION						
N/A	**EGR27**	**EDG B LOCAL ANNUN ACK**	**21**	**00:00:00**	**00:00:00**	**ACKN**
LOCAL EDG ANNUNCIATOR ACKNOWLEDGE						
N/A	**SIR29**	**HPSI PUMP A**	**N/A**	**00:00:00**	**00:00:00**	**RKOUT**
HPSI PUMP A BREAKER						

REFERENCES

Event	Procedures
1	OP-901-113, Volume Control Tank Makeup Control Malfunction, Rev. 302
2	OP-009-007, Plant Protection System, Rev. 17 OP-903-013, Monthly Channel Checks, Rev. 18 Technical Specification 3.3.1
3	OP-901-112, Charging or Letdown Malfunction, Rev. 6 OP-002-005, Chemical Volume Control, Rev. 56 Technical Specification 3.1.2.4
4	OP-901-201, Steam Generator Level Control Malfunction, Rev. 6
5	OP-901-220, Loss of Condenser Vacuum, Rev. 302 OP-002-005, Chemical Volume Control, Rev. 56 OP-004-004, Control Element Drive, Rev. 23 OP-901-212, Rapid Plant Power Reduction, Rev. 8
6	OP-902-000, Standard Post Trip Actions, Rev. 16
7	OP-902-004, Excess Steam Demand Recovery, Rev. 16 OP-902-009, Standard Appendices, Rev. 315, Appendix 2, Figures OP-902-009, Standard Appendices, Rev. 315, Appendix 1, Diagnostic Flow Chart
8	OP-902-004, Excess Steam Demand Recovery, Rev. 16
GEN	EN-OP-115, Conduct of Operations, Rev. 17 EN-OP-115-08, Annunciator Response, Rev. 4 EN-OP-200, Plant Transient Response Rules, Rev. 3 OI-038-000, EOP Operations Expectations / Guidance, Rev. 14

Op Test No.:	1	Scenario #	1	Event #	1	Page	1	of	41
Event Description:	VCT level instrument CVC-ILT-0227 Fails high								

Time	Position	Applicant's Actions or Behavior
Examiner Note **Cue the Simulator Operator when ready for Event 1**		
	ATC	Recognizes and reports indications of failed channel.
		Alarms:
		• PMC PID D39302 NT VCT
		• PMC PID D39303 FLASH TK
		Indications:
		• Valve CVC-169, VCT Inlet/Bypass To Holdup Tanks indicates BMS
		• VCT level indication CVC-ILT-0226 slowly lowering
		• VCT level indication PMC-IUR-0001 Green Pen (Flashing)
	Note	**The SRO may direct the ATC to take manual control of CVC-169, VCT Inlet/Bypass To Holdup Tanks and direct valve to the VCT position prior to entering procedure.**
	SRO	Enter and direct the implementation of OP-901-113, Volume Control Tank Makeup Control Malfunction
OP-901-113, Volume Control Tank Makeup Control Malfunction		
NOTE Failure low of VCT level instrument CVC-ILT-0227(PID A39401) will cause RWSP TO CHARGING PUMPS (CVC 507) to open and VCT DISCH VALVE (CVC 183) to close. Failure of VCT level instrument CVC-ILT-0226 (PID A39400) affects CP-4 level indication and Auto makeup to the VCT.		
	SRO	1. IF a VCT level instrument fails, THEN perform the following:
	N/A	1.1. IF level instrument CVC-ILT-0227 fails low causing Charging Pump suction source to swap to RWSP, THEN perform the following:

Op Test No.:	1	Scenario #	1	Event #	1	Page	2	of	41
Event Description:	VCT level instrument CVC-ILT-0227 Fails high								

Time	Position	Applicant's Actions or Behavior
	ATC	1.2. IF level instrument CVC-ILT-0227 fails high causing the VCT INLET/BYPASS VALVE (CVC 169) to divert to BMS, THEN perform the following: 1.2.1 Align VCT INLET/BYPASS VALVE (CVC 169) to VCT. 1.2.2 Makeup to VCT as required to restore level in accordance with OP-002-005, Chemical and Volume Control. 1.2.3 Initiate corrective action to repair level instrument. 1.2.4 WHEN level instrument CVC-ILT-0227 is repaired, THEN restore VCT INLET/BYPASS VALVE (CVC 169) to AUTO.
	N/A	1.3 IF level instrument CVC-ILT-0226 fails, THEN secure auto makeup to the VCT in accordance with OP-002-005, CHEMICAL AND VOLUME CONTROL, and monitor VCT level using PMC PID A39401, CVCS VOL CONT TK LVL 1.

CAUTION

DIRECT LOCAL DILUTION/BORATION OPERATIONS MUST BE DIRECTED FROM THE CONTROL ROOM. THIS REQUIRES THAT CONTINUOUS COMMUNICATIONS BE ESTABLISHED AND MAINTAINED BETWEEN THE CONTROL ROOM AND THE OPERATOR STATIONED IN BAMT ROOM A. IF COMMUNICATION IS LOST AT ANY TIME, THEN THE LOCAL OPERATOR SHALL IMMEDIATELY SECURE DILUTION/BORATION BY CLOSING MANUAL DIRECT BORATION ISOLATION (BAM 138) AND PMU TO CHG PMP SUCT HDR ISOL (PMU 140).

	N/A	2. IF boric acid OR primary water flow can NOT be established to VCT, THEN makeup directly to Charging Pump suction as follows:

Examiner Note

This event is complete after the ATC places CVC-169 to the VCT position or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 2

Op Test No.:	1	Scenario #	1	Event #	2	Page	3	of 41

Event Description: Safety Ch. C RCS Cold Leg Temp fails high (RC-ITI-0102CC) (T112CC)

Time	Position	Applicant's Actions or Behavior
	ATC	Recognizes and reports indications of failed channel.
		Alarms:
		• RPS CHANNEL TRIP LOCAL PWR DENSITY HI (Cabinet K, A-11)
		• RPS CHANNEL TRIP DNBR LO (Cabinet K, A-12)
		• RPS CHANNEL C TROUBLE (Cabinet K, G-18)
		Indications:
		• RC-ITI-0122CC, CP-7 Channel C Cold Leg Loop 1A indicator fails Hi
		• Red "CPC SENS FAIL" light on CPC Ch C
		• Trip indication Channel C HI LOCAL POWER bistable
		• Trip indication Channel C HI LOW DNBR bistable
Examiner Note **All BOP manipulations for OP-009-007 are located at CP-10 except as noted.**		
OP-009-007, Plant Protection System ,Section 6.2, Trip Channel Bypass Operation		
	SRO	6.2.1 Refer to Attachment 11.11, PPS Bistable Bypass Chart to assist in determination of Trip Channels requiring placement in bypass.
	Note	**SRO determines the following bistables are affected and need to be bypassed:** • **3 - HI LOCAL POWER** • **4 - LO DNBR**
	Note	**SRO directs BOP to bypass the HI LOCAL POWER and LO DNBR bistables in PPS Channel C within 1 hour in accordance with OP-009-007, Plant Protection System.**
	BOP	6.2.2 To place a bistable in or remove a bistable from bypass, go to Attachment 11.10, Trip Channel Bypass Operation.

Op Test No.: 1	Scenario # 1	Event # 2	Page 4 of 41
Event Description:	Safety Ch. C RCS Cold Leg Temp fails high (RC-ITI-0102CC) (T112CC)		

Time	Position	Applicant's Actions or Behavior
OP-009-007, Plant Protection System ,Attachment 11.10, Trip Channel Bypass Operation		
CAUTION (1) ATTEMPTING TO PLACE MORE THAN ONE TRIP CHANNEL IN BYPASS REMOVES BOTH TRIP CHANNELS FROM BYPASS. (2) PRIOR TO PLACING ANY TRIP CHANNEL IN BYPASS, VERIFY BYPASS PUSH BUTTONS ON DE-ENERGIZED PPS BAY NOT DEPRESSED.		
	Note	**BOP circles Channel C.**
	BOP	11.10.1 To Bypass a Trip Channel, perform the following: 11.10.1.1 Circle the bistable numbers selected for bypass under Step 11.10.1.4.
	Note	**BOP circles bistable numbers 3 and 4 in Step 11.10.1.4 table**
	BOP	11.10.1.2 Check desired Trip Channel is not Bypassed on another PPS Channel.
	BOP	11.10.1.3 Open key-locked portion of BCP in desired PPS Channel.
	Note	**The crew should expect annunciator RPS CABINET CONDITION ABNORMAL (Cabinet L, B-1) to actuate when the PPS Channel door is opened.**
	BOP	11.10.1.4 Depress Bypass push buttons for the desired Trip Channels (placekeep below).
	Note	**BOP depresses pushbuttons for bistables 3 and 4 using placekeeping table.**
	Note	**The crew should expect annunciator RPS BISTABLE BY-PASS (Cabinet K, B-18) to actuate when the first bistable is bypassed in the PPS Channel.**
	BOP	11.10.1.5 Check all selected bistable Bypass push buttons remain in a Depressed state.
	BOP	11.10.1.6 Check all selected bistable Bypass lights Illuminate on BCP for the desired Trip Channels.

Op Test No.:	1	Scenario #	1	Event #	2	Page	5	of	41

Event Description: Safety Ch. C RCS Cold Leg Temp fails high (RC-ITI-0102CC) (T112CC)

Time	Position	Applicant's Actions or Behavior
	CREW	11.10.1.7 Check all selected bistable Bypass lights Illuminate on ROM for the desired Trip Channels.
	Note	**Crew verifies correct bistables lit on CP-7 PPS Channel C Remote Operator Module.**
	SRO	Reviews the following Technical Specifications and determines applicable actions: • 3.3.1 action 2 (Bypass w/in 1 hr) • 3.3.3.5 – Not applicable • 3.3.3.6 – Not applicable

Examiner Note

This event is complete when bistables are bypassed and Technical Specifications have been addressed or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 3

Op Test No.:	1	Scenario #	1	Event #	3	Page	6	of	41

Event Description: Charging Pump B Trips

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of Charging Pump B trip.
		Alarms:
		• CHARGING PUMPS HEADER FLOW LO (Cabinet G, H-5)
		• CHARGING PUMP B TRIP/TROUBLE (Cabinet G, B-6)
		Indications:
		• Charging Pump B indicates OFF
		• Charging flow lowering
		• PZR level lowering
		• Letdown flow lowering
Examiner Note		
The SRO may direct the ATC to verify a suction source and start a Charging Pump upon the initial report, prior to entering the off normal.		
	SRO	Enter and direct the implementation of OP-901-112, Charging or Letdown Malfunction.
OP-901-112, Charging or Letdown Malfunction, E_0 – General		
	N/A	1. Stop turbine load changes.
	N/A	2. IF malfunction is due to failure of the Pressurizer Level Control System, THEN go to OP-901-110, PRESSURIZER LEVEL CONTROL MALFUNCTION.
	SRO	3. IF a Charging Malfunction is indicated, THEN go to Subsection E1, Charging Malfunction.
OP-901-112, Charging or Letdown Malfunction, E_1 – Charging Malfunction		
NOTE If all Charging Pumps are secured, then LETDOWN STOP VALVE (CVC 101) will close on high REGEN HX TUBE OUTLET temperature if RCS is ≥470°F.		
CAUTION THE REACTOR COOLANT SYSTEM WILL BE BORATED IF A CHARGING PUMP IS STARTED WITH THE RWSP AS THE MAKEUP WATER SOURCE.		

Op Test No.:	1	Scenario #	1	Event #	3	Page	7	of	41
Event Description:	Charging Pump B Trips								

Time	Position	Applicant's Actions or Behavior
	ATC	1. IF Charging Pumps have tripped, THEN perform the following: 1.1 Verify open EITHER VCT DISCH VALVE (CVC 183) OR RWSP TO CHARGING PUMP (CVC 507). 1.2 IF Letdown has NOT isolated, THEN attempt to restart Charging Pump(s). 1.3 IF the Charging Pump can NOT be restarted, THEN verify closed LETDOWN STOP VALVE (CVC 101). 1.4 IF the reason for the Charging pump trip is corrected AND Pressurizer level is in normal operating band, THEN place Charging and Letdown in service in accordance with Attachment 2.
	N/A	2. IF normal Charging flow can NOT be established AND Pressurizer level falls below minimum Pressurizer level for operation in accordance with Attachment 1, Pressurizer Level Versus Tave Curve, THEN perform the following:
	ATC/BOP	3. IF the PMC is available, THEN display PMC Group CVCS and monitor Charging System parameters to determine cause of Charging malfunction.
	SRO	4. Inspect Charging System for possible cause of malfunction.
	N/A	5. IF a Charging Line rupture has occurred, THEN perform the following:
CAUTION IF HPSI PUMPS ARE OPERATING, THEN CHARGING PUMPS SHOULD NOT BE ALIGNED TO HPSI HEADER.		
NOTE Aligning Charging to HPSI Train A renders HPSI train A INOPERABLE and Charging Pumps INOPERABLE. Enter TS 3.5.2 and 3.1.2.4. Refer to TS 3.5.3.		
	N/A	6. IF flow can NOT be established through the normal Charging Pump discharge path, THEN align Charging Pumps to discharge through HPSI Header A as follows:
	N/A	7. WHEN repairs have been completed to the Charging Header, THEN restore Charging Pumps discharge alignment to normal as follows:
	SRO	Reviews and enters the following Technical Specification: • 3.1.2.4 (Technical Specification) (Restore w/in 72 hrs or shutdown)

Op Test No.:	1	Scenario #	1	Event #	3	Page	8 of 41
Event Description:	Charging Pump B Trips						

Time	Position	Applicant's Actions or Behavior
Examiner Note **The SRO may align the AB Charging pump to replace the B Charging pump to allow exit of Technical Specification 3.1.2.4.**		
OP-002-005, Section 6.2, Charging Pump Operations		
CAUTION (1) THE CONTROL SWITCH FOR AT LEAST ONE OPERABLE CHARGING PUMP SHALL REMAIN IN AUTO OR ON AT ALL TIMES. (2) REFER TO TS 3.1.2.4.		
	ATC	6.2.10 Verify Standby Charging Pumps selector switch in the appropriate Position for the Charging Pump started (Pump in Lead) per Table 6.2-1.

TABLE 6.2-1

PUMP IN LEAD	POSITION
B	AB - A
A	B - AB
AB	A - B

Time	Position	Applicant's Actions or Behavior
	ATC	6.2.11 Place control switch(es) for Standby Charging Pump A(B)(AB) to AUTO.
	ATC	6.2.10 Place Pump AB Assignment switch to the appropriate Position for the Charging Pump A(B)(AB) to be Assigned to Trip on SIAS, per Table 6.2-2.
	Note	**Position 'B' will be selected due to inoperable pump B.**

Op Test No.: 1	Scenario # 1	Event # 3	Page 9 of 41
Event Description:	Charging Pump B Trips		

Time	Position	Applicant's Actions or Behavior

TABLE 6.2-2

ASSIGNED TO TRIP ON SIAS	POSITION
A	A
AB	NORM
B	B

Examiner Note

This event is complete after the ATC aligns the AB Charging pump to replace the B Charging pump and the SRO has evaluated Technical Specifications or at Lead Examiner's discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 4

Op Test No.:	1	Scenario #	1	Event #	4	Page	10	of	41
Event Description:	Steam Generator 2 Level Control Transmitter (SG-ILT-1106)								

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and report indications of failed SG Level instrument
		Alarms
		• SG 2 FW Contl Lvl Signal Dev/Pwr Lost (Cabinet F, T-19)
		• SG 2 Level Hi/Lo (Cabinet F, U-18)
		Indications
		• Controllers for SG 2 shift to Manual: o Main Feedwater Regulating Valve B Controller (FW-IHIC-1121) o Startup Feedwater Regulating Valve B Controller (FW-IHIC-1106) o Main Feedwater Pump B Speed Controller (FW-IHIC-1108)
	SRO	Enter and direct the implementation of OP-901-201, Steam Generator Level Control Malfunction.
OP-901-201, Steam Generator Level Control Malfunction, Section E0, General		
	SRO	1. Go to Attachment 1, General Actions.
OP-901-201, Attachment 1, General Actions		
	SRO	Did a Reactor Trip occur?
		NO – Continues through flow chart
	SRO/BOP	Observe the affected Steam Generator FWCS controllers **AND** note **ANY** controllers that are behaving erratically. **Steam Generator 1** FW IFIC 1111 , S/G 1 FWCS Master Controller FW IHIC 1111 , S/G 1 Main FRV Controller FW IHIC 1105 , S/G 1 S / U FRV Controller FW IHIC 1107 , SGFP A Speed Controller **Steam Generator 2** FW IFIC 1121 , S/G 2 FWCS Master Controller FW IHIC 1121 , S/G 2 Main FRV Controller FW IHIC 1106 , S/G 2 S / U FRV Controller FW IHIC 1108 , SGFP B Speed Controller
	Note	**BOP determines that no controllers are malfunctioning.**

Op Test No.:	1	Scenario #	1	Event #	4	Page	11	of 41

Event Description: Steam Generator 2 Level Control Transmitter (SG-ILT-1106)

Time	Position	Applicant's Actions or Behavior
	SRO/BOP	Place appropriate controllers for the affected FWCS in manual **AND** establish control of S/G level (See Notes 1 & 2).
	Note	**BOP determines proper controllers have transferred to Manual automatically.**
	SRO/BOP	Is the output of the affected FWCS Master Controller behaving erratically?
		NO – continues through flowchart
	SRO/BOP	**Verify** SGFP Discharge pressure for BOTH SGFP's is matched **AND** is greater than S/G pressures.
	N/A	Stop turbine load changes except to match Tave and Tref.
	SRO/BOP	Review the following guidelines **AND** restore S /G level to 50-70% NR: 1. **IF** one SGFP Speed controller is in auto, **THEN** use its output to help set the SGFP Speed controller that is in manual. 2. Momentary taps on the raise **AND** lower buttons of the Main Feedwater Reg Valve Controller have a noticeable impact on associated Steam Generator level. 3. Use the Startup Feedwater Reg Valve Controller to control Steam Generator level at low power levels. 4. Use indications on the unaffected FWCS controllers to help set affected FWCS controllers.
	BOP	Check the following Control Channel indicators to determine if a Control Channel has failed: (See Note 3) • FW IFR 1111, Steam Generator 1 Feedwater Flow (green pen) • FW IFR 1011, Steam Generator 1 Steam Flow (red pen) • FW IFR 1121, Steam Generator 2 Feedwater Flow (green pen) • FW IFR 1021, Steam Generator 2 Steam Flow (red pen) • SG ILR1111, Steam Generator 1 Downcomer Level (green pen) • SG ILR1105, Steam Generator 1 Downcomer Level (red pen) • SG ILR1121, Steam Generator 2 Downcomer Level (green pen) • SG ILR1106, Steam Generator 2 Downcomer Level (red pen)
	Note	**BOP determines SG-ILR-1106, Steam Generator 2 Downcomer Level (red pen) is the failed instrument.**
	SRO/BOP	Control Channel level deviation of >7%?

Op Test No.: 1	Scenario # 1	Event # 4 Page 12 of 41
Event Description:	Steam Generator 2 Level Control Transmitter (SG-ILT-1106)	

Time	Position	Applicant's Actions or Behavior
		YES – continues through flow chart
	BOP	Verify applicable controllers shifted to manual per automatic actions.
	Note	**Controllers for SG 2 that shift to Manual:** **Main Feedwater Regulating Valve B Controller (FW-IHIC-1121)** **Startup Feedwater Regulating Valve B Controller (FW-IHIC-1106)** **Main Feedwater Pump B Speed Controller (FW-IHIC-1108)**
	SRO	Determine **AND** correct the cause of the malfunction.
		• Coverage of the flow chart in Attachment 1 should conclude that the failed instrument is the problem.
		• The SRO should discuss with the BOP necessary contingency actions necessary with the listed controllers in MANUAL. This should include actions on a Reactor trip or on Steam Generator High Level Override.

Examiner Note

This event is complete when the flow chart in Attachment 1 has been completed and the contingencies have been discussed and the <u>BOP has performed manual control during the subsequent power reduction</u>

Or

As directed by the Lead Evaluator

This failure requires additional actions by the BOP during the power reduction and after the Reactor trip later in the scenario.

Examiner Note

Cue the Simulator Operator when ready for Event 5

Op Test No.:	1	Scenario #	1	Event #	5	Page	13	of	41
Event Description:	Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction								

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and report indications of lowering Main Condenser vacuum.
		Alarms
		• Vacuum Pump A Auto Start (Cabinet E, E-1)
		• Vacuum Pump B Auto Start (Cabinet E, E-2)
		• Vacuum Pump C Auto Start (Cabinet E, E-3)
		Indications
		• Condenser Vacuum dropping on any of the following: o PMC alarms A01103 and A10203 o Wide Range Condenser Vacuum (CD-IPI-1902-B2) o Narrow Range Condenser Vacuum (CD-IPI-1901-B) o Condenser Vacuum recorder (CD-IPR-1902-A)
		• At 26 INHG, standby Condenser Vacuum Pump(s) start
	SRO	Enter and direct the implementation of OP-901-220, Loss of Condenser Vacuum.
OP-901-220, Loss of Condenser Vacuum		
	SRO	1. Notify appropriate personnel that Condenser vacuum is dropping.
	N/A	2. <u>If</u> Reactor trip occurs, <u>then</u> perform OP-902-000, Standard Post Trip Actions, <u>concurrently</u> with this procedure.

NOTE

Normally, Circulating Water pumps should not be operated with intake bay river water level less than 0.00 Ft (at -0.7 Ft, consideration should be given to securing the Circulating Water pump) or operating current greater than 350 amps as noted on PMC.

Op Test No.:	1	Scenario #	1	Event #	5	Page	14	of 41
Event Description:	Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction							

Time	Position	Applicant's Actions or Behavior
	SRO/BOP	3. Verify the following: • Sufficient number of Circulating Water Pumps are in operation. • Verify the discharge valves closed for all non-running Circulating Water Pumps. • All operable Condenser Vacuum Pumps are in operation. • All operating Condenser Vacuum Pumps Air Separator sight-glasses are greater than half full of water. • Gland Seal header pressure is maintained between 100 and 140 psig. • Gland Seal pressure being maintained between as follows: o Between 1.3 to 3.0 PSIG for LP Turbine o Between 2.0 to 8.0 PSIG for HP Turbine o Between 2.6 to 5.6 PSIG for for Main Feedwater Pumps • Condenser Vacuum Breaker Seals are full of water.
NOTE Condenser Air Evacuation System is designed to maintain a minimum 25" Hg vacuum at full turbine load. If system is unable to maintain greater than 25" Hg vacuum, then excessive air in-leakage may exist. Refer to UNT-005-042, Determination of Main Condenser Air In-leakage, for assistance.		
	SRO	4. If the Plant is in Modes 1 or 2 and with one or both Main Steam Isolation Valves Open, then perform the following: 4.1 If Condenser vacuum continues to drop below 25" Hg vacuum, then commence Plant power reduction in accordance with OP-901-212, Rapid Down Power. 4.2 If Condenser vacuum has not stabilized and is approaching the Main Turbine Trip value of 20" Hg vacuum, then perform the following: o Trip the Reactor. o Verify Turbine Trip.
	Note	**Vacuum will stabilize between 22 and 24 INHG prompting a rapid plant power reduction.**
OP-901-212, Rapid Plant Power Reduction, E_0, General Actions		
Examiner Note **A Rapid downpower does not have to be started at 30MW/min, but should attempt to eventually reach that value. The SRO will likely select Direct Boration and direct a load reduction rate of ~20 MW/min and acid flow of 15-20 GPM.**		

Op Test No.:	1	Scenario #	1	Event #	5	Page	15	of	41
Event Description:	Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction								

Time	Position	Applicant's Actions or Behavior

NOTE

(1) A rapid power reduction is defined as approximately 30 MW/minute load reduction on the main turbine.

(2) Power Reduction may be stopped at any point.

(3) Some Steps of this procedure may not be applicable due to plant conditions. In these cases SM/CRS may NA the step.

(4) Steps within this procedure may be performed concurrently or out of sequence with SM/CRS concurrence.

(5) During power reduction PMC PID C24650, COLSS DESCENDING PWR TRACK (DUMOUT19), will automatically select and display the correct power indication. OP-010-003, Plant Startup, provides greater detail on which power indications are displayed by PID C24650 based on power level and whether or not the UFM is in service.

(6) Volume Control Tank (VCT) level may lower during the down power. Charging pump suction swaps to the RWSP at 5.5% VCT level. Makeup to the VCT in accordance with OP-002-005, Chemical and Volume Control, may be necessary if boration from the RWSP is not desired.

(7) Manual CEA Subgroup Selection should be evaluated per OP-004-015, Reactor Power Cutback, when power reduction is secured above 65% power.

Time	Position	Applicant's Actions or Behavior
	SRO/ATC	1. Begin RCS Boration by one of the following methods: 1.1 Direct Boration or 1.2 Borate from the RWSP using one or two Charging Pump as follows: 1.2.1 Open RWSP to Charging Pumps Suction Isolation, CVC-507. 1.2.2 Close Volume Control Tank Outlet Isolation, CVC-183. 1.2.3 If necessary, then start another Charging pump
	Note	**The crew will direct borate from the BAMTs per OP-002-005, section 6.7**

Op Test No.:	1	Scenario #	1	Event #	5	Page	16	of	41
Event Description:	Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction								

Time	Position	Applicant's Actions or Behavior

OP-002-005, Section 6.7, Direct Boration to RCS

CAUTION

THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

CAUTION

(1) THIS SECTION AFFECTS REACTIVITY. THIS EVOLUTION SHOULD BE CROSS-CHECKED AND COMPLETED PRIOR TO LEAVING CP-4.

(2) AT LEAST ONE REACTOR COOLANT PUMP IN EACH LOOP SHOULD BE OPERATING PRIOR TO PERFORMING DIRECT BORATION OPERATIONS TO ENSURE PROPER CHEMICAL MIXING.

	ATC	6.7.1 Inform SM/CRS that this Section is being performed.

NOTE

When performing a Plant down power where final RCS Boron Concentration needs to be determined, the following Plant Data Book figure(s) will assist the Operator in determining the required RCS Boron PPM change.

- 1.2 Power Defect Vs Power Level
- 1.4.3 Inverse Boron Worth Vs. T_{mod} at BOC
- 1.4.4 Inverse Boron Worth Vs. T_{mod} at Peak Boron
- 1.4.5 Inverse Boron Worth Vs. T_{mod} at MOC
- 1.4.6 Inverse Boron Worth Vs. T_{mod} at EOC

	ATC	6.7.2 At SM/CRS discretion, calculate volume of Boric Acid to be added on Attachment 11.6, Calculation of Boric Acid Volume for Direct Boration or VCT Borate Makeup Mode.
	Note	**The crew will most likely use Boric Acid volume in the reactivity sheet provided by Reactor Engineering.**
	ATC	6.7.3 Set Boric Acid Makeup Batch Counter to volume of Boric Acid desired.
	ATC	6.7.4 Verify Boric Acid Makeup Pumps selector switch aligned to desired Boric Acid Makeup Pump A(B).
	ATC	6.7.5 Place Direct Boration Valve, BAM-143, control switch to AUTO.

Op Test No.:	1	Scenario #	1	Event #	5	Page	17	of	41
Event Description:	Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction								

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.6 Place Makeup Mode selector switch to BORATE.
	ATC	6.7.7 Verify selected Boric Acid Makeup Pump A(B) Starts.
	ATC	6.7.8 Verify Direct Boration Valve, BAM-143, Opens.

NOTE

The Boric Acid Flow Totalizer will not register below 3 GPM. The Boric Acid Flow Totalizer is most accurate in the range of 10 - 25 GPM.

Time	Position	Applicant's Actions or Behavior
	Note	**ATC will likely use manual boric acid flow control. "CVCS Boric Acid Makeup Flow Hi/Lo" on CP-4 is an expected annunciator. Acid flow can be seen on the red pen of recorder BAM-IFR-0210Y on CP-4.**
	ATC	6.7.9 If manual control of Boric Acid flow is desired, then perform the following: 6.7.9.1 Verify Boric Acid Flow controller, BAM-IFIC-0210Y, in Manual. 6.7.9.2 Adjust Boric Acid Flow controller, BAM-IFIC-0210Y, output to >3 GPM flow rate.
	ATC	6.7.10 If automatic control of Boric Acid flow is desired, then perform the following: 6.7.10.1 Place Boric Acid Flow controller, BAM-IFIC-0210Y, in Auto. 6.7.10.2 Adjust Boric Acid Flow controller, BAM-IFIC-0210Y, setpoint potentiometer to >3 GPM flow rate.
	ATC	6.7.11 Verify Boric Acid Makeup Control Valve, BAM-141, Intermediate or Open.
	ATC	6.7.12 Observe Boric Acid flow rate for proper indication.
	ATC	6.7.13 When Boric Acid Makeup Batch Counter has counted down to desired value, then verify Boric Acid Makeup Control Valve, BAM-141, Closed.

Op Test No.:	1	Scenario #	1	Event #	5	Page	18	of 41
Event Description:	Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction							

Time	Position	Applicant's Actions or Behavior
NOTE Step 6.7.14 may be repeated as necessary to achieve desired total boron addition for plant conditions.		
	ATC	6.7.14 If additional boric acid addition is required and with SM/CRS permission, then perform the following: 6.7.14.1 Reset Boric Acid Makeup Batch Counter. 6.7.14.2 Verify Boric Acid Makeup Control Valve, BAM-141, Intermediate or Open. 6.7.14.3 Observe Boric Acid flow rate for proper indication. 6.7.14.4 When Boric Acid Makeup Batch Counter has counted down to desired value, then verify Boric Acid Makeup Control Valve, BAM-141, Closed.
	ATC	6.7.15 Verify Boric Acid Flow controller, BAM-IFIC-0210Y, in Manual.
	ATC	6.7.16 Verify both Boric Acid Flow controller, BAM-IFIC-0210Y, output and setpoint potentiometer set to zero.
	ATC	6.7.17 Place Makeup Mode selector switch to MANUAL.
	ATC	6.7.18 Verify Selected Boric Acid Makeup Pump A (B) Stops.
	ATC	6.7.19 Verify Direct Boration Valve, BAM-143, Closed.
	ATC	6.7.20 Place Direct Boration Valve, BAM-143, control switch to CLOSE.
OP-901-212, Rapid Plant Power Reduction, E_0, General Actions (cont.)		
NOTE To prevent Pressurizer heater cutout, avoid operating with Pressurizer pressure near the heater cutout pressure of 2270 PSIA while on Boron Equalization.		
	ATC	2. Perform Boron Equalization as follows: 2.1 Place available Pressurizer Pressure Backup Heater Control Switches to ON.

Op Test No.:	1	Scenario #	1	Event #	5	Page	19	of 41

Event Description: Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction

Time	Position	Applicant's Actions or Behavior
	ATC	2.2 Reduce Pressurizer Spray Valve Controller (RC-IHIC-0100) setpoint potentiometer to establish spray flow and maintain RCS pressure 2250 PSIA (2175 – 2265).

CAUTION

REFER TO TECHNICAL SPECIFICATION 3.1.3.6 FOR TRANSIENT INSERTION LIMITS.

	ATC	3. Operate CEAs in accordance with OP-004-004, Control Element Drive, to maintain ASI using CEA Reg. Group 5, 6 or Group P Control Element Assemblies in accordance with OP-010-005, Plant Shutdown, Attachment 9.10, Axial Shape Control Guidelines.

OP-004-004, Section 6.7, Operation of CEAs in Manual Group (MG) Mode

CAUTION

(1) CRITICALITY SHALL BE ANTICIPATED ANY TIME CEAS ARE WITHDRAWN AND THE REACTOR IS NOT CRITICAL.

(2) OBSERVE APPLICABLE GROUP INSERTION LIMITS IN ACCORDANCE WITH TECHNICAL SPECIFICATION 3.1.3.6 (REG GROUP), AND TECHNICAL SPECIFICATION 3.1.3.5 (SHUTDOWN BANKS).

(3) IMPROPER OPERATION OF CEAS IN MANUAL GROUP MODE MAY CAUSE A REACTOR TRIP BASED ON AN OUT-OF-SEQUENCE CONDITION.

(4) CEA INITIALIZATION PROGRAM MUST BE RUNNING IN THE PLANT MONITORING COMPUTER TO HAVE GROUP STOPS AND SEQUENTIAL PERMISSIVES AVAILABLE.

CAUTION

THIS SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY. [INPO 06-006]

	ATC	6.7.1 Verify Plant Monitoring Computer operable in accordance with OP-004-012, Plant Monitoring Computer.
	ATC	6.7.2 Position Group Select switch to desired group.
	Note	**The crew should use group P or Regulating Group 6 CEAs.**

Op Test No.:	1	Scenario #	1	Event #	5	Page	20	of	41
Event Description:	Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction								

Time	Position	Applicant's Actions or Behavior
NOTE The Operator should remain in the area in front of the CEA Drive Mechanism Control Panel when the Mode Select switch is not in OFF.		
	ATC	6.7.3 Place Mode Select switch to MG and verify the following: • White lights Illuminated on Group Selection Matrix for selected group • MG light Illuminates

	ATC	6.7.4 Operate CEA Manual Shim switch to WITHDRAW or INSERT group to desired height while monitoring the following:
		• CEA Position Indicator selected CEA group is moving in desired direction
		• If Reactor is critical, then monitor the following:
		  • Reactor Power
		  • Reactor Coolant System (RCS) temperature
		  • Axial Shape Index (ASI)

	ATC	6.7.5 When desired set of moves have been completed, then place Mode Select switch to OFF.
OP-901-212, Rapid Plant Power Reduction, E_0, General Actions (cont.)		
	SRO	4. Notify the Woodlands System Load Dispatcher that a rapid power reduction is in progress.
	BOP	5. Announce to Station Personnel over the Plant Paging System that a rapid plant power reduction is in progress.
	ATC	6. Maintain RCS Cold Leg Temperature 536°F to 549°F.
	Note	**BOP may use OP-005-007, Sect. 6.2 instead of step 7 below which accomplishes the same thing.**
	BOP	7. Commence Turbine load reduction by performing the following: 7.1 Depress LOAD RATE MW/MIN pushbutton.
	BOP	7.2 Set selected rate in Display Demand Window.
	BOP	7.3 Depress ENTER pushbutton.

Op Test No.:	1	Scenario #	1	Event #	5	Page	21	of	41

Event Description: Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction

Time	Position	Applicant's Actions or Behavior
	BOP	7.4 Depress REFERENCE pushbutton.
	BOP	7.5 Set desired load in Reference Demand Window.
	BOP	7.6 Depress ENTER pushbutton.
	BOP	7.7 Depress GO pushbutton.
NOTE If USBSCAL is not in service, the COLSS Steam Calorimetric will be automatically disabled when MSBSCAL, PMC PID C24246, drops below 95% Power, and will revert back to FWBSCAL, PMC PID C24235. This may result in a step change in COLSS indicated Plant Power (BSCAL) of up to 1.0% when this occurs.		
	SRO/ATC	8. <u>When</u> Reactor Power consistently indicates less than 98% power, as indicated on PMC PID C24631 [MAIN STEAM RAW POWER (MSBSRAW)], <u>or</u> an alternate point provided by Reactor Engineering, <u>then</u> verify the value of C24648 [BSCAL SMOOTHING VAL. APPLD (DUMOUT17)] automatically changes to 1.
	N/A	9. <u>If</u> C24648 does not automatically change to 1, <u>then</u> inform Reactor Engineering <u>and</u> set the value of 1 for COLSS power smoothing constant K24250, [ADDRSSBL SMOOTHING FOR BSCAL (ALPHA)] in accordance with OP-004-005, Core Operating Limits Supervisory System.
	SRO/BOP	10. Following a Reactor Power change of >15% within a one hour period, direct Chemistry Department to sample Reactor Coolant System (RCS) for an isotopic iodine analysis two to six hours later.
	BOP	11. <u>When</u> Condensate flow is <18,000 gpm, <u>verify</u> Gland Steam Condenser Bypass, CD-154, Closed (PMC PID D02404).
	BOP	12. Monitor Condensate Polisher differential pressure <u>and</u> remove Polishers from service to maintain system pressure in accordance with OP-003-031, Condensate Polisher/Backwash Treatment.
	BOP	13. <u>When</u> Reactor Power is approximately 70% <u>or</u> Heater Drain Pump flow is unstable, <u>then</u> remove Heater Drain Pumps from service by taking pump control switches to Stop.

Op Test No.:	1	Scenario #	1	Event #	5	Page	22	of	41
Event Description:	Main Condenser Leak, Lowering Vacuum, Rapid Plant Power Reduction								

Time	Position	Applicant's Actions or Behavior

Examiner Note
This event is complete after the Reactivity Manipulation is satisfied and the BOP has controlled SG level in manual or at Lead Examiner's discretion.
Examiner Note
Cue the Simulator Operator when ready for Event 6

Op Test No.:	1	Scenario #	1	Event #	6	Page	23	of	41

Event Description: RCP 2A Locked Rotor/Automatic Reactor Trip Fails

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of RCP trip and no Auto RX Trip
		Alarms:
		• RCP 2A TRIP/TROUBLE (Cabinet H, A-7)
		• RCP 2A LUBE OIL PRESSURE LO (Cabinet H, E-7)
		• RCP 2A VIBRATION HI (Cabinet H, A-8)
		• RCP 2A CCW FLOW LO (Cabinet H, H-7)
		• CEA WITHDRAWAL PROHIBIT (Cabinet H, M-7)
		• RCP 2A CCW FLOW LOST (Cabinet SA(SB), A-3(8))
		• RPS CHANNEL TRIP LOCAL PWR DENSITY HI (Cabinet K, A-11)
		• RPS CHANNEL TRIP DNBR LO (Cabinet K, A-12)
		• LOCAL PWR DENSITY HI PRETRIP A/C(B/D) (Cabinet K, B(C)-11)
		• DNBR LO PRETRIP A/C(B/D) (Cabinet K, B(C)-12)
		• RPS CHANNEL TRIP COOLANT FLOW LOST (Cabinet K, D-12)
		• RPS CHANNEL A(B)(C)(D) TROUBLE (Cabinet K, E(F)(G)(H)-18)
		Indications:
		• RCP 2A STOP light and Yellow Trip indication
		• RCP 2A Oil Lift Pumps running
		• RCP 2A motor amps indicate 0amps
		• RCP 2A ΔP lowering
		• Trip indication Channel A(B)(C)(D) HI LOCAL POWER bistables
		• Pre-Trip indication Channel A(B)(C)(D) HI LOCAL POWER bistables
		• Trip indication Channel A(B)(C)(D) LOW DNBR bistables
		• Pre-Trip indication Channel A(B)(C)(D) LOW DNBR bistables
		• Trip indication Channel A(B)(C)(D) SG LO FLOW bistables
		• All Reactor Trip breakers remain closed
		• All CEAs remain withdrawn

CRITICAL TASK 1

Establish Reactivity Control

This task is satisfied by manually tripping the reactor using the manual pushbuttons, Diverse Reactor Trip, or de-energizing bus 32A and 32B within 1 minute of exceeding a PPS limit.

This task becomes applicable following the RCP trip. (OP-902-000, 1.a.1)

Op Test No.:	1	Scenario #	1	Event #	6	Page	24	of	41
Event Description:	RCP 2A Locked Rotor/Automatic Reactor Trip Fails								

Time	Position	Applicant's Actions or Behavior
	ATC	Manually Trip the Reactor (**CRITICAL**)
OP-902-000, Standard Post Trip Actions		
	Note	**During Standard Post Trip Actions, one crew member (typically the BOP) will go to a back panel to restore radiation monitor sample pumps due to some sample pumps requiring restart following a loss of power or voltage dip (i.e. plant loads transfer from UATs to SUTs).**
NOTE Steps 1 and 2 are immediate actions and satisfy Reactivity Control		
	ATC	1. Determine Reactivity Control acceptance criteria are met: a. Check reactor power is dropping. b. Check startup rate is negative. c. Check less than **TWO** CEAs are **NOT** fully inserted.
	ATC	a.1 Perform the following as necessary to insert CEAs: 1) Manually trip the Reactor.
	BOP	2. Verify Main Turbine and Generator tripped: a. Check the Main Turbine is tripped: • Governor valves closed • Throttle valves closed • Turbine Speed lowering
	BOP	b. Check the Main Generator is tripped: • GENERATOR BREAKER A tripped • GENERATOR BREAKER B tripped • EXCITER FIELD BREAKER tripped

Op Test No.: 1	Scenario # 1	Event # 6 Page 25 of 41
Event Description:	RCP 2A Locked Rotor/Automatic Reactor Trip Fails	

Time	Position	Applicant's Actions or Behavior
	BOP	3. Verify maintenance of Vital Auxiliaries a. Check station loads are energized from Off-site power as follows: **Train A** • A1, Non-Safety bus • A2, Non-Safety bus • A3, Safety bus • A-DC Electrical bus • A and C vital AC Instrument Channels **Train B** • B1, Non-Safety bus • B2, Non-Safety bus • B3, Safety bus • B-DC Electrical bus • B and D vital AC Instrument Channels b. Verify CCW flow to RCPs
	ATC	4. Verify RCS Inventory Control: a. Check that **BOTH** of the following conditions exist: • Pressurizer level is 7% to 60% • Pressurizer level is trending to 33% to 60% b. Check RCS subcooling is greater than or equal to 28ºF.
	ATC	5. Check RCS Pressure control: • Pressurizer pressure is 1750 psia to 2300 psia • Pressurizer pressure is trending to 2125 psia to 2275 psia
	ATC	6. Check Core Heat Removal: a. At least **ONE** RCP is operating. b. Operating loop ΔT less than 13ºF. c. RCS subcooling greater than or equal to 28ºF.

Examiner Note

This event is complete after the crew has checked Core Heat Removal or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 7

Op Test No.:	1	Scenario #	1	Event #	7	Page	26	of 41

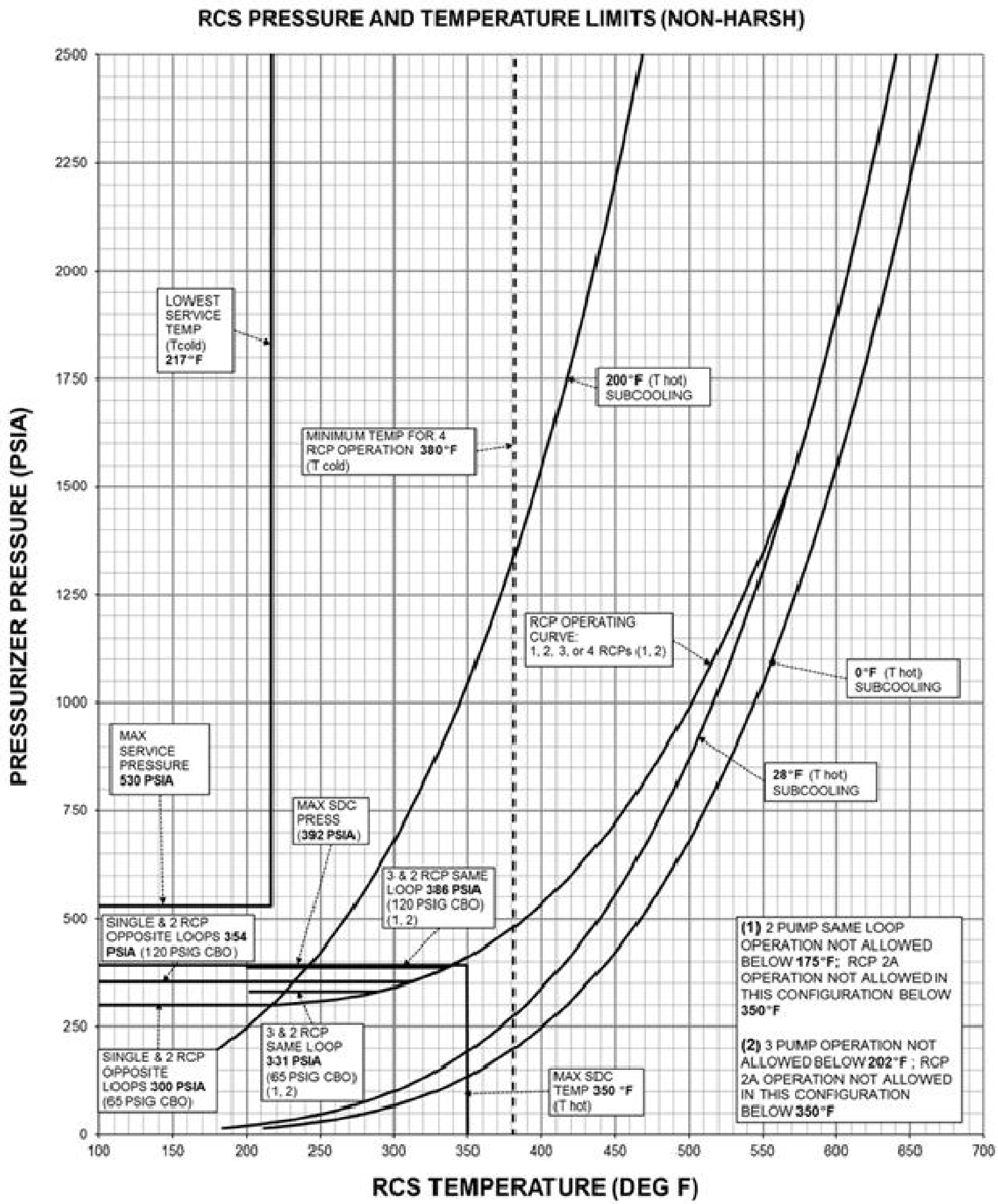
Event Description: Main Steam Line Break Outside Containment (SG 1)

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of a Main Steam Line Break (Excess Steam Demand)
		Alarms:
		• N/A
		Indications:
		• Lowering RCS temperatures Tavg, Th, Tc CP-2, CP-7
		• Lowering Pressurizer Level CP-2, CP-8
		• Lowering Pressurizer Pressure CP-2, CP-7
		• Lowering Steam Generator Pressure CP-1, CP-8
		• Lowering Steam Generator Level CP-1, CP-8
OP-902-000, Standard Post Trip Actions (Cont.)		
Examiner Note **Pressurizer pressure will eventually lower below the 2 thresholds (1684; 1621 PSIA) after the Pressurizer empties.**		
	ATC	5.2 **IF** PZR pressure is less than 1684 psia, **THEN** verify **BOTH** of the following have initiated. • SIAS • CIAS
	Note	**If directed by the SRO, the ATC will initiate Safety Injection Actuation (SIAS), Main Steam Isolation (MSIS) and Containment Isolation Actuation (CIAS) at CP-7.**
	ATC	5.3 **IF** PZR pressure is less than 1621 psia, **THEN** verify **ONE** RCP in each loop is stopped.
	ATC	5.4 **IF** PZR pressure is less than the minimum RCP NPSH of Appendix 2-A-B, "RCS Pressure and Temperature Limits", **THEN** stop **ALL** RCPs.
Examiner Note **Appendix 2-A is contained on the next page. Conditions should allow for 2 RCPs to remain running.**		

Op Test No.: 1	Scenario # 1	Event # 7	Page 27 of 41
Event Description:	Main Steam Line Break Outside Containment (SG 1)		

Time	Position	Applicant's Actions or Behavior

Attachment 2-A



Op Test No.:	1	Scenario #	1	Event #	7	Page	28	of	41
Event Description:	Main Steam Line Break Outside Containment (SG 1)								

Time	Position	Applicant's Actions or Behavior
	BOP	7. <u>Verify</u> RCS Heat Removal: a. <u>Check</u> that at least **ONE** SG has **BOTH** of the following: • SG level is 10% to 76% NR • Feedwater is available to restore level within 55%-70% NR
	BOP	b. <u>Check</u> Feedwater Control in Reactor Trip Override: • MAIN FW REG valves are closed • STARTUP FW REG valves are 13% to 21% open • Operating Main Feedwater pumps are 3800 rpm to 4000 rpm
	BOP	b.1 Manually operate the Feedwater control system.
	Note	**If Main Steam Isolation Signal (MSIS) is <u>not</u> actuated, the BOP should manually close MAIN FW REG valve B using controller FW-IHIC-1121 and throttle (13-21% open) STARTUP FW REG valve B using controller FW-IHIC-1106.**
	ATC	c. <u>Check</u> RCS T_C is 530 to 550 ºF.
	SRO	c2. **IF** RCS Tc is less than 530 ºF, **THEN** <u>perform</u> the following: • **IF** RCS Tc is being controlled by an ESD, **THEN** <u>stabilize</u> RCS temperature with the least affected SG using Appendix 13, "Stabilize RCS Temperature".
	Note	**After Excess Steam Demand is identified, the SRO should direct the ATC and/or the BOP (usually the BOP) to monitor for the trigger points for the need to stabilize Reactor Coolant System temperature.** **Critical parameters are <u>Pressurizer pressure rising</u> and <u>Reactor Coolant System Representative CET temperature rising</u>.** **Steps for stabilizing Reactor Coolant System temperature following an excess steam demand are contained in 2 procedures. Either procedure is acceptable.** • **Appendix 13 (may be used if the SRO has not yet reached step 18 in OP-902-004, Excess Steam Demand Recovery)** • **Step 18 of OP-902-004 (used if the crew has entered OP-902-004 and Appendix 13 has not been implemented)**

Op Test No.:	1	Scenario #	1	Event #	7	Page	29	of 41
Event Description:	Main Steam Line Break Outside Containment (SG 1)							

Time	Position	Applicant's Actions or Behavior
<u>CRITICAL TASK 2</u> **Establish RCS Pressure and Temperature Control** **This task is satisfied by manually feeding and steaming the unaffected Steam Generator to stabilize RCS temperature and pressure prior to exiting the step to stabilize RCS temperature in OP-902-004, Excess Steam Demand Recovery and take action to achieve and maintain less than 1600 PSID across the affected Steam Generator.** **This task becomes applicable once CET temperature and PZR pressure begins to rise following the ESDE. (OP-902-004, step 18 or OP-902-009, App. 13)**		
OP-902-009, Appendix 13, Stabilize RCS Temperature (includes HPSI Throttle Criteria)		
NOTE Actions to stabilize RCS temperature following an excess steam demand event should be initiated when BOTH of the following parameters are met: • CET temperatures rise • Pressurizer pressure rise		
Examiner Note **Least affected SG is #2**		
		1. For the LEAST AFFECTED SG:
	BOP	a. <u>Place</u> the ADV to manual and fully open ADV.
	BOP	b. Manually <u>initiate</u> EFAS.
	BOP	c. <u>Place</u> the EFW Flow Control valve to manual and <u>commence</u> feeding.
	BOP	d. <u>Perform</u> **ANY** of the following as necessary to establish RCS pressure and temperature control • <u>Throttle</u> associated SG ADV. • <u>Adjust</u> associated SG EFW flow.
	BOP	2. **IF** RCS pressure is greater than or equal to 1500 psia, **THEN** <u>stabilize</u> RCS pressure at a value not to exceed 1600 psid between the RCS and the lowest SG pressure.

Op Test No.:	1	Scenario #	1	Event #	7	Page	30	of	41

Event Description: Main Steam Line Break Outside Containment (SG 1)

Time	Position	Applicant's Actions or Behavior
	BOP	3. **IF** RCS is less than 1500 psia, **THEN** stabilize RCS pressure greater than HPSI shutoff head (1500-1600 psia).
	ATC/BOP	*4. **IF** HPSI pumps are operating, **AND ALL** of the following conditions are satisfied: • RCS subcooling is greater than or equal to 28ºF • Pressurizer level is greater than 7% [23%] and controlled • At least **ONE** Steam Generator level is being maintained or restored to within **ANY** of the following: o 55 to 70% NR [60-80% NR] using MFW o 55 to 70% NR [60-80% NR] using EFW in auto or manual • RVLMS indicates level higher than Hot Leg by at least ONE of the following: o QSPDS level 5 **NOT** voided o VESSEL LEVEL PLENUM greater than or equal to 80% **THEN** perform **ANY** of the following: • Throttle HPSI flow. • Stop **ONE** HPSI pump at a time.
OP-902-000, Standard Post Trip Actions (Cont.)		
	BOP	d. Check Steam Generator pressure is 885 psia to 1040 psia.
	BOP	d.1 **IF** SG pressure less than or equal to 666 psia, **THEN** verify MSIS is initiated. d.2 **IF** steam generator pressure is less than 885 psia, **THEN** perform **ALL** of the following: 1) Verify steam bypass valves are closed. 2) Verify ADVs are closed.
	BOP	e. Reset Moisture Separator reheaters and check the Temperature Control valves closed.
	ATC	8. Verify Containment Isolation: a. Check Containment pressure is less than 16.4 psia. b. Check NO Containment Area Radiation monitor alarms OR unexplained rise in activity. c. Check NO Steam Plant Activity monitor alarms OR unexplained rise in activity.

Op Test No.:	1	Scenario #	1	Event #	7	Page	31	of 41

Event Description: Main Steam Line Break Outside Containment (SG 1)

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	9. Verify Containment Temperature and Pressure Control: • Check Containment temperature is less than or equal to 120ºF. • Check Containment pressure is less than 16.4 psia.
	SRO	10. GO TO Appendix 1, "Diagnostic Flowchart" and diagnose to appropriate EOP.
OP-902-009, Standard Appendices, Appendix 1 Diagnostic Flow Chart		
Examiner Note **Appendix 1 is a flow chart used to diagnose to the correct recovery procedure for the event in progress. The steps below will be followed by a YES or NO to indicate proper flow path.**		
	ATC	Is Reactivity Control met? (YES)
	BOP	Is at least **ONE** 125 VDC **SAFETY** bus energized? (YES)
	BOP	Is at least **ONE** 4.16 KV **NON-SAFETY** bus energized? (YES)
	BOP	Is at least **ONE** 4.16 KV **SAFETY** bus energized? (YES)
	ATC	Is at least **ONE** RCP running? (YES)
	BOP	Does at least **ONE** SG have adequate FW? (Note 2) (YES)
	ATC	Is PZR pressure >1750 psia **AND** stable or rising? (NO)
	ATC	Is RCS Subcooling <28F **AND** stable or lowering? (NO)
	BOP	Are **BOTH** SG pressures >885 psia **AND** stable or rising? (NO)
	SRO	**CONSIDER** ESD OP-902-004
	ATC	Is CNTMT pressure <16.4 psia **AND** stable or lowering? (YES)
	ATC/BOP	Is SGTR indicated? (Note 3) (NO)
	BOP	Are **BOTH** SG pressures >885 psia **AND** stable or rising? (Note 5) (NO)

Op Test No.:	1	Scenario #	1	Event #	7	Page	32	of 41

Event Description: Main Steam Line Break Outside Containment (SG 1)

Time	Position	Applicant's Actions or Behavior
	SRO	**CONSIDER** ESD OP-902-004
	SRO	Are **ALL** acceptance criteria satisfied? (NO)
	SRO	Has **ANY** event been diagnosed? (YES)
	SRO	Can a single event be diagnosed? (Note 4) (YES)
	SRO	**GO TO** Appropriate EOP
	Note	**SRO goes to OP-902-004, Excess Steam Demand Recovery**
	Note	**The BOP may secure AH-12 A or B on SRO direction after initiation of SIAS at CP-18.**
Examiner Note		
The SRO may pull up step 18 to stabilize RCS temperature depending on plant conditions. Step 16 contains actions to isolate Steam Generator #1; step 20 contains HPSI throttle criteria.		
OP-902-004, Excess Steam Demand Recovery		
NOTE The Shift Chemist should be notified if a SIAS or CIAS has occurred. The secondary sampling containment isolation valves should not be opened following a SIAS or CIAS until directed by the Shift Chemist.		
	SRO/STA	*1. Confirm diagnosis of an ESD: a. Monitor the SFSCs and check Safety Function Status Check Acceptance criteria are satisfied. b. **IF** Steam Generator sample path is available, **THEN** direct Chemistry to sample **BOTH** Steam Generators for activity.
	Crew	*2. Announce an Excess Steam Demand is in progress using the plant page.
	SRO	*3. Advise the Shift Manager to implement the Emergency Plan using EP-001-001, "Recognition & Classification of Emergency Condition".
	SRO	*4. REFER TO Section 6.0, "Placekeeper" and record the time of the reactor trip.

Op Test No.:	1	Scenario #	1	Event #	7	Page	33	of 41
Event Description:		Main Steam Line Break Outside Containment (SG 1)						

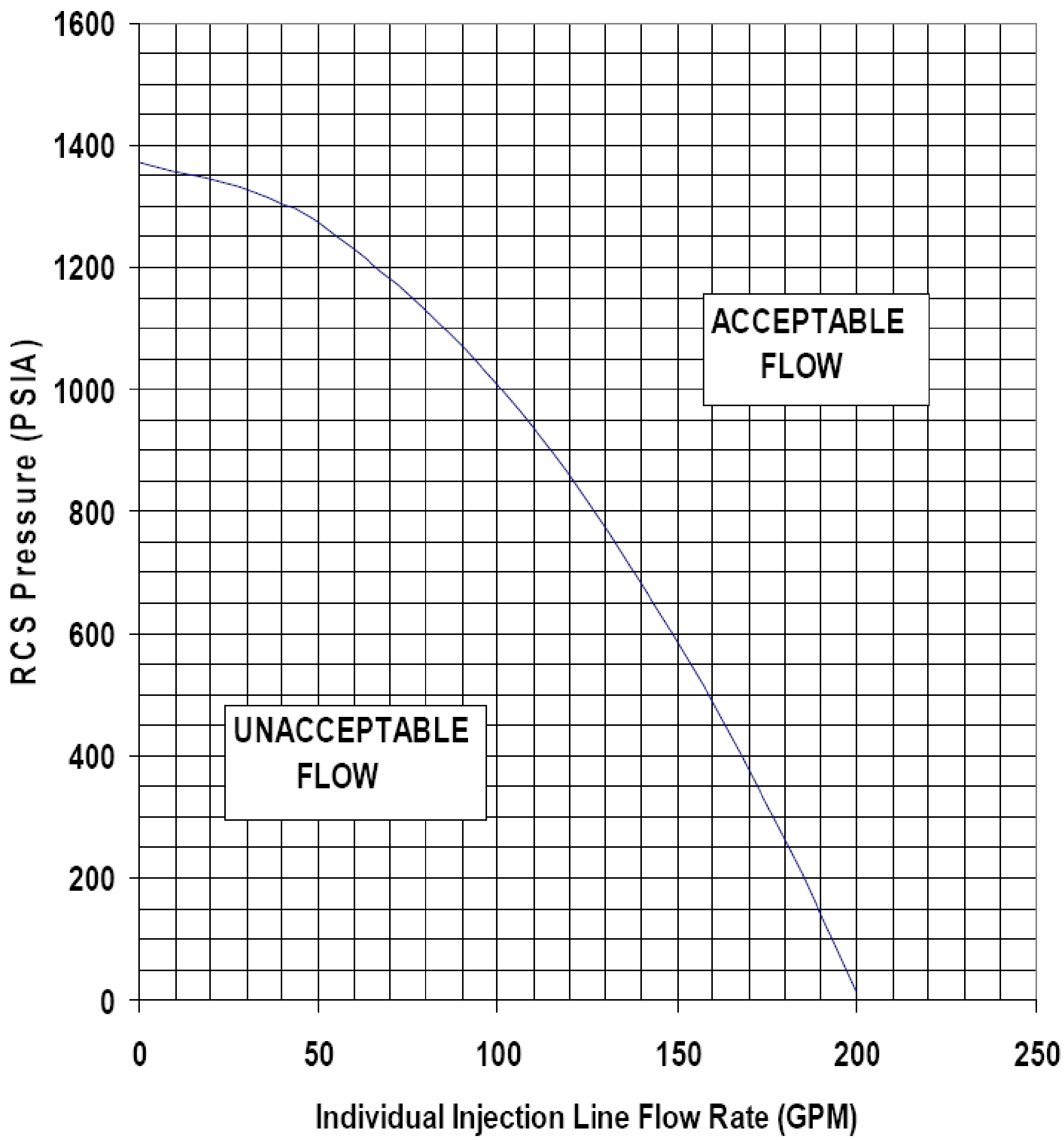
Time	Position	Applicant's Actions or Behavior
	N/A	*5. **IF** power has been interrupted to either 3A or 3B Safety bus, **THEN** perform Appendix 20, "Operation of DCT Sump Pumps."
	ATC/BOP	* 6. Check SIAS has actuated.
	ATC/BOP	6.1 IF PZR pressure is less than 1684 psia, OR CNTMT pressure greater than or equal to 17.1 psia, THEN verify SIAS has initiated.
	ATC/BOP	* 7. IF SIAS has actuated, THEN perform the following: a. Verify Safety Injection pumps have started. b. Check Safety Injection flow is within BOTH of the following: o Attachment 2-E, "HPSI Flow Curve" o Attachment 2-F, "LPSI Flow Curve" c. Verify ALL available Charging pumps are operating. d. IF RWSP on Purification, THEN isolate RWSP using Appendix 40 "Isolate RWSP from Purification."

Examiner Note

HPSI and LPSI flow curves are included in the next two pages. Injection flow should be satisfactory.

Op Test No.: 1	Scenario # 1	Event # 7	Page 34 of 41
Event Description:	Main Steam Line Break Outside Containment (SG 1)	
Time	Position	Applicant's Actions or Behavior

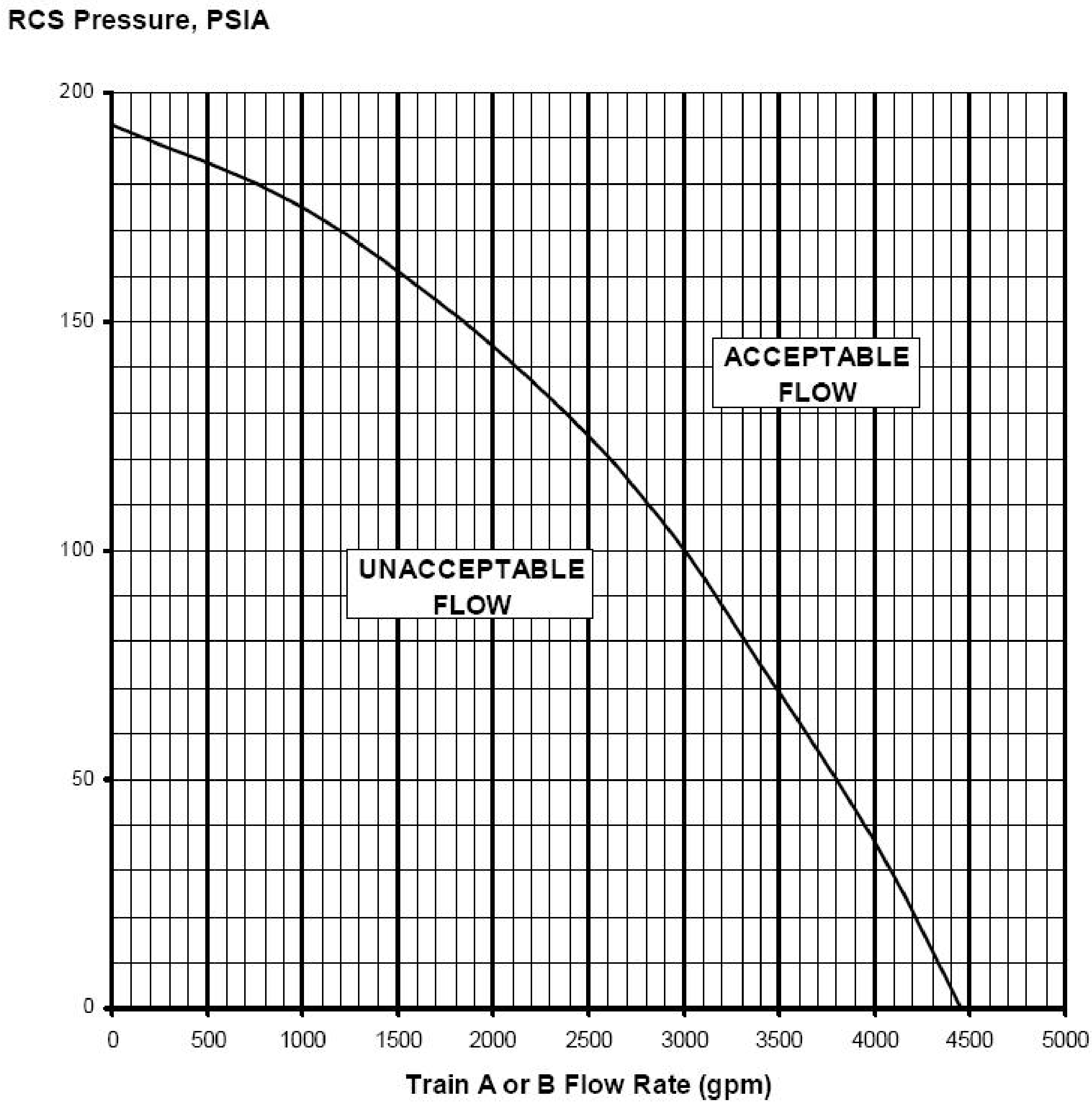
Attachment 2-E: HPSI Flow Curve



Op Test No.:	1	Scenario #	1	Event #	7	Page	35	of	41
Event Description:	Main Steam Line Break Outside Containment (SG 1)								

Time	Position	Applicant's Actions or Behavior

Attachment 2-F: LPSI Flow Curve



Op Test No.:	1	Scenario #	1	Event #	7	Page	36	of	41
Event Description:	Main Steam Line Break Outside Containment (SG 1)								

Time	Position	Applicant's Actions or Behavior
	BOP	8. Verify MSIS Actuation.
	ATC	* 9. **IF** PZR pressure is less than 1621 psia, **AND** SIAS is actuated, **THEN** perform the following: a. Verify **ONE** RCP in each loop is stopped. b. Check Pressurizer pressure is greater than the minimum RCP NPSH of Attachment 2A-D, "RCS Pressure and Temperature Limits."
	ATC	* 10. **IF** RCPs are operating, **THEN** perform the following: a. Verify CCW available to RCPs. b. **IF** a CSAS is initiated, **THEN** stop **ALL** RCPs. c. **IF** RCS TC is less than 380ºF **[384ºF]**, **THEN** verify **ONE** RCP in each loop is stopped. d. Check RCP operating parameters: • NPSH, REFER TO Attachment 2A-D, "RCS P-T Limits" • Bearing temperatures less than or equal to 225°F • Bleed Off temperature less than 200°F • Cooling Coils Return CCW temp less than 155°F • At Least Two Seals per RCP operable
	BOP	*11. Perform **BOTH** of the following to protect the Main condenser: • Verify CW System in operation. REFER TO OP-003-006, "Circulating Water." • Check Condenser vacuum greater than 14 inches Hg.
	BOP	11.1 Perform the following: a. Verify **BOTH** MSIVs are closed: • MS 124A, MSIV 1 • MS 124B, MSIV 2 b. Verify **ALL** Steam Generator Blowdown Isolation valves are closed: • BD 102A, STM GEN 1 (IN) • BD 102B, STM GEN 2 (IN) • BD 103A, STM GEN 1 (OUT) • BD 103B, STM GEN 2 (OUT)

Op Test No.: 1	Scenario # 1	Event # 7	Page 37 of 41

Event Description: Main Steam Line Break Outside Containment (SG 1)

Time	Position	Applicant's Actions or Behavior
	BOP	* 12. Check CCW operation: a. Check a CCW pump is operating for each energized 4.16 KV Safety bus: • 3A Safety bus • 3B Safety bus
	N/A	b. **IF** only **ONE** CCW pump operating, **THEN** split CCW headers using Appendix 35, "Single CCW Pump Operation."
	BOP	c. Check an Essential chiller is operating for EACH energized 4.16 KV Safety bus: • 3A Safety bus • 3B Safety bus
	Note	**BOP checks Essential Chillers running on CP-18.**
	Crew	*13. Check ESD break flow is still in progress.
	ATC/BOP	* 14. Determine the MOST AFFECTED SG by considering **ALL** of the following: • High steam flow from SG • Dropping SG pressure • Dropping SG level • Dropping RCS Cold Leg temperature
	N/A	*15. **IF BOTH** SGs are equally affected, **AND** suspect that the break is in the EFW Pump AB Steam Supply line, **THEN** perform the following:
		* 16. Isolate the MOST AFFECTED SG as follows:
	BOP	a. Verify MS 124A, MSIV 1 is closed.
	BOP	b. Verify FW 184A, MFIV 1 is closed.
	BOP	c. Verify MS 116A, ADV 1 is closed and the controller in manual.
	BOP	d. Verify EFW Isolation valves are closed: • EFW 228A, SG 1 PRIMARY • EFW 229A, SG 1 BACKUP

Op Test No.:	1	Scenario #	1	Event #	7	Page	38	of	41

Event Description: Main Steam Line Break Outside Containment (SG 1)

Time	Position	Applicant's Actions or Behavior
	BOP	e. Place EFW FLOW CONTROL valves in MAN and THEN close: • EFW 224A, SG 1 PRIMARY • EFW 223A, SG 1 BACKUP
	BOP	f. Close MS 401A, PUMP AB TURB STM SUPPLY SG 1.
	BOP	g. Close Main Steam Line Drains: • MS 120A, NORMAL • MS 119A, BYPASS
	BOP	h. Verify SG Blowdown Isolation valves are closed: • BD 103A, STM GEN 1 (OUT) • BD 102A, STM GEN 1 (IN)
	NAO	i. Check SG1 West Side Main Steam Safety valves are closed.
	Note	**The crew should direct an NAO to locally verify the MS safety valves closed.**
	ATC/BOP	* 17. Verify the most affected SG is isolated by observing **ALL** of the following: • SG pressures • SG levels • RCS Cold Leg temperatures

NOTE

Actions to stabilize RCS temperature following an excess steam demand event should be initiated when **BOTH** of the following parameters are met:

- CET temperatures rise
- Pressurizer pressure rise

Examiner Note

Least affected SG is #2

Time	Position	Applicant's Actions or Behavior
	BOP	* 18. Stabilize RCS temperature within PT Curves by performing the following:
	BOP	a. For the LEAST AFFECTED SG: 1) Place the ADV to manual and fully open ADV.
	BOP	2) Manually initiate EFAS.

Op Test No.:	1	Scenario #	1	Event #	7	Page	39	of	41
Event Description:	Main Steam Line Break Outside Containment (SG 1)								

Time	Position	Applicant's Actions or Behavior
	BOP	3) Place the EFW Flow Control valve to manual and commence feeding.
	BOP	4) Perform **ANY** of the following as necessary to establish RCS pressure and temperature control: • Throttle associated SG ADV. • Adjust associated SG EFW flow.
	ATC/BOP	b. **IF** RCS pressure is greater than or equal to 1500 psia, **THEN** stabilize RCS pressure at a value not to exceed 1600 psid between the RCS and the lowest SG pressure.
	ATC/BOP	b.1 **IF** RCS pressure is less than 1500 psia, **THEN** stabilize RCS pressure at greater than HPSI shutoff head (1500 - 1600 psia).
	ATC/BOP	c. REFER TO Step 20 HPSI Throttle Criteria.
	N/A	*19. **IF** ESD isolated by MSIS, **THEN** stabilize RCS temperature within PT Curves by performing the following:
	ATC/BOP	*20. **IF** HPSI pumps are operating, **AND ALL** of the following conditions are satisfied: • RCS subcooling is greater than or equal to 28ºF • PZR level is greater than 7% **[23%]** and controlled • Verify at least **ONE** SG is available for RCS heat removal and level is being maintained or restored to within 55 to 70% NR **[60 to 80% NR]** using EFW in auto or manual. • RVLMS indicates level higher than Hot Leg by at least **ONE** of the following: o QSPDS REACTOR VESSEL LEVEL 5 **NOT** voided o VESSEL LEVEL PLENUM greater than or equal to 80% **THEN** perform **ANY** of the following: • Throttle HPSI flow. • Stop **ONE** HPSI pump at a time.

Op Test No.:	1	Scenario #	1	Event #	7	Page	40	of	41
Event Description:	Main Steam Line Break Outside Containment (SG 1)								

Time	Position	Applicant's Actions or Behavior

Examiner Note
This event is complete after Reactor Coolant System temperature and pressure have been stabilized and steps to isolate Steam Generator 1 have been taken or at Lead Examiner's Discretion.
Examiner Note
Event 8 is contained on the next page and is automatically inserted on a Containment Isolation Signal. It is possible that the applicants performed the actions of Event 8 earlier in the scenario.

Op Test No.:	1	Scenario #	1	Event #	8	Page	41	of	41

Event Description: Relay K202A fails (CVC-401, CVC109, IA-909 & FP-601A will not close automatically on CIAS)

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	Recognize indications of CVC-401, CVC-109, IA-109 and FP-601A Failure to close.
		Alarms
		• N/A
		Indications
		• CVC-401 position indicates OPEN (Red) (CP-4)
		• CVC-109 position indicates OPEN (Red) (CP-4)
		• IA-109 position indicates OPEN (Red) (CP-8)
		• FP-601A position indicates OPEN (Red) (CP-8)
		• SPDS page 2
Examiner Note **These valves may have been noticed and closed earlier in the scenario.**		
	ATC	Closes CVC-401, RCP Controlled Bleedoff Isolation, and CVC-109, Letdown Outside Containment Isolation.
	BOP	Closes IA-909, IA Isolation to Containment, and FP-601A, Firewater to Containment Isolation
Examiner Note **This event is complete after the CVC-401, CVC-109, IA-909 and FP-601A are closed or at Lead Examiners discretion.**		

Facility: Waterford 3 Scenario No.: **2** Op Test No.: 1

Examiners: Operators:

Initial Conditions: Reactor power is 100%. AB Buses are aligned to Train B.

Turnover:

Protected Train is B; EFW Pump A operability check is in progress; Maintain 100%. LPSI pump A is out of service.

Event No.	Malf. No.	Event Type*	Event Description
1	FW06A	N – BOP N – SRO TS – SRO	Manually start EFW Pump A. EFW Pump A fails during operability check. (TS 3.7.1.2)
2	RC21A	I – All	Hot Leg 1 Temperature, RC-ITI-0111X, fails low affecting PZR level setpoint. OP-901-110, Pressurizer Level Control Malfunction (Sect. E2).
3	RC08C	C – BOP C – SRO	Reactor Coolant Pump 2A Lower Seal fails. OP-901-130, Reactor Coolant Pump Malfunction.
4	SG04E	I – BOP I – SRO TS – SRO	Steam Generator 1 Pressure Instrument, SG-IPT-1013A, fails low requiring Technical Specification entry and bypass of multiple Plant Protection System A trip bistables. (TS 3.3.1, 3.3.2, & 3.3.3.5)
5	FW35B	R – ATC N – BOP N – SRO	Feedwater Heater 5B tube leak from Condensate to heater shell causing isolation of the Low Pressure heater string. OP-901-221, Secondary System Transient (Sect. E1) and OP-901-212, Rapid Plant Power Reduction to 72% power.
6	RC09C	C – ATC C – SRO	Reactor Coolant Pump 2A Middle Seal fails, requiring a manual reactor trip, and securing of Reactor Coolant Pump 2A.
7	RC11A1	M – All	Pressurizer Code Safety, RC-317A, fails open. OP-902-002, Loss of Coolant Accident Recovery. All Reactor Coolant Pumps must be secured. **(CT 1, Trip RCPs exceeding operating limits)**
8	SI02B	C – BOP C – SRO	HPSI Pump B fails to AUTO start on the Safety Injection Actuation Signal requiring a manual start. **(CT 2, Inventory Control)**
9	SI19A SI01A	N/A	High Press Safety Injection (HPSI) Pump A degrades internally and trips.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

The crew assumes the shift at 100% power with instructions to maintain 100% power. Low Pressure Safety Injection pump A is out of service. The crew turnover includes instructions to complete OP-903-046, Emergency Feed Pump Operability, for Emergency Feedwater (EFW) Pump A. EFW pump A will trip on overcurrent shortly after it is started. The SRO should declare EFW pump A inoperable and enter Tech Spec 3.7.1.2.d.

After Tech Specs are addressed, Loop 1 T_{hot} instrument, RC-ITI-0111X, fails low. This affects the Reactor Regulating System Tave calculation and the Pressurizer Level Setpoint. The SRO should enter OP-901-110, Pressurizer Level Control Malfunction and implement Section E2, Pressurizer Level Setpoint Malfunction. The crew should take manual control of Pressurizer Level, select the non-faulted T_{hot} instrument (Loop 2) in both Reactor Regulating System cabinets, verify normal setpoint is restored and restore Pressurizer Level Control to Auto after returning Pressurizer Level to setpoint.

After Pressurizer Level control is in automatic, Reactor Coolant Pump 2A Lower Seal fails. The crew should enter OP-901-130, Reactor Coolant Pump Malfunction and implement Section E1, Seal Failure.

After the crew is in Section E1 of OP-901-130 AND the BOP has adjusted Component Cooling Water Temperature, Steam Generator 1 Pressure Instrument, SG-IPT-1013A, fails low. The SRO should review and enter Technical Specifications 3.3.1 action 2, 3.3.2 actions 13 and 19 and 3.3.3.5 action a. The SRO will direct the BOP to bypass Steam Generator 1 Pressure Lo, Steam Generator 1 DP, and Steam Generator 2 DP trip bistables (11, 19 & 20) in Plant Protection System Channel A within 1 hour, in accordance with OP-009-007, Plant Protection System. The SRO should review Technical Specifications 3.3.3.5 and 3.3.3.6 using OP-903-013, Monthly Channel Checks, and determine that Technical Specification 3.3.3.5 is applicable and 3.3.3.6 is not.

Once the SRO has addressed Technical Specifications and trip bistables are bypassed, a tube leak occurs in Feedwater Heater 5B, causing Condensate flow to isolate through Low Pressure Feedwater Heaters 5B and 6B. The crew should enter OP-901-221, Secondary System Transient, and implement Section E1, Loss of Feedwater Preheating. This also requires a power reduction to < 72% power using OP-901-212, Rapid Plant Power Reduction. The SRO should implement EN-OP-200, Transient Response Rules.

After the reactivity manipulation is satisfied, Reactor Coolant Pump 2A Middle Seal fails. The crew should trip the reactor, implement OP-902-000, Standard Post Trip Actions AND secure Reactor Coolant Pump 2A.

After Reactor Coolant Pump 2A is secured, Pressurizer Code Safety, RC-317A, fails open. The crew should diagnose to OP-902-002, Loss of Coolant Accident Recovery. The crew should secure an additional Reactor Coolant Pump in the opposite loop (preferably 1A) when RCS Pressure lowers to <1621 PSIA and secure all Reactor Coolant Pumps exceeding NPSH limits as indicated by high vibration or within 3 minutes of the Containment Spray Actuation **(CRITICAL TASK 1)**.

When Safety Injection occurs, either manually or automatically, HPSI Pump B fails to Auto Start. High Pressure Safety Injection (HPSI) pump A will run for about three minutes, degrade internally and trip. The BOP should manually start High Pressure Safety Injection Pump B **(CRITICAL TASK 2)**.

The scenario can be terminated after the crew starts a cooldown or at the lead examiner's discretion.

Critical Task		
Number	Description	Basis
1	Trip Any RCP Exceeding Operating Limits This task is satisfied by stopping all running RCPs within 3 minutes of loss of Component Cooling Water flow or prior to completing the step that verifies RCP operating limits. This task becomes applicable after either running RCP Vibration alarms actuate OR Containment Spray is initiated, whichever occurs first. (OP-902-002, 9.b or 9.d.1)	The time requirement of 3 minutes is based on the RCP operating limit of 3 minutes without CCW cooling. Continued operation of RCP without CCW or outside of the operating limits could lead to a failure of the RCS pressure boundary at the RCP seal. (TM-OP-100-03, CT-23; ECS98-001, D.10)
2	Establish RCS Inventory Control This task is satisfied by starting High Pressure Safety Injection Pump B to establish Reactor Coolant System inventory control before exiting the step to verify Safety Injection Actuation Signal Actuation. This task becomes applicable following the initiation of a Safety Injection Actuation Signal. (OP-902-002, step 7)	Based on minimum required flow per the flow delivery curve in OP-902-009, Appendix 2E. Failure to take action to establish the minimum required Safety Injection flow during a LOCA would degrade the inventory available to maintain the fuel covered. Adequate SI flow ensures RCS Inventory Control and Core Heat Removal safety functions are satisfied. (TM-OP-100-03, CT-16; ECS98-001, A.02)
* **Critical Task** (As defined in NUREG 1021 Appendix D) ** Per NUREG-1021, Appendix D, If an operator or the crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review.		

Scenario Quantitative Attributes

1. Malfunctions after EOP entry (1–2)	2
2. Abnormal events (2–4)	3
3. Major transients (1–2)	1
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	0
6. EOP based Critical tasks (2–3)	2

SCENARIO SETUP

A. Reset Simulator to IC-162.

B. Verify Scenario Malfunctions, Remotes, and Overrides are loaded, as listed in the Scenario Timeline.

C. Verify Event Trigger 8 is set to “PZR Press < 1684 psia”.

D. Verify LPSI pump A is removed from service as follows:

   1. Insert **SIR32** to RKOUT
   2. Place C/S in OFF with a Danger Tag

E. Place a copy of OP-903-046, EFW Operability Check, Section 7.1 on the BOP desk. Section 7.1 should be place-kept with step 7.1.5 (Start EFW pump A) circled. Previous steps should be circled-slashed and step 7.1.3 (Check valve test) N/A’d. A copy of Attachment 10.1, EFW Pump A IST Data, should also be available with step 7.1.1 (Group B Test selected) filled in. Shift turnover should state that the NAO is standing by the pump with the required paperwork in hand.

F. Verify all EFW Flow Control Valves are in Auto and Caution Tags removed.

G. Ensure Protected Train B sign is placed in SM office window.

H. Verify EOOS is 10.0 Green with LPSI pump A out of service.

I. Place Protected Equipment covers on running SFP pump and LPSI pump B control switches.

J. Complete the simulator setup checklist.

K. Start Insight, open file Crew Performance.tis.

SIMULATOR BOOTH INSTRUCTIONS

Event 1 EFW Pump A trips on overcurrent during operability check

1. Approximately 1 minute after the crew starts EFW Pump A, initiate Event **Trigger 1**.
2. If Work Week Manager or PME are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.
3. If sent to the breaker, wait 2 minutes and report overcurrent flags on all three phases.
4. If sent to the pump, wait 5 minutes and report an acrid odor in the room but no signs of fire.

Event 2 Hot Leg 1 Temperature, RC-ITI-0111X, Fails Low

1. On Lead Examiner's cue, initiate Event **Trigger 2**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.

Event 3 RCP 2A Lower Seal Fails

1. On Lead Examiner's cue, initiate Event **Trigger 3**.
2. If the Duty Engineering or RCP Engineer is called inform the caller that you will monitor RCP 2A for further degradation.
3. If the Work Week Manager or PMM are called, inform the caller that a work package will be assembled for the next forced outage.

Event 4 Steam Generator Pressure Instrument, SG-IPT-1013A, Fails Low

1. On Lead Examiner's cue, initiate Event **Trigger 4**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.
3. If sent to LCP-43, report that SG-IPI-1013-A1 reads 0 PSIA. Observe other indications of SG pressure using Extreme View on LCP-43 and report actual pressure if asked.

Event 5 Feedwater Heater 5B Tube Leak, Rapid Plant Power Reduction

1. On Lead Examiner's cue, initiate Event **Trigger 5**.
2. If called to verify Low Pressure Heater levels, verify levels using the PMC and report levels to the Control Room.
3. If called to verify position of the Normal and Alternate Control Valves, verify valve positions using the PMC and report the position of the valves to the Control Room.
4. If requested to monitor Polisher Vessel D/P and remove as necessary, acknowledge the report.
5. If Work Week Manager or PMM are called, inform the caller that a work package will be assembled.
6. If Chemistry is called to sample the RCS for Dose Equivalent Iodine due to the down power, acknowledge and report that samples will be taken 2-6 hours from notification time and if asked tell the caller your name is Joe Chemist.

<u>Event 6</u> **<u>RCP 2A Middle Seal Fails</u>**

1. After the reactivity manipulation is satisfied and on lead examiner's cue, initiate Event **Trigger 6**.
2. **I**f the Duty Engineering or RCP Engineer is called inform the caller that you will monitor RCP 2A for further degradation.
3. **I**f the Work Week Manager or PMM are called, inform the caller that a work package will be assembled.

<u>Event 7</u> **<u>Pressurizer Code Safety, RC-317A, Fails Open</u>**

1. After the crew secures RCP 2A, initiate Event **Trigger 7**.
2. **I**f Chemistry is called to perform samples acknowledge the request.
3. **I**f called as NAO to verify proper operation of unloaded Emergency Diesel Generators, then wait 2 minutes and manually initiate Event **Trigger 20**. Wait an additional minute and manually initiate Event **Trigger 21** to acknowledge local EDG panels. Report that both A and B EDGs are running properly and unloaded.

<u>Event 8</u> **<u>HPSI Pump B Fails To AUTO Start</u>**

1. External communications are not expected for this event.

<u>Event 9</u> **<u>HPSI Pump B Fails To AUTO Start & HPSI Pump A Degrades & Trips</u>**

1. Event **Trigger 8** (for event 9) is automatically triggered when PZR Pressure is <1684 psia.
2. **I**f Work Week Manager or PME are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.
3. **I**f sent to the HPSI Pump A breaker, wait 2 minutes and report overcurrent flags on all three phases.
4. **I**f sent to HPSI Pump A, wait 5 minutes and report the pump is not running and there is nothing else abnormal.

At the end of the scenario, before resetting, end data collection and save the file as <u>2017 Scenario 2-(start-end time).tid.</u> Export to .csv file. Save the file into the folder for the appropriate crew.

SCENARIO TIMELINE

EVENT	KEY	DESCRIPTION	TRIGGER	DELAY HH:MM:SS	RAMP HH:MM:SS	FINAL
EVENT DESCRIPTION						
1	**FW06A**	**MOTOR DRIVEN EFW PMP A TRIP**	**1**	**00:00:00**	**00:00:00**	**ACTIVE**
MOTOR DRIVEN EFW PMP A TRIPS DURING OPERABILITY CHECK						
2	**RC21A**	**RCS HOT LEG 1 CONTROL TT 111X FAILS (0-100%)**	**2**	**00:00:00**	**00:00:00**	**0%**
HOT LEG 1 TEMPERATURE FAILS LOW						
3	**RC08C**	**RCP 2A LOWER SEAL FAILURE (0-100%)**	**3**	**00:00:00**	**00:00:00**	**100%**
RCP 2A LOWER SEAL FAILS						
4	**SG04E**	**MS LINE IPT-1013A FAIL (0-100%)**	**4**	**00:00:00**	**00:00:00**	**0%**
SG 1 PRESSURE INSTRUMENT SG-IPT-1013A FAILS LOW						
5	**FW35B**	**LP FW HEATER 5B TUBE LEAK (100% = 10% OF TUBES)**	**5**	**00:00:00**	**00:00:30**	**15%**
FW HTR 5B TUBE LEAK FROM CONDENSATE TO HEATER SHELL, RAPID DOWN POWER TO < 72% POWER						
6	**RC09C**	**RCP 2A MIDDLE SEAL FAILURE (0-100%)**	**6**	**00:00:00**	**00:00:00**	**100%**
RCP 2A MIDDLE SEAL FAILS						
7	**RC11A1**	**CODE SAFETY RC-317A FAIL OPEN**	**7**	**00:00:00**	**00:00:00**	**ACTIVE**
PRESSURIZER CODE SAFETY, RC-317A, FAILS OPEN						
8	**SI02B**	**HPSI PUMP B FAILS TO AUTO START**	**N/A**	**00:00:00**	**00:00:00**	**ACTIVE**
HPSI PUMP B FAILS TO AUTO START						
9	**SI19A**	**HPSI PUMP A DEGRADATION (Triggered when PZR Press <1684 psia)**	**8 (AUTO)**	**00:02:00**	**00:01:00**	**100%**
	SI01A	**HPSI PUMP A TRIPPED (Triggered when PZR Press <1684 psia)**	**8 (AUTO)**	**00:03:00**	**00:00:00**	**ACTIVE**
HPSI PUMP A DEGRADES AND TRIPS						
N/A	**EGR26**	**EDG A LOCAL ANNUN ACK**	**20**	**00:00:00**	**00:00:00**	**ACKN**
LOCAL EDG ANNUNCIATOR ACKNOWLEDGE						
N/A	**EGR27**	**EDG B LOCAL ANNUN ACK**	**21**	**00:00:00**	**00:00:00**	**ACKN**
LOCAL EDG ANNUNCIATOR ACKNOWLEDGE						

EVENT	KEY	DESCRIPTION	TRIGGER	DELAY HH:MM:SS	RAMP HH:MM:SS	FINAL
EVENT DESCRIPTION						
N/A	**SIR32**	**LPSI PUMP A (will not show up in summary tab)**	**N/A**	**00:00:00**	**00:00:00**	**RKOUT**
LPSI PUMP A BREAKER						

REFERENCES

Event	Procedures
1	OP-903-046, Emergency Feed Pump Operability Check, Rev. 318 Technical Specification 3.7.1.2
2	OP-901-110, Pressurizer Level Control Malfunction, Rev. 9 OP-901-501, PMC or Core Operating Limits Supervisory System Malfunction, Rev. 15
3	OP-901-130, Reactor Coolant Pump Malfunction, Rev. 11
4	OP-009-007, Plant Protection System, Rev. 17 OP-903-013, Monthly Channel Checks, Rev. 18 Technical Specification 3.3.1 Technical Specification 3.3.2 Technical Specification 3.3.3.5 Technical Specification 3.3.3.6
5	OP-901-221, Secondary System Transient, Rev. 4 OP-901-212, Rapid Plant Power Reduction, Rev. 8 OP-002-005, Chemical and Volume Control, Rev. 56 OP-004-004, Control Element Drive, Rev. 23
6	OP-901-130, Reactor Coolant Pump Malfunction, Rev. 11 OP-902-000, Standard Post Trip Actions, Rev. 16 OP-902-009, Standard Appendices, Rev. 315, Appendix 1, Diagnostic Flow Chart
7	OP-902-002, Loss of Coolant Accident Recovery Procedure, Rev. 20 OP-902-009, Standard Appendices, Rev. 315, Appendix 2, Figures OP-902-009, Standard Appendices, Rev. 315, Appendix 1, Diagnostic Flow Chart
8 & 9	OP-902-002, Loss of Coolant Accident Recovery Procedure, Rev. 20
GEN	EN-OP-115, Conduct of Operations, Rev. 17 EN-OP-115-08, Annunciator Response, Rev. 4 EN-OP-200, Plant Transient Response Rules, Rev. 3 OI-038-000, EOP Operations Expectations / Guidance, Rev. 14

Op Test No.:	1	Scenario #	2	Event #	1	Page	1	of 36
Event Description:	EFW Pump A trips on overcurrent.							

Time	Position	Applicant's Actions or Behavior
Examiner Note **Event 1 is a normal plant evolution. The crew will be pre-briefed and ready to start EFW Pump A once they take the shift.**		
	BOP	Recognizes and reports indications of EFW Pump A trip.
		Alarms:
		• EFW PUMP A TRIP/TROUBLE (Cabinet M, E-1)
		Indications:
		• Indicating light for EFW Pump A goes from red to green on CP-8.
		• Amber light illuminates on the lower portion of the control switch for EFW Pump A on CP-8
Examiner Note **The BOP manipulation for starting EFW Pump A is located on CP-8.**		
OP-903-046, Emergency Feed Pump Operability Check ,Section 7.1, EFW Pump A Check		
	BOP	7.1.5 Start EFW Pump A
	Note	**After the EFW Pump A trip, the crew may decide to take the control switch for EFW Pump A to the OFF position. The crew should expect annunciator EFW PUMP A UNAVAILABLE (Cabinet M, D-1) if EFW Pump A control switch is taken to OFF.**
	SRO	Reviews the following Technical Specifications and determines applicable action: • 3.7.1.2 action d
Examiner Note **This event is complete after the SRO evaluates Technical Specifications or at Lead Examiner's Discretion.**		
Examiner Note **Cue the Simulator Operator when ready for Event 2**		

Op Test No.: 1	Scenario # 2	Event # 2	Page 2	of 36

Event Description: Hot Leg 1 Temperature fails low affecting Pressurizer level setpoint

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of failed instrument.
		Alarms:
		• PRESSURIZER LEVEL HI/LO (Cabinet H, B-1)
		• PRESSURIZER LEVEL HI-HI (Cabinet H, A-1)
		• LETDOWN HX OUTLET PRESSURE HI (Cabinet G, B-1)
		• REACTOR COOLANT TAVG/TREF LO (Cabinet H, L-1)
		Indications
		• Mismatch between Charging (CVC-IFI-0212) <u>and</u> Letdown (CVC-IFI-0202) flow indications. Letdown rises to maximum, with 1 charging pump running.
		• Deviation between actual level <u>and</u> programmed level as indicated on Pressurizer level recorder (RC-ILR-0110). Pressurizer level is slowly lowering toward setpoint.
		• Deviation of setpoint on Pressurizer level controller (RC-ILIC-0110) from programmed level.
		• Pressurizer Backup Heaters energize.
		• Hot Leg Loop 1 RC-ITI-0111 reads < 525 °F on CP-2.
	SRO	May direct the ATC to take manual control of Pressurizer Level Controller, RC-ILIC-0110 and match Letdown flow and Charging flow prior to entering procedure.
	SRO	Enter and direct the implementation of OP-901-110, Pressurizer Level Control Malfunction.
OP-901-110, E0 - General Actions		
	N/A	1. Stop Turbine load changes.
	N/A	2. <u>If</u> malfunction is due to failure of Letdown Flow Control valve, <u>then</u> <u>go to</u> OP-901-112, CHARGING/LETDOWN MALFUNCTION.
	N/A	3. <u>If</u> malfunction is due to failure of Pressurizer Level Control Channel (incorrect readings on <u>EITHER</u> RC-ILI-0110X <u>OR</u> RC-ILI-0110Y), <u>then</u> <u>go</u> <u>to</u> Subsection E_1, Pressurizer Level Control Channel Malfunction.
	SRO	4. <u>IF</u> malfunction is due to failure of Pressurizer Level Setpoint (RC-ILIC-0110), <u>then</u> <u>go</u> <u>to</u> Subsection E_2, Pressurizer Level Setpoint Malfunction.

Op Test No.:	1	Scenario #	2	Event #	2	Page	3	of 36
Event Description:	Hot Leg 1 Temperature fails low affecting Pressurizer level setpoint							

Time	Position	Applicant's Actions or Behavior
OP-901-110, E_2 - Pressurizer Level Setpoint Malfunction		
	ATC	1. Place Pressurizer Level Controller (RC-ILIC-0110) in MAN AND adjust OUTPUT to slowly adjust letdown flow to restore Pressurizer level.
	ATC	2. Verify normal indications on all Safety Measurement Channel Hot Leg and Cold Leg temperature indicators.
	ATC	3. Determine affected channel(s) by checking Reactor Regulating System (RRS) Tavg recorders (RC-ITR-0111 AND RC-ITR-0121).
CAUTION PRIOR TO SECURING ALL CHARGING PUMPS ENSURE LETDOWN IS ISOLATED. LETDOWN STOP VALVE (CVC-101) WILL AUTOMATICALLY CLOSE ON HIGH LETDOWN TEMPERATURE.		
	ATC	4. Start or stop Charging Pumps as necessary to maintain Pressurizer level above minimum level for operation in accordance with Attachment 1, Pressurizer Level Versus Tave Curve.
	N/A	5. If unable to control Pressurizer level with Letdown in service, then perform the following: 5.1 Close Letdown Stop valve (CVC-101). 5.2 Prior to starting Charging Pump(s), complete Attachment 2, Charging Nozzle Thermal Cycling Evaluation Data. 5.3 Cycle Charging Pump(s) to maintain Pressurizer level above minimum level for operation in accordance with Attachment 1, Pressurizer Level Versus Tave Curve.
	N/A	6. IF malfunction is due to failure of Letdown Flow Controller (RC-IHIC-0110), then perform the following: 6.1 Place Letdown Flow Controller (RC-IHIC-0110) in MAN. 6.2 Maintain Pressurizer level above minimum level for operation in accordance with Attachment 1, Pressurizer Level Versus Tave Curve.
	N/A	7. If backup Charging Pumps have started, then secure unnecessary Charging Pumps.
	ATC	8. If Pressurizer Backup Heaters have energized, then place unnecessary BACKUP HEATER BANKS to OFF.

Op Test No.:	1	Scenario #	2	Event #	2	Page	4	of 36

Event Description: Hot Leg 1 Temperature fails low affecting Pressurizer level setpoint

NOTE

(1) Selecting the non-faulted channel may cause automatic actions to occur if actual level is not at program level.

(2) If a Tc or Th instrument fails, refer to OP-901-501, PMC or Core Operating Limit Supervisory System Malfunction, E2, Loss of COLSS (PMC Available). The associated PMC PID may be deleted from process per OP-004-005 in order to remove the failed input to COLSS. The instructions in MWOs 2405 (RC ITI0111X), 1020 (RC ITI0111Y), 2420 (RC ITI0121X), and 1021 (RC ITI0121Y) should be used as guidance when deleting these points from scan.

Time	Position	Applicant's Actions or Behavior
	ATC	9. Check Reactor Regulating System (RRS) Hot Leg indicators (RC-ITI-0111-X and RC-ITI-0121-X) for abnormal readings and perform the following:
	BOP	9.1 IF RCS Temperature Loop 1 Hot Leg (RC-ITI-0111-X) indicates abnormally high or low, then select LOOP 2 for TAVE LOOP SELECTOR on both RRS local cabinets (CP-12A and CP-12B).
	N/A	9.2 IF RCS Temperature Loop 2 Hot Leg (RC-ITI-0121-X) indicates abnormally high or low, then select LOOP 1 for TAVE LOOP SELECTOR on both RRS local cabinets (CP-12A and CP-12B).
	N/A	10. Check Reactor Regulating System (RRS) Cold Leg indicators (RC-ITI-0111-Y AND RC-ITI-0121-Y) for abnormal readings and perform the following: 10.1 IF RCS Temperature Loop 1 Cold Leg (RC-ITI-0111-Y) indicates abnormally high or low, then perform either of the following: Select presently non-selected position (ALT OR NORM) on TCOLD LOOP 1 selector switch located behind CP-2, Reactor Control (Preferred Method). OR Select LOOP 2 on both RRS local cabinets (CP-12A AND CP-12B) 10.2 IF RCS Temperature Loop 2 Cold Leg (RC-ITI-0121-Y) indicates abnormally high or low, then perform either of the following: Select presently non-selected position (ALT or NORM) on TCOLD LOOP 2 selector switch located behind CP-2, Reactor Control (Preferred Method). OR Select LOOP 1 on both RRS local cabinets (CP-12A and CP-12B).

Op Test No.:	1	Scenario #	2	Event #	2	Page	5 of 36

Event Description: Hot Leg 1 Temperature fails low affecting Pressurizer level setpoint

Time	Position	Applicant's Actions or Behavior
	ATC	11. Verify setpoint on Pressurizer Level Controller (RC-ILIC-0110) returns to program setpoint in accordance with Attachment 1, Pressurizer Level Versus Tave Curve and perform the following: 11.1 Slowly adjust Letdown Flow Controller (RC-IHIC-0110) OUTPUT to match PROCESS and place in AUTO.
	N/A	11.2 Place desired backup Charging Pumps in AUTO.
	ATC	11.3 Place Pressurizer Level Controller (RC-ILIC-0110) in AUTO and verify Pressurizer level being controlled at setpoint.
	ATC	11.4 Place desired Pressurizer BACKUP HEATER BANKS in AUTO.
	Note	**ATC should restore to AUTO any B/U Heaters that were turned OFF in step 8. Backup heaters 4 and 6 on normally maintained in ON.**
	N/A	11.5 If necessary, then reset both PROPORTIONAL HEATER BANKS.
	N/A	12. IF setpoints from BOTH Reactor Regulating Systems are faulty, THEN place CP-31 switches 1 AND 2 on Cardframe 1, Slot 36, in DEFEAT AND perform the following: 12.2 Check RTGB light illuminates and RRS light extinguishes on CP-2. 12.3 Adjust setpoint on Pressurizer Level Controller (RC-ILIC-0110) in accordance with Attachment 1, Pressurizer Level Versus Tave Curve. 12.4 Slowly adjust Letdown Flow Controller (RC-IHIC-0110) OUTPUT to match PROCESS and place in AUTO. 12.5 Place desired backup Charging Pumps in AUTO. 12.6 Place Pressurizer Level Controller (RC-ILIC-0110) in AUTO and verify Pressurizer level being controlled at setpoint. 12.7 Place desired Pressurizer BACKUP HEATER BANKS in AUTO. 12.8 if necessary, then reset both PROPORTIONAL HEATER BANKS.

Examiner Note

This event is complete when Pressurizer Level Controller is in AUTO or at Lead Examiner's Discretion.

Op Test No.:	1	Scenario #	2	Event #	2	Page	6	of	36

Event Description: Hot Leg 1 Temperature fails low affecting Pressurizer level setpoint

Time	Position	Applicant's Actions or Behavior

Examiner Note

Cue the Simulator Operator when ready for Event 3

Op Test No.:	1	Scenario #	2	Event #	3	Page	7	of 36
Event Description:	Reactor Coolant Pump 2A seal fails							

Time	Position	Applicant's Actions or Behavior
	ATC	Recognizes and reports indications of failed lower seal on RCP 2A
		Alarms:
		• RCP 2A Upper Seal Pressure (PMC)
		• RCP 2A Middle Seal Pressure (PMC)
		• RCP 2A CBO Flow (PMC)
		Indications:
		• RCP Controlled Bleedoff temperature slowly rising on CP-2
		• RCP 2A seal pressures outside of normal parameters on CP-2 and PMC
	SRO	Enters and Implements OP-901-130, Reactor Coolant Pump Malfunction
OP-901-130, Reactor Coolant Pump Malfunction, Section E0, Subsequent Operator Actions		
NOTE Waterford 3 has operating Experience of ARRD failures, resulting in reverse rotation of a tripped Reactor Coolant Pump. In this case, indicated speed will not go negative when a RCP rotates in the reverse direction, it will be an absolute number. Speed will indicate approximately 600 RPM for the affected RCP with the other three RCPs running.		
	N/A	1. If Reactor Coolant Pump trips, then verify Reactor tripped and go to OP-902-000, Standard Post Trip Actions.
	N/A	2. If loss of Component Cooling Water to Reactor Coolant Pumps occurs, then go to OP-901-510, COMPONENT COOLING WATER SYSTEM MALFUNCTION.
	SRO	3. If Reactor Coolant Pump Seal has failed, then go to section E1, Seal Failure.
OP-901-130, Reactor Coolant Pump Malfunction, Section E1, Seal Failure		

Op Test No.:	1	Scenario #	2	Event #	3	Page	8	of	36
Event Description:	Reactor Coolant Pump 2A seal fails								

Time	Position	Applicant's Actions or Behavior

NOTE

1. RCP Seal pressure and Control Bleedoff temperature and flow are normally as follows: (assuming normal operating RCS temperature and pressure):
   - Vapor Seal pressure: 25 to 45 PSIG
   - Upper Seal pressure: 585 to 915 PSIG
   - Middle Seal pressure: 1237 to 1815 PSIG
   - CBO temperature: 135° to 190°F
   - CBO flow: 1.2 to 1.8 GPM
2. The following parameters are indicative of RCP seal failure
   - Any seal pressure equal to RCS pressure
   - Two or more seal pressures approximately equal to each other
   - Controlled Bleedoff flow greater than 2.0 GPM
   - Inability to maintain Seal CCW Cooler Return Temperature <145°F
   - A failed stage is indicated by a differential pressure of less than 100 psid across the stage
3. If only one Reactor Coolant Pump Seal has failed on a Reactor Coolant Pump, then pump operation may continue provided the seal package is monitored for further degradation.

Time	Position	Applicant's Actions or Behavior
	SRO	1. Inform System Engineer of Reactor Coolant Pump Seal failure.

CAUTION

(1) CCW TEMPERATURES OF < 75°F COULD LEAD TO ESSENTIAL CHILLER TRIPS ON EVAPORATOR LOW REFRIGERANT PRESSURE.

(2) CCW TEMPERATURE SHOULD BE CHANGED AT A RATE OF $\leq$10°F IN ONE HOUR TO PREVENT DEGREDATION OF THE REACTOR COOLANT PUMP SEALS.

Time	Position	Applicant's Actions or Behavior
	BOP	2. If Controlled Bleedoff temperature is rising, then lower Component Cooling Water temperature by any of the following: • Start Dry Cooling Tower Fans. • Start Auxiliary Component Cooling Water Pump(s) and associated Wet Cooling Tower Fans. • Start Auxiliary Component Cooling Water Pump(s) and lower ACC-126A(B) setpoint.

Examiner Note

This event is complete after Component Cooling Water Temperature is lowered or at Lead Examiner's Discretion.

Op Test No.:	1	Scenario #	2	Event #	3	Page	9	of	36
Event Description:	Reactor Coolant Pump 2A seal fails								

Time	Position	Applicant's Actions or Behavior

Examiner Note
Cue the Simulator Operator when ready for Event 4

Op Test No.:	1	Scenario #	2	Event #	4	Page	10	of 36
Event Description:	Steam Generator 1 Pressure Instrument fails low (SG-IPT-1013A)							

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	Recognizes and reports indications of failed channel.
		Alarms:
		• RPS CHANNEL TRIP SG 1 PRESSURE LO (Cabinet K, E-15)
		• SG 1 PRESSURE LO PRETRIP A/C (Cabinet K, F-15)
		• RPS CHANNEL A TROUBLE (Cabinet K, E-18)
		• ESFAS CHANNEL TRIP PRESS SG 2 > SG 1 (Cabinet K, L-16)
		• PRESS SG 2 > SG 1 ESFAS PRETRIP A/C (Cabinet K, M-16)
		Indications:
		• 0 PSIA indicated on SG 1 Pressure Instrument SG-ILI-1013A on CP-8
		• SG 1 Pressure Instruments, SG-ILI-1013B, C, and D reading ~800 PSIA on CP-8
		• SG 1 Press LO Trip and Pretrip Bistable lights illuminated on PPS Channel A ROM on CP-7.
Examiner Note **All BOP manipulations for OP-009-007 are located at CP-10 except as noted.**		
OP-009-007, Plant Protection System,Section 6.2, Trip Channel Bypass Operation		
	SRO	6.2.1 Refer to Attachment 11.11, PPS Bistable Bypass Chart to assist in determination of Trip Channels requiring placement in bypass.
	Note	**SRO determines the following bistables are affected and need to be bypassed:** • **11 - LO SG-1 PRESS** • **19 - HI SG-1 ΔP** • **20 - HI SG-2 ΔP**
	Note	**SRO directs BOP to bypass the LO SG 1 Pressure, HI SG 1 ΔP, and HI SG 2 ΔP bistables in PPS Channel A within 1 hour in accordance with OP-009-007, Plant Protection System.**
	BOP	6.2.2 To place a bistable in <u>or</u> remove a bistable from bypass, go to Attachment 11.10, Trip Channel Bypass Operation.
OP-009-007, Plant Protection System ,Attachment 11.10, Trip Channel Bypass Operation		

Op Test No.:	1	Scenario #	2	Event #	4	Page	11	of 36
Event Description:	Steam Generator 1 Pressure Instrument fails low (SG-IPT-1013A)							

Time	Position	Applicant's Actions or Behavior

CAUTION

(1) ATTEMPTING TO PLACE MORE THAN ONE TRIP CHANNEL IN BYPASS REMOVES BOTH TRIP CHANNELS FROM BYPASS.

(2) PRIOR TO PLACING ANY TRIP CHANNEL IN BYPASS, VERIFY BYPASS PUSH BUTTONS ON DE-ENERGIZED PPS BAY NOT DEPRESSED.

	Note	**BOP circles Channel A.**
	BOP	11.10.1 To Bypass a Trip Channel, perform the following: 11.10.1.1 Circle the bistable numbers selected for bypass under Step 11.10.1.4.
	Note	**BOP circles bistable numbers 11, 19, and 20 in Step 11.10.1.4 table**
	BOP	11.10.1.2 Check desired Trip Channel is not Bypassed on another PPS Channel.
	BOP	11.10.1.3 Open key-locked portion of BCP in desired PPS Channel.
	Note	**The crew should expect annunciator RPS CABINET CONDITION ABNORMAL (Cabinet L, B-1) to actuate when the PPS Channel door is opened.**
	BOP	11.10.1.4 Depress Bypass push buttons for the desired Trip Channels (placekeep below).
	Note	**BOP depresses pushbuttons for bistables 11, 19, and 20 using placekeeping table.**
	Note	**The crew should expect annunciator RPS BISTABLE BY-PASS (Cabinet K, B-18) to actuate when the first bistable is bypassed in the PPS Channel.**
	BOP	11.10.1.5 Check all selected bistable Bypass push buttons remain in a Depressed state.
	BOP	11.10.1.6 Check all selected bistable Bypass lights Illuminate on BCP for the desired Trip Channels.
	CREW	11.10.1.7 Check all selected bistable Bypass lights Illuminate on ROM for the desired Trip Channels.

Op Test No.:	1	Scenario #	2	Event #	4	Page	12	of 36
Event Description:	Steam Generator 1 Pressure Instrument fails low (SG-IPT-1013A)							

Time	Position	Applicant's Actions or Behavior
	Note	**Crew verifies correct bistables lit on CP-7 PPS Channel A Remote Operator Module.**
	SRO	Reviews the following Technical Specifications and determines applicable actions: • 3.3.1 action 2 • 3.3.2 actions 13 and 19 • 3.3.3.5 action a • 3.3.3.6 – no actions required
Examiner Note **This event is complete after the BOP bypasses the associated Trip Bistables in PPS Channel A or at Lead Examiner's Discretion.**		
Examiner Note **Cue the Simulator Operator when ready for Event 5**		

Op Test No.:	1	Scenario #	2	Event #	5	Page	13	of	36

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and report indications of isolation of 5B and 6B Feedwater Heaters.
		Alarms
		• Heater 5B Level Hi-Hi (Cabinet A, B-9)
		• Heater 5B Level Hi/Lo (Cabinet A, C-9)
		• Heater 5B Alt Drain Vlv Open (Cabinet A, D-9)
		• Numerous other heater level related alarms actuate as a result of cascading heater drains being affected
		Indications
		• Loss of 5B and 6B LP Feedwater Heater by closure of the following valves on CP-33: o CD-175B, Low Pressure Heater 6B Inlet Isolation o CD-189B, Low Pressure Heater 5B Outlet Isolation
	SRO	Enters and implements OP-901-221, Secondary System Transient.

OP-901-221, Secondary System Transient, Section E0, General Actions

NOTE

(1) Some steps of this procedure may not be applicable due to plant conditions. In these cases SM/CRS may NA the step.

(2) Steps within this procedure may be performed concurrently or out of sequence with SM/CRS concurrence.

	N/A	1. If Reactor trip occurs, then go to OP-902-000, Standard Post Trip Actions.
	N/A	2. If Reactor Power Cutback occurs, then perform OP-901-101, Reactor Power Cutback, concurrently with this procedure.
	N/A	3. If an Atmospheric Dump Valve fails or begins to fail Open, then place the respective controller to MANUAL with minimum output.
	N/A	4. If a Steam Bypass Valve fails or begins to fail Open, then perform any of the following (in preferred order) to close the valve. • Place the respective Valve Mode Select switch to OFF. • Place the respective valve controller to MANUAL with minimum output.

Op Test No.: 1	Scenario # 2	Event # 5	Page 14 of 36

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
	N/A	5. If an uncontrollable RCS cooldown exists, then perform the following: 5.1 Manually trip Reactor. 5.2 Commence Emergency Boration in accordance with OP-901-103, Emergency Boration. 5.3 If Steam Generator Pressures continue to lower following the trip, then initiate Main Steam Isolation (MSIS). 5.4 Go to OP-902-000, Standard Post Trip Actions.

NOTE

(1) The following are initial turbine load reductions to be considered depending on the current power level, time in core life, and equipment malfunction.

Transient	**Initial Load Reduction**	**Rate**
Two or more Heater Drain Pumps Tripping	100 MW	40 MW/min
FW Heater #1(ES-109) or FW Heater #2 Extraction Steam Valve(ES-205) Closure		
Atmospheric Dump Valve Fails Open		
Steam Bypass Valve Fails Open		
One Heater Drain Pump Tripping	10 MW	5 MW/min

(2) With COLSS in service, utilize the following to observe instantaneous power changes for power levels ≥ 40%. Reference Attachment 2, COLSS Maneuvering Power Indications, for all other power levels.

Reactor Power	**UFM in service**	**UFM not in service**
≥ 95%	MSBSRAW (PMC PID C24631)	
< 95% and ≥ 40%	USBSRAW (PMC PID C24629)	FWBSRAW (PMC PID C24630)

Op Test No.:	1	Scenario #	2	Event #	5	Page	15	of 36

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
	BOP	6. If Main Turbine is available, then adjust Turbine load as necessary to maintain the following: • Reactor Power ≤100% • Match T_{avg} with T_{ref} • FWPT Suction Pressure > 300 PSIG (monitored on CP-1 via CD IPI1280, IP Htrs Outlet Hdr) • RCS T_{cold} 536F – 549F
	N/A	7. If needed, then concurrently perform OP-901-212, Rapid Plant Down Power, until a power level is reached in which the plant can be stabilized.
	SRO	8. If a loss of Feedwater preheating occurs, then go to E_1, Loss of Feedwater Preheating.
OP-901-221, Secondary System Transient, Section E1, Loss of Feedwater Preheating		
	ATC	1. Verify the following: 1.1 Pressurizer Pressure Control System maintaining or restoring Pressurizer pressure to 2250 PSIA.
	ATC	1.2 Pressurizer Level Control System maintaining or restoring Pressurizer level to program level.
	BOP	1.3 Steam Generator levels being maintained or restored to 50% to 70% Narrow Range level.
	BOP	1.4 Steam Bypass Control System responding to maintain Steam Generator pressure.

Op Test No.: 1	Scenario # 2	Event # 5	Page 16	of 36			

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior

NOTE

(1) If the following valve(s) close on a Hi Hi Heater level, then the respective valve will stop movement when the associated Hi Hi Heater Level condition clears. Thereafter the valve(s) may be re-opened with SM/CRS permission.

	Extraction Steam Valve	Annunciator
ES-109	ES to HP Heaters #1 Isolation	Heater 1A(1B)(1C) Level Hi-Hi [Cabinet A G-2 (G-3) (G-4)]
ES-205	ES TO #2 Heaters Isolation	Heater 2A(2B)(2C) Level Hi-Hi [Cabinet A L-2 (L-3) (L-4)]

(2) The closure of an Extraction Steam valve which cannot be reopened will result in a reduction in MFP suction pressure potentially causing a MFP trip on low suction pressure.

Time	Position	Applicant's Actions or Behavior
	SRO	2. If a Feedwater Heater has isolated, then refer to Attachment 1, and concurrently perform OP-901-212, Rapid Plant Down Power, until Generator Gross Load is less than the Power Limitation listed on Attachment 1, Feedwater Heater Power Limitations.
	Note	**SRO determines from Attachment 1 that power must be reduced to 893 MWe (72%) for loss of one LP Heater String.**
	SRO	Enters and implements OP-901-212, Rapid Plant Down Power, concurrently with OP-901-221.

OP-901-212, Rapid Plant Power Reduction, E_0, General Actions

Examiner Note

A Rapid downpower does not have to be started at 30MW/min, but should attempt to eventually reach that value. The SRO will likely select Direct Boration and direct a load reduction rate of ~20 MW/min and acid flow of 15-20 GPM.

Op Test No.:	1	Scenario #	2	Event #	5	Page	17	of 36

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior

NOTE

(1) A rapid power reduction is defined as approximately 30 MW/minute load reduction on the main turbine.

(2) Power Reduction may be stopped at any point.

(3) Some Steps of this procedure may not be applicable due to plant conditions. In these cases SM/CRS may NA the step.

(4) Steps within this procedure may be performed concurrently or out of sequence with SM/CRS concurrence.

(5) During power reduction PMC PID C24650, COLSS DESCENDING PWR TRACK (DUMOUT19), will automatically select and display the correct power indication. OP-010-003, Plant Startup, provides greater detail on which power indications are displayed by PID C24650 based on power level and whether or not the UFM is in service.

(6) Volume Control Tank (VCT) level may lower during the down power. Charging Pump suction swaps to the RWSP at 5.5% VCT level. Makeup to the VCT in accordance with OP-002-005, Chemical and Volume Control, may be necessary if boration from the RWSP is not desired.

(7) Manual CEA subgroup selection should be evaluated per OP-004-015, Reactor Power Cutback, when power reduction is secured above 65% power.

	SRO/ATC	1. Begin RCS Boration by one of the following methods: 1.1 Direct Boration or 1.2 Borate from the RWSP using one or two Charging Pump as follows: 1.2.1 Open RWSP to Charging Pumps Suction Isolation, CVC-507. 1.2.2 Close Volume Control Tank Outlet Isolation, CVC-183. 1.2.3 If necessary, then start another Charging pump
	Note	**The crew will direct borate from the BAMTs per OP-002-005, section 6.7**

Op Test No.: 1	Scenario # 2	Event # 5 Page 18 of 36
Event Description:	FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)	
Time	Position	Applicant's Actions or Behavior

OP-002-005, Section 6.7, Direct Boration to RCS

CAUTION

THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

CAUTION

(1) THIS SECTION AFFECTS REACTIVITY. THIS EVOLUTION SHOULD BE CROSS-CHECKED AND COMPLETED PRIOR TO LEAVING CP-4.

(2) AT LEAST ONE REACTOR COOLANT PUMP IN EACH LOOP SHOULD BE OPERATING PRIOR TO PERFORMING DIRECT BORATION OPERATIONS TO ENSURE PROPER CHEMICAL MIXING.

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.1 Inform SM/CRS that this Section is being performed.

NOTE

When performing a Plant down power where final RCS Boron Concentration needs to be determined, the following Plant Data Book figure(s) will assist the Operator in determining the required RCS Boron PPM change.

- 1.2 Power Defect Vs Power Level
- 1.4.3 Inverse Boron Worth Vs. T_{mod} at BOC
- 1.4.4 Inverse Boron Worth Vs. T_{mod} at Peak Boron
- 1.4.5 Inverse Boron Worth Vs. T_{mod} at MOC
- 1.4.6 Inverse Boron Worth Vs. T_{mod} at EOC

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.2 At SM/CRS discretion, calculate volume of Boric Acid to be added on Attachment 11.6, Calculation of Boric Acid Volume for Direct Boration or VCT Borate Makeup Mode.
	Note	**The crew will most likely use Boric Acid volume in the reactivity sheet provided by Reactor Engineering.**
	ATC	6.7.3 Set Boric Acid Makeup Batch Counter to volume of Boric Acid desired.
	ATC	6.7.4 Verify Boric Acid Makeup Pumps selector switch aligned to desired Boric Acid Makeup Pump A(B).
	ATC	6.7.5 Place Direct Boration Valve, BAM-143, control switch to AUTO.

Op Test No.:	1	Scenario #	2	Event #	5	Page	19	of 36

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.6 Place Makeup Mode selector switch to BORATE.
	ATC	6.7.7 Verify selected Boric Acid Makeup Pump A(B) Starts.
	ATC	6.7.8 Verify Direct Boration Valve, BAM-143, Opens.
		NOTE The Boric Acid Flow Totalizer will not register below 3 GPM. The Boric Acid Flow Totalizer is most accurate in the range of 10 - 25 GPM.
	Note	**ATC will likely use manual boric acid flow control. "CVCS Boric Acid Makeup Flow Hi/Lo" on CP-4 is an expected annunciator. Acid flow can be seen on the red pen of recorder BAM-IFR-0210Y on CP-4.**
	ATC	6.7.9 If manual control of Boric Acid flow is desired, then perform the following: 6.7.9.1 Verify Boric Acid Flow controller, BAM-IFIC-0210Y, in Manual. 6.7.9.2 Adjust Boric Acid Flow controller, BAM-IFIC-0210Y, output to >3 GPM flow rate.
	N/A	6.7.10 If automatic control of Boric Acid flow is desired, then perform the following: 6.7.10.1 Place Boric Acid Flow controller, BAM-IFIC-0210Y, in Auto. 6.7.10.2 Adjust Boric Acid Flow controller, BAM-IFIC-0210Y, setpoint potentiometer to >3 GPM flow rate.
	ATC	6.7.11 Verify Boric Acid Makeup Control Valve, BAM-141, Intermediate or Open.
	ATC	6.7.12 Observe Boric Acid flow rate for proper indication.
	ATC	6.7.13 When Boric Acid Makeup Batch Counter has counted down to desired value, then verify Boric Acid Makeup Control Valve, BAM-141, Closed.

Op Test No.: 1	Scenario # 2	Event # 5	Page 20 of 36				

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
		NOTE Step 6.7.14 may be repeated as necessary to achieve desired total boron addition for plant conditions.
	ATC	6.7.14 If additional boric acid addition is required and with SM/CRS permission, then perform the following: 6.7.14.1 Reset Boric Acid Makeup Batch Counter. 6.7.14.2 Verify Boric Acid Makeup Control Valve, BAM-141, Intermediate or Open. 6.7.14.3 Observe Boric Acid flow rate for proper indication. 6.7.14.4 When Boric Acid Makeup Batch Counter has counted down to desired value, then verify Boric Acid Makeup Control Valve, BAM-141, Closed.
	ATC	6.7.15 Verify Boric Acid Flow controller, BAM-IFIC-0210Y, in Manual.
	ATC	6.7.16 Verify both Boric Acid Flow controller, BAM-IFIC-0210Y, output and setpoint potentiometer set to zero.
	ATC	6.7.17 Place Makeup Mode selector switch to MANUAL.
	ATC	6.7.18 Verify Selected Boric Acid Makeup Pump A(B) Stops.
	ATC	6.7.19 Verify Direct Boration Valve, BAM-143, Closed.
	ATC	6.7.20 Place Direct Boration Valve, BAM-143, control switch to CLOSE.
OP-901-212, Rapid Plant Power Reduction, E_0, General Actions (cont.)		
		NOTE To prevent Pressurizer heater cutout, avoid operating with Pressurizer pressure near the heater cutout pressure of 2270 PSIA while on Boron Equalization.
	ATC	2. Perform Boron Equalization as follows: 2.1 Place available Pressurizer Pressure Backup Heater Control Switches to ON.

Op Test No.:	1	Scenario #	2	Event #	5	Page	21	of 36

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
	ATC	2.2 Reduce Pressurizer Spray Valve Controller (RC-IHIC-0100) setpoint potentiometer to establish spray flow and maintain RCS pressure 2250 PSIA (2175 – 2265).
		<u>CAUTION</u> REFER TO TECHNICAL SPECIFICATION 3.1.3.6 FOR TRANSIENT INSERTION LIMITS.
	ATC	3. Operate CEAs in accordance with OP-004-004, Control Element Drive, to maintain ASI using CEA Reg. Group 5, 6 or Group P Control Element Assemblies in accordance with OP-010-005, Plant Shutdown, Attachment 9.10, Axial Shape Control Guidelines.
		OP-004-004, Section 6.7, Operation of CEAs in Manual Group (MG) Mode
		<u>CAUTION</u> (1) CRITICALITY <u>SHALL</u> BE ANTICIPATED <u>ANY</u> TIME CEAS ARE WITHDRAWN <u>AND</u> THE REACTOR IS <u>NOT</u> CRITICAL. (2) OBSERVE APPLICABLE GROUP INSERTION LIMITS IN ACCORDANCE WITH TECHNICAL SPECIFICATION 3.1.3.6 (REG GROUP), <u>AND</u> TECHNICAL SPECIFICATION 3.1.3.5 (SHUTDOWN BANKS). (3) IMPROPER OPERATION OF CEAS IN MANUAL GROUP MODE MAY CAUSE A REACTOR TRIP BASED ON AN OUT-OF-SEQUENCE CONDITION. (4) CEA INITIALIZATION PROGRAM MUST BE RUNNING IN THE PLANT MONITORING COMPUTER TO HAVE GROUP STOPS <u>AND</u> SEQUENTIAL PERMISSIVES AVAILABLE.
		CAUTION THIS SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY. [INPO 06-006]
	ATC	6.7.1 Verify Plant Monitoring Computer operable in accordance with OP-004-012, Plant Monitoring Computer.
	ATC	6.7.2 Position Group Select switch to desired group.
	Note	**The crew should use group P or Regulating Group 6 CEAs.**

Op Test No.: 1	Scenario # 2	Event # 5	Page 22 of 36				

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
		NOTE The Operator should remain in the area in front of the CEA Drive Mechanism Control Panel when the Mode Select switch is not in OFF.
	ATC	6.7.3 Place Mode Select switch to MG and verify the following: • White lights Illuminated on Group Selection Matrix for selected group • MG light Illuminates
	ATC	6.7.4 Operate CEA Manual Shim switch to WITHDRAW or INSERT group to desired height while monitoring the following: • CEA Position Indicator selected CEA group is moving in desired direction • If Reactor is critical, then monitor the following: • Reactor Power • Reactor Coolant System (RCS) temperature • Axial Shape Index (ASI)
	ATC	6.7.5 When desired set of moves have been completed, then place Mode Select switch to OFF.
OP-901-212, Rapid Plant Power Reduction, E_0, General Actions (cont.)		
	CREW	4. Notify the Woodland System Load Dispatcher that a rapid power reduction is in progress.
	CREW	5. Announce to Station Personnel over the Plant Paging System that a rapid plant power reduction is in progress.
	ATC/BOP	6. Maintain RCS Cold Leg Temperature 536°F to 549°F.
	Note	**BOP may use OP-005-007, Sect. 6.2 instead of step 7 below which accomplishes the same thing.**
	BOP	7. Commence Turbine load reduction by performing the following: 7.1 Depress LOAD RATE MW/MIN pushbutton.
	BOP	7.2 Set selected rate in Display Demand Window.
	BOP	7.3 Depress ENTER pushbutton.

Op Test No.: 1	Scenario # 2	Event # 5	Page 23 of 36				

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
	BOP	7.4 Depress REFERENCE pushbutton.
	BOP	7.5 Set desired load in Reference Demand Window.
	BOP	7.6 Depress ENTER pushbutton.
	BOP	7.7 Depress GO pushbutton.

NOTE

If USBSCAL is not in service, the COLSS Steam Calorimetric will be automatically disabled when MSBSCAL, PMC PID C24246, drops below 95% Power, and will revert back to FWBSCAL, PMC PID C24235. This may result in a step change in COLSS indicated Plant Power (BSCAL) of up to 1.0% when this occurs.

Time	Position	Applicant's Actions or Behavior
	SRO/ATC	8. When Reactor Power consistently indicates less than 98% power, as indicated on PMC PID C24631 [MAIN STEAM RAW POWER (MSBSRAW)], or an alternate point provided by Reactor Engineering, then verify the value of C24648 [BSCAL SMOOTHING VAL. APPLD (DUMOUT17)] automatically changes to 1.
	N/A	9. If C24648 does not automatically change to 1, then inform Reactor Engineering and set the value of 1 for COLSS power smoothing constant K24250, [ADDRSSBL SMOOTHING FOR BSCAL (ALPHA)] in accordance with OP-004-005, Core Operating Limits Supervisory System.

Examiner Note

After the reactivity manipulation is satisfied, direct the Booth Operator to initiate Trigger 6.

Time	Position	Applicant's Actions or Behavior
	SRO/BOP	10. Following a Reactor Power change of >15% within a one hour period, direct Chemistry Department to sample Reactor Coolant System (RCS) for an isotopic iodine analysis two to six hours later.
	BOP	11. When Condensate flow is <18,000 gpm, verify Gland Steam Condenser Bypass, CD-154, Closed (PMC PID D02404).
	BOP	12. Monitor Condensate Polisher differential pressure and remove Polishers from service to maintain system pressure in accordance with OP-003-031, Condensate Polisher/Backwash Treatment.

Op Test No.:	1	Scenario #	2	Event #	5	Page	24	of 36

Event Description: FW Heater 5B tube leak from Condensate to Heater Shell/ OP-901-212, Rapid Plant Down Power (to 72 %)

Time	Position	Applicant's Actions or Behavior
	BOP	13. When Reactor Power is approximately 70% or Heater Drain Pump flow is unstable, then remove Heater Drain Pumps from service by taking pump control switches to Stop.

Examiner Note

This event is complete after the Reactivity Manipulation is satisfied or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 6

Op Test No.:	1	Scenario #	2	Event #	6	Page	25 of 36

Event Description: RCP 2A Middle Seal fails (second seal failure)

Time	Position	Applicant's Actions or Behavior
	ATC	Recognizes and reports indications of failed middle seal on RCP 2A
		Alarms:
		• NONE
		Indications:
		• RCP Controlled Bleedoff temperature slowly rising on CP-2
		• RCP 2A Middle and Upper Seal pressures indicate approximately 2235 psig on CP-2 and PMC
	SRO	Returns to OP-901-130, Reactor Coolant Pump Malfunction, or orders a manual reactor trip based on previous review of the procedure.
OP-901-130, Reactor Coolant Pump Malfunction, Section E1, Seal Failure		
	SRO/ATC	3. If two or more seals fail in rapid succession, (within 12 hours) then perform the following: 3.1 Trip the Reactor
	ATC	3.2 Secure affected Reactor Coolant Pump.
	CREW	3.3 GO TO OP-902-000, STANDARD POST TRIP ACTIONS.
	SRO	Directs ATC and BOP to carry out Standard Post trip Actions.

Examiner Note

This event is complete after the Reactor is tripped and RCP 2A is secured.

Examiner Note

The following events (7, 8 & 9) will be triggered by the Simulator Operator when RCP 2A is secured without prior notification.

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	26	of	36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of Loss of Coolant Accident.
		Alarms:
		• LETDOWN FLOW HI/LO (Cabinet G, C-1)
		• PRESSURIZER LEVEL HI/LO (Cabinet H, B-1)
		• PRESSURIZER LEVEL HI-HI (Cabinet H, A-1)
		• QUENCH TANK LEVEL HI/LO (Cabinet H, A-2)
		• QUENCH TANK PRESSURE HI (Cabinet H, B-2)
		• PRESSURIZER RELIEF LINE TEMP HI (Cabinet H, D-2)
		• PRESSURIZER RELIEF VALVE OPEN (Cabinet H, H-6) – Red Alarm
		Indications
		• Mismatch between Charging (CVC-IFI-0212) <u>AND</u> Letdown (CVC-IFI-0202) flow indications. Letdown rises to maximum, with 1 charging pump running
		• Deviation between actual level <u>AND</u> programmed level as indicated on Pressurizer level recorder (RC-ILR-0110). Pressurizer level slowly lowering toward setpoint
		• Deviation of setpoint on Pressurizer level controller (RC-ILIC-0110) from programmed level
		• Pressurizer Backup Heaters energize
		• Relief Valve A red open indication on CP-2
		• Relief Valve A open indication on QSPDS
OP-902-000, Standard Post Trip Actions		
	Note	**During Standard Post Trip Actions, one crew member (typically the BOP) will go to a back panel to restore radiation monitor sample pumps due to some sample pumps requiring restart following a loss of power or voltage dip (i.e. plant loads transfer from UATs to SUTs).**
<u>NOTE</u> Steps 1 and 2 are immediate actions and satisfy Reactivity Control		
	ATC	1. <u>Determine</u> Reactivity Control acceptance criteria are met: a. <u>Check</u> reactor power is dropping. b. <u>Check</u> startup rate is negative. c. <u>Check</u> less than **TWO** CEAs are **NOT** fully inserted.

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	27	of 36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	BOP	2. Verify Main Turbine and Generator tripped: a. Check the Main Turbine is tripped: • Governor valves closed • Throttle valves closed • Turbine Speed lowering
	BOP	b. Check the Main Generator is tripped: • GENERATOR BREAKER A tripped • GENERATOR BREAKER B tripped • EXCITER FIELD BREAKER tripped
	BOP	3. Verify maintenance of Vital Auxiliaries a. Check station loads are energized from Off-site power as follows: **Train A** • A1, Non-Safety bus • A2, Non-Safety bus • A3, Safety bus • A-DC Electrical bus • A and C Vital AC Instrument Channels **Train B** • B1, Non-Safety bus • B2, Non-Safety bus • B3, Safety bus • B-DC Electrical bus • B and D Vital AC Instrument Channels b. Verify CCW flow to RCPs
	ATC	4. Verify RCS Inventory Control: a. Check that **BOTH** of the following conditions exist: • Pressurizer level is 7% to 60% • Pressurizer level is trending to 33% to 60% b. Check RCS subcooling is greater than or equal to 28ºF.

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	28	of 36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK 2 **Establish RCS Inventory Control** This task is satisfied by starting High Pressure Safety Injection Pump B to establish Reactor Coolant System inventory control before exiting the step to verify Safety Injection Actuation Signal Actuation. This task becomes applicable following the initiation of a Safety Injection Actuation Signal. (OP-902-002, step 7)		
	ATC	5. Check RCS Pressure control: • Pressurizer pressure is 1750 psia to 2300 psia • Pressurizer pressure is trending to 2125 psia to 2275 psia
	ATC	5.2 **IF** pressurizer pressure is less than 1684 psia, **THEN** verify **BOTH** of the following have initiated. • SIAS • CIAS
	BOP	Following initiation of Safety Injection Actuation Signal (auto or manual) start High Pressure Safety Injection Pump B. • Momentarily place HPSI Pump B C/S to START.
	ATC	5.3 **IF** pressurizer pressure is less than 1621 psia, **THEN** verify **ONE** RCP in each loop is stopped.
CRITICAL TASK 1 **Trip Any RCP Exceeding Operating Limits** This task is satisfied by stopping all running RCPs within 3 minutes of loss of Component Cooling Water flow or prior to completing the step that verifies RCP operating limits. This task becomes applicable after either running RCP Vibration alarms actuate OR Containment Spray is initiated, whichever occurs first. (OP-902-002, 9.b or 9.d.1)		

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	29	of 36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	ATC	5.4 **IF** pressurizer pressure is less than the minimum RCP NPSH of Appendix 2A-B, "RCS Pressure and Temperature Limits", **THEN** stop **ALL** RCPs.
	ATC	6. Check Core Heat Removal: a. At least **ONE** RCP is operating. b. Operating loop ΔT less than 13ºF. c. RCS subcooling greater than or equal to 28ºF.
	Note	**The above step can be skipped if RCPs are secured.**
	BOP	7. Verify RCS Heat Removal: a. Check that at least **ONE** SG has **BOTH** of the following: • SG level is 10% to 76% NR • Feedwater is available to restore level within 55%-70% NR.
	BOP	b. Check Feedwater Control in Reactor Trip Override: • MAIN FW REG valves are closed • STARTUP FW REG valves are 13% to 21% open • Operating Main Feedwater pumps are 3800 rpm to 4000 rpm
	ATC	c. Check RCS Tc is 530 to 550 ºF.
	BOP	d. Check Steam Generator pressure is 885 to 1040 psia.
	Note	**If MSIS has occurred, the Feedwater Regulating valves will be closed and the Feedwater pumps will be coasting due to no steam supply.**
	BOP	e. Reset Moisture Separator reheaters, and check the Temperature Control valves closed.
	ATC	8. Verify Containment Isolation: a. Check containment pressure is less than 16.4 psia. b. Check NO containment area radiation monitor alarms OR unexplained rise in activity. c. Check NO steam plant activity monitor alarms OR unexplained rise in activity.

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	30	of	36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	ATC	a1. **IF** containment pressure is greater than or equal to 17.1 psia, **THEN** verify **ALL** of the following: • CIAS is initiated • SIAS is initiated • MSIS is initiated
	BOP	9 Verify Containment Temperature and Pressure Control: a. Check Containment temperature is less than or equal to 120ºF. b. Check Containment pressure is less than 16.4 psia.
	BOP	9.2 **IF** containment pressure is greater than or equal to 17.1 psia, **THEN** verify **ALL** available Containment Fan Coolers are operating in emergency mode.
CRITICAL TASK 1 **Trip Any RCP Exceeding Operating Limits** This task is satisfied by stopping all running RCPs within 3 minutes of loss of Component Cooling Water flow or prior to completing the step that verifies RCP operating limits. This task becomes applicable after either running RCP Vibration alarms actuate OR Containment Spray is initiated, whichever occurs first. (OP-902-002, 9.b or 9.d.1)		
	ATC/BOP	9.3 **IF** containment pressure is greater than or equal to 17.7 psia, **THEN** verify **ALL** of the following: • CSAS is initiated • **ALL** available containment spray pumps are delivering flow greater than 1750 gpm • **ALL** RCPs are stopped
	Note	**The Reactor Coolant Pumps may have already been secured.**
	SRO	10. GO TO Appendix 1, "Diagnostic Flowchart" and diagnose to appropriate EOP.
OP-902-009, Standard Appendices, Appendix 1 Diagnostic Flow Chart		

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	31	of	36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior

Examiner Note

Appendix 1 is a flow chart used to diagnose to the correct recovery procedure for the event in progress. The steps below will be followed by a YES or NO to indicate proper flow path.

	ATC	Is Reactivity Control met? (YES)
	BOP	Is at least **ONE** 125 VDC **SAFETY** bus energized? (YES)
	BOP	Is at least **ONE** 4.16 KV **NON-SAFETY** bus energized? (YES)
	BOP	Is at least **ONE** 4.16 KV **SAFETY** bus energized? (YES)
	ATC	Is at least **ONE** RCP running? (NO)
	SRO	Consider LOOP/LOFC OP-902-003
	BOP	Does at least **ONE** SG have adequate FW? (Note 2) (YES)
	ATC	Is PZR pressure >1750 psia **AND** stable or rising? (NO)
	ATC	Is RCS Subcooling <28F **AND** stable or lowering? (YES)
	ATC/BOP	Is SGTR Indicated? (Note 3) (NO)
	SRO	**Consider** LOCA OP-902-002
	ATC	Is CNTMT pressure <16.4 psia **AND** stable or lowering? (NO)
	ATC	Are CNTMT Rad monitor(s) in alarm or unexplained rise? (YES)
	SRO	**Consider** LOCA OP-902-002
	ATC/BOP	Is SGTR Indicated? (Note 3) (NO)
	BOP	Are **BOTH** SG pressures >885 psia **AND** stable or rising? (Note 5) (YES)
	SRO	Are **ALL** acceptance criteria satisfied? (NO)

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	32	of	36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	SRO	Has **ANY** event been diagnosed? (Note 4) (YES)
	SRO	Can a single event be diagnosed? (Note 4) (YES)
	SRO	**GO TO** Appropriate EOP
	Note	**SRO goes to OP-902-002, Loss of Coolant Accident Recovery**
	Note	**The BOP may secure AH-12 A or B on SRO direction after initiation of SIAS at CP-18.**
	CREW	When Containment Temperature rises above 200 F, update crew on need to use bracketed parameters due to harsh environment in Containment.
OP-902-002, Loss of Coolant Accident Recovery		
NOTE The Shift Chemist should be notified if a SIAS or CIAS has occurred. The secondary sampling containment isolation valves should not be opened following an SIAS or CIAS until directed by the Shift Chemist.		
	SRO	1. Confirm diagnosis of a LOCA : a. Monitor the SFSCs and check Safety Function Status Check Acceptance criteria are satisfied. b. **IF** Steam Generator sample path is available, **THEN** direct Chemistry to sample **BOTH** SGs for activity.
	CREW	2. Announce a Loss of Coolant Accident is in progress using the plant page.
	SRO	3. Advise the Shift Manager to implement the Emergency Plan using EP-001-001, "Recognition & Classification of Emergency Condition."
	SRO	4. REFER TO Section 6.0, "Placekeeper" and record the time of the reactor trip.
	N/A	5. **IF** power has been interrupted to either 3A or 3B safety bus, **THEN** perform Appendix 20, "Operation of DCT Sump Pumps."
	Note	**The CRS will typically perform a brief at this point in the EOP. Brief should not be held until RCPs and HPSI Pump B are addressed.**

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	33	of 36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	Note	**During brief in OP-902-002, the SRO should discuss necessary strategy of using Steam Generators to cool RCS.**
	SRO/ATC	6. Check SIAS has actuated.
		6.1 **IF** pressurizer pressure is less than 1684 psia **OR** CNTMT pressure greater than or equal to 17.1 psia, **THEN** verify SIAS is actuated.
	SRO/BOP	7. **IF** SIAS has actuated, **THEN** perform the following: a Verify Safety Injection pumps have started. b. Check Safety Injection flow is within the following: • Appendix 2-E, "HPSI Flow Curve" • Appendix 2-F, "LPSI Flow Curve" c. Verify **ALL** available charging pumps are operating. d. **IF** RWSP on Purification, **THEN** isolate RWSP using Appendix 40, "Isolate RWSP from Purification."
	ATC	8. **IF** pressurizer pressure is less than 1621 psia, **AND** SIAS is actuated, **THEN** perform the following: a. Verify **ONE** RCP in each loop is stopped. b. Check pressurizer pressure is greater than the minimum RCP NPSH of Attachment 2A-D, "RCS Pressure and Temperature Limits."
	Note	**The Reactor Coolant Pumps may have already been secured.**
		b.1 Verify **ALL** RCPs stopped.
	ATC	9. **IF** RCPs are operating, **THEN** perform the following: a. Verify CCW available to RCPs. b. **IF** a CSAS is initiated, **THEN** stop **ALL** RCPs. c. **IF** RCS TC is less than 380ºF **[384ºF]**, **THEN** verify **ONE** RCP in each loop is stopped. d. Check RCP operating parameters: • NPSH, REFER TO Attachment 2A-D, "RCS P-T Limits" • Bearing Temperatures less than or equal to 225ºF. • Bleed Off Temperature less than 200ºF • Cooling Coils Return CCW Temp less than 155ºF • At least Two Seals per RCP operable

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	34	of	36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	BOP	10. Check CCW operation: a. Check a CCW pump is operating for each energized 4.16 KV Safety bus: • 3A Safety bus • 3B Safety bus b. **IF** only **ONE** CCW pump operating, **THEN** split CCW headers using Appendix 35, "Single CCW Pump Operation." c. Check an Essential chiller is operating for EACH energized 4.16 KV Safety Bus: • 3A Safety bus • 3B Safety bus
	Note	**BOP checks Essential Chillers running on CP-18.**
	BOP/ATC	11. Isolate the LOCA: a. Verify **ALL** Letdown isolation valves are closed: • CVC 101, LETDOWN STOP VALVE • CVC 103, LETDOWN ISOL VALVE • CVC 109, LETDOWN ISOL VALVE b. Verify **ALL** RCS sampling containment isolation valves are closed: **Train A** • PSL 107, HOT LEG • PSL 204, PZR SURGE • PSL 304, PZR STEAM **Train B** • PSL 105, HOT LEG • PSL 203, PZR SURGE • PSL 303, PZR ISOL VLV
NOTE SIAS will cause a CCW surge tank level rise due to higher heat loads.		
	ATC/BOP	c. Check RCS to CCW boundary is intact by **ALL** of the following: • CCW Radiation monitor AB Hi alarm clear • No abnormal rise in CCW Radiation monitor AB reading • No unexplained rise in CCW Surge Tank level

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	35	of 36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	12. Check LOCA is NOT outside containment by evaluating the following: • Auxiliary Building Radiation Monitor trends normal and alarm clear • No unexplained rise in Auxiliary Building Sump levels • No abnormal rise in Waste Tank level
	ATC/BOP	13. **IF ANY** of the following conditions exist: • Containment pressure is greater than 17.1 psia • SIAS is actuated due to low RCS pressure • Containment Area Radiation monitors greater than the Hi Alarm **THEN** perform the following: a. Check CIAS is initiated. b. Verify **ALL** available Containment Fan Coolers operating in emergency mode.
	ATC/BOP	14. **IF** containment pressure is greater than or equal to 17.7 psia, **THEN** perform the following: a. Verify CSAS is initiated. b. Verify **ALL** operating containment spray pumps are delivering flow greater than 1750 gpm.
CAUTION The Containment Vacuum Relief Valves may open if Containment pressure lowers to less than 15.0 [15.7] psia.		
	N/A	15. **IF** CS pumps are operating **AND ALL** of the following conditions are satisfied: • Containment pressure is less than 16.7 psia and stable or lowering • Containment Spray is not required for containment cooling • Containment Spray is **NOT** required for iodine removal **THEN** reset CSAS actuation using Attachment 5-E, "CSAS Reset Procedure." .
	N/A	16. Perform **BOTH** of the following to protect the Main Condenser: • Verify CW System in operation. REFER TO OP-003-006, "Circulating Water." • Check Condenser vacuum greater than 14 inches Hg.

Op Test No.:	1	Scenario #	2	Event #	7,8,9	Page	36	of	36

Event Description: Pressurizer Code Safety, RC-317A fails open, High Pressure Safety Injection Pump B fails to auto start on SIAS, High Pressure Safety Injection Pump A trips

Time	Position	Applicant's Actions or Behavior
	BOP	17. Verify instrument air is available: a. Check **BOTH** of the following are operating: • TCW pump • CW pump b. Check instrument air pressure is greater than 95 psig. c. Check IA 909, CNTMT ISOLATION INSTRUMENT AIR valve is open.
	BOP	c.1 Open IA-909, CNTMT ISOLATION INSTRUMENT AIR valve
	SRO	18. Check LOCA is still in progress.

NOTE

- The following RCS cooldown rates apply:
  - RCS $\leq$ 100°F/hr
  - RCS on Natural Circulation with Asymmetrical Steam Generator RCS $\leq$ 50°F/hr
  - Pressurizer $\leq$ 200°F/hr
- Attachment 3-A, "Pressurizer/RCS Cooldown Log" may be required during the cooldown and depressurization
- During a Large Break LOCA, the Steam Generators may become decoupled from the RCS. Removing stored energy from the SGs supports RCS heat removal

Time	Position	Applicant's Actions or Behavior
	N/A	19. Commence SG cooldown using the Steam Bypass Control valves.
	BOP/ATC	19.1 Cooldown SGs using the Atmospheric Dump valves.

Examiner Note

This event is complete when an RCS cooldown has been initiated or at Lead Examiner's Discretion.

Facility: Waterford Scenario No.: **3** Op Test No.: 1

Examiners: Operators:

Initial Conditions: ~ 1% Reactor Power; 1st SGFP in service; AB Buses are aligned to Train B. Charging Pumps A and B running. No major equipment out of service.

Turnover:

Protected Train is B, Secure AFW pump, Raise power to 5-10% using CEAs.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R – ATC N – BOP N – SRO	Secure the Auxiliary Feedwater Pump and raise power to 5-10% using CEAs in accordance with OP-010-003, Plant Startup.
2	RX08A	I – ATC I – SRO	Pressurizer Level Controller, RC-ILIC-0110, fails off requiring implementation of OP-901-110, Pressurizer Level Control Malfunction (E3).
3	RP04B5 AO-07A2M11-1	I – BOP I – SRO TS – SRO	RWSP Level Instrument, SI-ILI-0305B, fails low and generates an RAS trip requiring TS 3.3.2 entry and bypassing the affected trip bistable.
4	CC01B	C – BOP C – SRO TS – SRO	Component Cooling Water Pump B trips requiring entry into OP-901-510, Component Cooling Water System Malfunction (TS 3.7.3 & Cascading).
5	RX14A RC14B1	C – ATC C – SRO	Selected Pressurizer Pressure Control Channel (RC-IPR-100X) fails high and Pressurizer Spray Valve RC-301B fails open, requiring entry into OP-901-120, Pressurizer Pressure Control Malfunction and a manual reactor trip to secure selected Reactor Coolant Pumps and stop RCS depressurization. **(CT 1, RCS Pressure Control)**
6	ED01 A – D	M – All	Loss of Off-site Power, OP-902-003, Loss of Offsite Power/Loss of Forced Circulation Recovery
7	EG10A	N/A	Emergency Diesel Generator A trips on overspeed.
8	ED23B	C – BOP C – SRO	Emergency Diesel Generator B Output Breaker fails to AUTO Close, due to the 3B to 2B Tie Breaker failing to open on Undervoltage. Crew re-energizes B Safety bus. **(CT 2, Energize a Safety Electrical Bus)**

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

The crew assumes the shift at ~ 1% power with instructions to secure the AFW pump and raise power to 5-10% to roll the Main Turbine. All requirements have been met to change modes from MODE 2 to MODE 1. The SRO should direct raising power using Control Element Assemblies in accordance with the reactivity plan, OP-010-003, Plant Startup and OP-010-004, Power Operations.

After the AFW pump is secured and the reactivity manipulation has been satisfied, Pressurizer level controller RC-ILIC-0100 fails off. The CRS should enter OP-901-110, Pressurizer Level Control Malfunction, and implement section E3. This will require the ATC to control Letdown from CP-4. There are no Tech Spec consequences of the failure provided the crew restores letdown flow prior to exceeding 62.5% level in the pressurizer.

After the Pressurizer Level Controller Failure is addressed, RWSP Level instrument, SI-ILI-0305B, fails low and generates an RAS trip on channel B. The ATC operator will review the annunciators for this failure. The CRS should evaluate Tech Specs and enter Tech Spec 3.3.2 and determine that the Plant Protection System bistable (18) for Low RWSP Level must be bypassed within 1 hour on Channel B. Tech Spec 3.3.3.5 and 3.3.3.6 should be referenced but not entered.

After the Low RWSP bistable is bypassed, Component Cooling Water Pump B trips on overcurrent. The SRO should enter OP-901-510, Component Cooling Water System Malfunction, and direct the start of Component Cooling Water Pump AB to replace Component Cooling Water Pump B. The SRO should enter Technical Specification 3.7.3 and cascading Technical Specifications per OP-100-014, Technical Specification and Technical Requirements Compliance and comply with a 1 hour action by performing OP-903-066, Electrical Breaker Alignment Check. Once CCW pump AB is in service Tech Spec 3.7.3 and cascading Tech Specs may be exited.

After the SRO has addressed Technical Specifications, the selected Pressurizer Pressure Channel fails high causing pressurizer spray to initiate. When the crew takes manual control of the Pressurizer Spray Controller, Pressurizer Spray Valve, RC-301B remains open. The crew should select Spray Valve A. When RC-301B remains open, the crew should determine a reactor trip is required to secure sufficient Reactor Coolant Pumps to stop the RCS depressurization **(Critical Task 1)**. The crew will be taking the actions required by OP-901-120, Pressurizer Control Malfunction but may not enter the procedure prior to the reactor trip due to the pressure dropping in the RCS. The SRO should enter OP-902-000, Standard Post Trip Actions. In order to restore Pressurizer heaters the SRO will have to implement the section in the offnormal to select the non-faulted pressurizer pressure control channel and the pressurizer level must recover above the low level heater cutout setpoint reset (~30%).

After the crew has secured sufficient Reactor Coolant Pumps for the Spray valve failure and the crew is performing Standard Post Trip Actions, a loss of off-site power occurs. Emergency Diesel Generator A will trip on overspeed. Emergency Diesel Generator B will start but, its output breaker will fail to close automatically due to the 3B to 2B Bus Tie Breaker failing to open on undervoltage. The crew must manually trip the 3B to 2B Bus Tie Breaker which allows EDG B output breaker to close automatically and re-energize the B Safety Bus **(Critical Task 2)**. If the crew fails to manually trip the 3B to 2B Bus Tie Breaker, a station blackout results and EDG B will eventually overheat and fail due to no CCW cooling. The SRO should enter OP-902-003, Loss of Offsite Power/Loss of Forced Circulation Recovery. The SRO should direct a non-licensed operator to restore power to the Dry Cooling Tower Sump Pumps. The BOP should take action to protect the Main Condenser from over-pressurization. The scenario can be ended after these actions are complete, or at the lead examiner's discretion.

Critical Task		
Number	Description	Basis
1	Establish RCS Pressure Control This task is satisfied by securing sufficient Reactor Coolant Pumps to stop Reactor Coolant System depressurization prior to loss of Subcooled Margin. This task becomes applicable after Pressurizer Spray Valve B, RC-301B, fails open. (OP-901-120, E3 step 3)	RCS subcooling is an integral part of adequate pressure control, inventory control, and Core heat removal. The importance of keeping the fluid surrounding the Core in a subcooled state carries a high degree of nuclear safety significance based on its direct relationship to these safety functions. (ECS-98-001, S.01)
2	Energize at Least One Safety Electrical Bus This task is satisfied by the crew taking action to energize the B Safety Bus by tripping the 3B-to-2B Bus Tie breaker prior to failure of Emergency Diesel Generator B due to no Component Cooling Water. This task becomes applicable after the loss of offsite power occurs. (OP-902-000, 3.a.1)	Failure to energize at least one emergency bus will result in the plant remaining in a configuration that will not support protection if a subsequent event would occur. This lowers the capability of the plant to mitigate an event. (TM-OP-100-03, CT-3)
***** **Critical Task** (As defined in NUREG 1021 Appendix D) ** Per NUREG-1021, Appendix D, If an operator or the crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review.		

Scenario Quantitative Attributes

1. Malfunctions after EOP entry (1–2)	2
2. Abnormal events (2–4)	3
3. Major transients (1–2)	1
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	0
6. EOP based Critical tasks (2–3)	2

SCENARIO NOTES

A. Reset Simulator to IC-163.

B. Verify Scenario Malfunctions are loaded, as listed in the Scenario Timeline.

C. Verify all EFW Flow Control Valves are in Auto (remove Caution Tags on flow controllers).

D. Verify Channel X is selected for PZR pressure control.

E. Place a Protect Equipment cover on running SFP pump C/S.

F. Ensure Protected Train B sign is placed in SM office window.

G. Verify EOOS is 10.0 Green with no equipment out of service.

H. Place a copy of OP-010-003, Plant Startup, on the Control Room desk with step 9.4.52.2 (secure AFW) circled and several of the previous steps circle-slashed to show progress. Fill in initials and circle-slash steps 9.4.53 (adjust Blowdown), 9.4.59 (mode 1 Tech Spec logs) and 9.4.60 (Chemistry contacted) as complete. Sign step 9.4.61 (SM permission to enter mode 1).

I. Complete the simulator setup checklist.

J. Establish the following trends:

   1. C24104 on CP3, CRT 6 (0-10 scale, 1 sec update)
   2. SG Wide Range levels on CP-35 (15 sec update)

K. Start Insight, open file Crew Performance.tis.

SIMULATOR BOOTH INSTRUCTIONS

Event 1 Secure AFW Pump and raise reactor power

1. If called as an NAO to standby the AFW pump, acknowledge the communication. Wait 2 minutes and report you are standing by.
2. If called as Chemistry to verify SG chemistry is within specification, inform the caller that SG chemistry is satisfactory. If asked for your name, say Joe Chemist.
3. If called as an NAO to open or throttle open MS-148, acknowledge the communication. Wait 5 minutes, report that you will be slowly opening/throttling MS-148, MS Supply to Gland Seal Isolation. Initiate Event **Trigger 1.** After MS-148 completes ramping, report that MS-148 is open/throttled open. If you are directed to further throttle open MS-148, simply acknowledge the request, wait ~30 seconds and report the new throttled position. Repeat as necessary until it is reported that MS-148 is fully open.
4. If called as an NAO to transfer Auxiliary Steam from Aux Boiler Steam to Main Steam, acknowledge the communication. Wait 15 minutes, and then report that Auxiliary Steam has been transferred to Main Steam (no remote necessary).
5. If called as an NAO to secure the Portable Auxiliary Boiler, acknowledge the communication. Wait 5 minutes, initiate Event **Trigger 20** and report that the Portable Aux Boiler is secured..

Event 2 Pressurizer Level Controller, RC-ILIC-0110, Output Fails Off

1. On Lead Examiner's cue, initiate Event **Trigger 2**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.

Event 3 RWSP Level Instrument, SI-ILI-0305B, Fails Low & RAS Trip Generated

1. On Lead Examiner's cue, initiate Event **Trigger 3**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.

Event 4 Component Cooling Water Pump B Trips

1. On Lead Examiner's cue, initiate Event **Trigger 4**.
2. If called as the watchstander and sent to CCW Pump B, wait 3 minutes, report that the pump looks normal locally.
3. If called as the watchstander and sent to CCW Pump B breaker, wait 3 minutes, report that the breaker indicates open and that there are various breaker parts on the floor of the cubicle.
4. If Work Week Manager or PME are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.

Event 5 Pressurizer Pressure Control Channel, RC-IPT-0100X, Fails High and Pressurizer Spray Valve RC-301B Fails Open

1. On Lead Examiner's cue, initiate Event **Trigger 5**.

Event 6 Loss of Offsite Power

1. On Lead Examiner's cue, initiate Event **Trigger 6**.
2. If the Duty Plant Manager is called, inform the caller that you will make the necessary calls.
3. If Chemistry is called to perform samples acknowledge the request.

Event 7&8 EDG A Trips on Overspeed; 3B-to-2B Bus Tie Breaker Fails to Trip on UV

1. If called as an NAO to investigate EDG A, wait 3 minutes; initiate Event **Trigger 21** (EGR26) to acknowledge the local alarm panel and report that EDG A is not running, “EMERGENCY STOP or UNIT S/D” and “ENGINE OVERSPEED” alarms are locked in but there is no obvious signs of damage. If asked, report Overspeed Butterfly valve is tripped.
2. If Work Week Manager or PMM are called, inform the caller that a team will be organized and sent to the field as soon as possible.
3. If called as an NAO to check EDG B, wait 2 minutes; initiate Event **Trigger 22** (EGR27) to acknowledge the local alarm panel. If EDG B output breaker is closed and CCW pump B is running, report EDG B is running and all parameters are normal. If CCW pump B is not running (i.e. EDG B Output breaker is not closed), report EDG B is running and “SERVICE WATER LOW FLOW” alarm is locked in.

At the end of the scenario, before resetting, end data collection and save the file as 2017 Scenario 3-(start-end time).tid. Export to .csv file. Save the file into the folder for the appropriate crew.

SCENARIO TIMELINE

EVENT	KEY	DESCRIPTION	TRIGGER	DELAY HH:MM:SS	RAMP HH:MM:SS	FINAL
EVENT DESCRIPTION						
1	MSR09	MS-148 MS to GS ISOL VALVE	1	00:00:00	00:01:00	12%
SECURE AFW PUMP AND RAISE REACTOR POWER						
2	RX08A	PZR LVL CONTROLLER 110 FAILS OFF	2	00:00:00	00:00:00	ACTIVE
PRESSURIZER LEVEL CONTROLLER RC-ILIC-0110 OUTPUT FAILS OFF						
3	RP04B5	TRIP GENERATED CH B RWSP LVL(RAS)	3	00:00:00	00:00:00	ACTIVE
	AO-07A2M11-1	CH B RWSP LEVEL	3	00:00:00	00:00:00	0%
RSWP CHANNEL B LEVEL INSTRUMENT SI-ILI-0305B FAILS LOW & RAS TRIP GENERATED						
4	CC01B	CCW PUMP B TRIP	4	00:00:00	00:00:00	ACTIVE
COMPONENT COOLING WATER PUMP B TRIP						
5	RX14A	PZR PRESSURE CNTL CHL 100X FAIL (0-100%)(1500-2500 PSIA)	5	00:00:00	00:00:00	100
	RC14B1	PZR SPRAY VALVE RC-301B FAILS OPEN	5	00:00:00	00:00:00	ACTIVE
PRESSURIZER PRESSURE CONTROL CHANNEL, RC-IPT-0100X, FAILS HIGH AND PRESSURIZER SPRAY VALVE, RC-301B, FAILS OPEN						
6	ED01A	FEEDER BREAKER 7172 TRIP IN SWITCHYARD	6	00:00:00	00:00:00	ACTIVE
	ED01B	FEEDER BREAKER 7176 TRIP IN SWITCHYARD	6	00:00:00	00:00:00	ACTIVE
	ED01C	FEEDER BREAKER 7182 TRIP IN SWITCHYARD	6	00:00:00	00:00:00	ACTIVE
	ED01D	FEEDER BREAKER 7186 TRIP IN SWITCHYARD	6	00:00:00	00:00:00	ACTIVE
LOSS OF OFFSITE POWER						
7	EG10A	DG A OVERSPEED TRIP	6	00:00:10	00:00:00	ACTIVE
EDG A TRIPS ON OVERSPEED						
8	ED23B	3BS TO B2 BUS BREAKER FAILS TO TRIP ON UV	6	00:00:00	00:00:00	ACTIVE
3BS TO B2 BUS BREAKER FAILS TO TRIP ON UV						

EVENT	KEY	DESCRIPTION	TRIGGER	DELAY HH:MM:SS	RAMP HH:MM:SS	FINAL
EVENT DESCRIPTION						
N/A	**MSR32**	**TEMPORARY AUX BOILER**	**20**	**N/A**	**N/A**	**OFFLINE**
TEMPORARY AUX BOILER (16 MIN TILL RATED PRESS)						
N/A	**EGR26**	**EDG A LOCAL ANNUN ACK**	**21**	**00:00:00**	**00:00:00**	**ACKN**
LOCAL EDG ANNUNCIATOR ACKNOWLEDGE						
N/A	**EGR27**	**EDG B LOCAL ANNUN ACK**	**22**	**00:00:00**	**00:00:00**	**ACKN**
LOCAL EDG ANNUNCIATOR ACKNOWLEDGE						

REFERENCES

Event	Procedures
1	OP-010-003, Plant Startup, Rev. 342 OP-003-035, Auxiliary Feedwater, Rev. 305 OP-004-004, Control Element Drive, Rev. 23
2	OP-901-110, Pressurizer Level Control Malfunction, Rev. 9
3	OP-009-007, Plant Protection System, Rev. 17 OP-903-013, Monthly Channel Checks, Rev. 18 Technical Specification 3.3.2
4	OP-901-510, Component Cooling Water Malfunction, Rev. 303 Technical Specification 3.7.3 & Cascading
5	OP-901-120, Pressurizer Pressure Control Malfunction, Rev. 302 OP-902-000, Standard Post Trip Actions, Rev 16 OP-902-009, Standard Appendices, Rev. 315, Appendix 1 (Diagnostic Flow Chart), Appendix 2 (Figures)
6	OP-902-003, Loss of Offsite Power/Loss of Forced Circ Recovery Procedure, Rev. 10
7 & 8	OP-902-000, Standard Post Trip Actions, Rev. 16
GEN	EN-OP-115, Conduct of Operations, Rev. 17 EN-OP-115-08, Annunciator Response, Rev. 4 EN-OP-200, Plant Transient Response Rules, Rev. 3 OP-100-014, TS and TRM Compliance, Rev. 336 OI-038-000, EOP Operations Expectations / Guidance, Rev. 14

Op Test No.:	1	Scenario #	3	Event #	1	Page	1	of 24
Event Description:	Secure AFW Pump and raise power to 5-10%							

Time	Position	Applicant's Actions or Behavior
Examiner Note **Event 1 is a normal plant evolution. The crew will be pre-briefed and ready to start raising power once they take the shift. Per the reactivity plan the crew will use control rods to raise power.**		
OP-010-003, Plant Startup, Section, 9.4		
	SRO	9.4.52.2 Secure Auxiliary Feedwater Pump in accordance with OP-003-035, Auxiliary Feedwater.
OP-003-035, Auxiliary Feedwater, Section, 7.0		
	N/A	7.1 Shutdown of Auxiliary Feedwater Pump 7.1.1 If recircing Steam Generators, then re-align Blowdown to Condenser A by performing the following:
	BOP	7.1.2 Secure Auxiliary Feedwater Pump.
	BOP	7.1.3 Place Auxiliary Feedwater Controller, FW-IFIC-8202, in Manual (MAN).
	BOP	7.1.3.1 Set controller to minimum setting.
	BOP	7.1.4 Open Auxiliary Feedwater Pump Discharge Pressure Cntrl, AFW-125.
OP-010-003, Plant Startup, Section, 9.4		
	BOP	9.4.52.3 Maintain Steam Generator levels 50 to 70% NR.
	N/A	9.4.53 Adjust Steam Generator Blowdown flow as recommended by Chemistry Department.
	ATC	9.4.54 Begin raising Reactor power by CEA withdrawal or boron dilution to ≤5% full power.
	Note	**Crew commences raising power per Reactivity plan and per OP-004-004, Control Element Drive.**

Op Test No.:	1	Scenario #	3	Event #	1	Page	2 of 24
Event Description:	Secure AFW Pump and raise power to 5-10%						

Time	Position	Applicant's Actions or Behavior
OP-004-004, Section 6.7, Operation of CEAs in Manual Group (MG) Mode		

CAUTION

(1) CRITICALITY SHALL BE ANTICIPATED ANY TIME CEAS ARE WITHDRAWN AND THE REACTOR IS NOT CRITICAL.

(2) OBSERVE APPLICABLE GROUP INSERTION LIMITS IN ACCORDANCE WITH TECHNICAL SPECIFICATION 3.1.3.6 (REG GROUP), AND TECHNICAL SPECIFICATION 3.1.3.5 (SHUTDOWN BANKS).

(3) IMPROPER OPERATION OF CEAS IN MANUAL GROUP MODE MAY CAUSE A REACTOR TRIP BASED ON AN OUT-OF-SEQUENCE CONDITION.

(4) CEA INITIALIZATION PROGRAM MUST BE RUNNING IN THE PLANT MONITORING COMPUTER TO HAVE GROUP STOPS AND SEQUENTIAL PERMISSIVES AVAILABLE.

CAUTION

THIS SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

	ATC	6.7.1 Verify Plant Monitoring Computer operable in accordance with OP-004-012, Plant Monitoring Computer.
	ATC	6.7.2 Position Group Select switch to desired group.
	Note	**Reg. Group 6 should be selected.**

NOTE

The Operator should remain in the area in front of the CEA Drive Mechanism Control Panel when the Mode Select switch is not in OFF.

	ATC	6.7.3 Place Mode Select switch to MG and verify the following: ▪ White lights Illuminated on Group Selection Matrix for selected group ▪ MG light Illuminates

Op Test No.:	1	Scenario #	3	Event #	1	Page	3	of	24
Event Description:	Secure AFW Pump and raise power to 5-10%								

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.4 Operate CEA Manual Shim switch to WITHDRAW or INSERT group to desired height while monitoring the following: ▪ CEA Position Indicator selected CEA group is moving in desired direction ▪ If Reactor is critical, then monitor the following: o Reactor Power o Reactor Coolant System (RCS) temperature o Axial Shape Index (ASI)
	ATC	6.7.5 When desired set of moves have been completed, then place Mode Select switch to OFF.
OP-010-003, Plant Startup, Section, 9.4		
	ATC	9.4.55 Prior to exceeding 5% power, verify Linear Power Channels are on scale.
Examiner Note **This event is complete when the AFW pump is stopped and Reactivity Manipulation is satisfied or at Lead Examiner's Discretion.**		
Examiner Note **Cue the Simulator Operator when ready for Event 2**		

Op Test No.: 1	Scenario # 3	Event # 2	Page 4 of 24				

Event Description: Pressurizer Level Controller RC-ILIC-0110 fails OFF (output 0%)

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of failed controller
		Alarms
		• LETDOWN FLOW HI/LO (Cabinet G, C-1)
		• LETDOWN HX OUTLET PRESS LO (Cabinet G, B-2)
		Indications
		• Mismatch between Charging (CVC-IFI-0212) AND Letdown (CVC-IFI-0202) flow indications
		• Letdown Flow (CVC-IFI-0202) indicates 0 GPM
	SRO	Enter and direct the implementation of OP-901-110, Pressurizer Level Control Malfunction.
OP-901-110, Pressurizer Level Control Malfunction, E0 General		
	N/A	1. Stop Turbine load changes.
	N/A	2. <u>If</u> malfunction is due to failure of Letdown Flow Control valve, <u>then</u> <u>go to</u> OP-901-112, CHARGING/LETDOWN MALFUNCTION.
	N/A	3. <u>If</u> malfunction is due to failure of Pressurizer Level Control Channel (incorrect readings on <u>either</u> RC-ILI-0110X <u>or</u> RC-ILI-0110Y), <u>then</u> <u>go to</u> Subsection E1, Pressurizer Level Control Channel Malfunction.
	N/A	4. <u>If</u> malfunction is due to failure of Pressurizer Level Setpoint (RC-ILIC-0110), <u>then</u> <u>go to</u> Subsection E2, Pressurizer Level Setpoint Malfunction.
	SRO	5. If malfunction is due to failure of Pressurizer Level Controller (RC-ILIC-0110), <u>then</u> <u>go to</u> Subsection E3, Pressurizer Level Controller Malfunction.
OP-901-110, Pressurizer Level Control Malfunction, E3 PZR Level Controller Malfunction		
	ATC	1. Place Pressurizer Level Controller (RC-ILIC-0110) in MAN <u>and</u> adjust OUTPUT to slowly adjust letdown flow to restore Pressurizer level.
	Note	**This will not function because of the nature of the malfunction. This controller output is failed to zero.**

Op Test No.:	1	Scenario #	3	Event #	2	Page	5	of 24
Event Description:	Pressurizer Level Controller RC-ILIC-0110 fails OFF (output 0%)							

Time	Position	Applicant's Actions or Behavior
	ATC	2. IF the Pressurizer Level Controller (RC-ILIC-0110) has failed low, THEN perform the following:
	ATC	2.1 Place Letdown Flow controller (RC-IHIC-0110) to MAN
	ATC	2.2 Place Letdown Backpressure controller (CVC-IPIC-0202) to MAN AND set OUTPUT to 10%
	ATC	2.3 Complete Attachment 2, Charging Nozzle Thermal Cycling Evaluation Data, then slowly restore Letdown flow to a value equal to Charging flow minus Controlled Bleedoff flow
	ATC	2.4 Adjust Letdown Backpressure controller OUTPUT as needed to maintain backpressure ~460 PSIG
	ATC	2.5 WHEN desired Letdown flowrate is achieved and Letdown backpressure is at desired setpoint, then place Letdown Backpressure controller (CVCIPIC- 0201) to AUTO
	ATC	2.6 Maintain Pressurizer level above minimum level for operation in accordance with Attachment 1, Pressurizer Level Versus T_{AVE} Curve.
	Note	**Minimum level for operation for the current Tave is 33.1%**

Examiner Note

This event is complete after Letdown is being controlled manually using the Letdown Flow Controller from CP-4 or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 3

Op Test No.:	1	Scenario #	3	Event #	3	Page	6	of	24

Event Description: RWSP Level Instrument, SI-ILI-0305B, fails low and generates an RAS trip

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of failed channel.
		Alarms:
		• ESFAS CHANNEL TRIP RWSP LEVEL LO (Cabinet K, F-17)
		• RPS CHANNEL B TROUBLE (Cabinet K, F-18)
		Indications
		• RWSP Level instrument, SI-ILI-0305B on CP-7 indicates failed low
		• LO RWT LEVEL trip lamp lit on CP-7 Channel B.
Examiner Note **All BOP manipulations for OP-009-007 are located at CP-10 except as noted.**		
OP-009-007, Plant Protection System ,Section 6.2, Trip Channel Bypass Operation		
	SRO	6.2.1 Refer to Attachment 11.11, PPS Bistable Bypass Chart to assist in determination of Trip Channels requiring placement in bypass.
	Note	**SRO determines the following bistable is affected and needs to be bypassed:** • **18 - LO RWT LEVEL**
	Note	**SRO directs BOP to bypass the LO RWT LEVEL bistable in PPS Channel B within 1 hour in accordance with OP-009-007, Plant Protection System.**
	BOP	6.2.2 To place a bistable in or remove a bistable from bypass, go to Attachment 11.10, Trip Channel Bypass Operation.
OP-009-007, Plant Protection System ,Attachment 11.10, Trip Channel Bypass Operation		
CAUTION (1) ATTEMPTING TO PLACE MORE THAN ONE TRIP CHANNEL IN BYPASS REMOVES BOTH TRIP CHANNELS FROM BYPASS. (2) PRIOR TO PLACING ANY TRIP CHANNEL IN BYPASS, VERIFY BYPASS PUSH BUTTONS ON DE-ENERGIZED PPS BAY NOT DEPRESSED.		
	Note	**BOP circles Channel B.**

Op Test No.:	1	Scenario #	3	Event #	3	Page	7 of 24

Event Description: RWSP Level Instrument, SI-ILI-0305B, fails low and generates an RAS trip

Time	Position	Applicant's Actions or Behavior
	BOP	11.10.1 To Bypass a Trip Channel, perform the following: 11.10.1.1 Circle the bistable numbers selected for bypass under Step 11.10.1.4.
	Note	**BOP circles bistable number 18 in Step 11.10.1.4 table**
	BOP	11.10.1.2 Check desired Trip Channel is <u>not</u> Bypassed on another PPS Channel.
	BOP	11.10.1.3 Open key-locked portion of BCP in desired PPS Channel.
	Note	**The crew should expect annunciator RPS CABINET CONDITION ABNORMAL (Cabinet L, B-1) to actuate when the PPS Channel door is opened.**
	BOP	11.10.1.4 Depress Bypass push buttons for the desired Trip Channels.
	Note	**BOP depresses pushbutton for bistable 18 using placekeeping table.**
	Note	**The crew should expect annunciator RPS BISTABLE BY-PASS (Cabinet K, B-18) to actuate when the first bistable is bypassed in the PPS Channel.**
	BOP	11.10.1.5 Check all selected bistable Bypass push buttons remain in a Depressed state.
	BOP	11.10.1.6 Check all selected bistable Bypass lights Illuminate on BCP for the desired Trip Channels.
	CREW	11.10.1.7 Check all selected bistable Bypass lights Illuminate on ROM for the desired Trip Channels.
	Note	**Crew verifies correct bistable lit on CP-7 PPS Channel B Remote Operator Module.**

Op Test No.: 1	Scenario # 3	Event # 3	Page 8 of 24
Event Description:	RWSP Level Instrument, SI-ILI-0305B, fails low and generates an RAS trip		

Time	Position	Applicant's Actions or Behavior
	SRO	Reviews the following Technical Specifications and determines applicable actions: • 3.3.2 action 19 (Bypass w/in 1 hr) • 3.3.1 – Not applicable • 3.3.3.5 – Not applicable • 3.3.3.6 – Not applicable

Examiner Note

This event is complete when the bistable is bypassed and Technical Specifications have been addressed or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 4

Op Test No.:	1	Scenario #	3	Event #	4	Page	9	of 24

Event Description: Component Cooling Water Pump B Trips

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and report indications of tripped CCW Pump.
		Alarms:
		• CCW PUMP B TRIP/TROUBLE (Cabinet N, B-12)
		• RCP 1A CCW FLOW LO (Cabinet H, H-3)
		• RCP 1B CCW FLOW LO (Cabinet H, H-5)
		• RCP 2A CCW FLOW LO (Cabinet H, H-7)
		• RCP 2B CCW FLOW LO (Cabinet H, H-10)
		Indications
		• Amber trip/trouble light on CCW Pump B control switch
		• CCW System pressure abnormally low and dropping
		• CCW System and component flows abnormally low
	Note	**Based on how long the crew takes to align CCW Pump AB, red RCP Low Flow alarms may come in on CP-2. These alarms should be called out by the ATC.**
	SRO	Enter and direct the implementation of OP-901-510, Component Cooling Water System Malfunction.
OP-901-510 Section E0, General		
	N/A	1. IF ANY of the following occur, THEN GO TO Subsection E_1, System Leakage:
		• CCW Surge Tank level dropping
		• CCW Dry Cooling Towers isolated due to low CCW Surge Tank level
		• CMU-226, WATER STORAGE MAKEUP CCW SURGE TANK, cycling frequently
		• CCW header isolates due to low CCW Surge Tank level
		• Local observation of CCW leak reported to Control Room
	SRO	2. IF ANY of the following occur, THEN GO TO Subsection E_2, Loss of CCW Pump(s):
		• CCW system OR component flows low
		• Amber trip/trouble light on CCW PUMP A(B)(AB) Control Switch

Op Test No.:	1	Scenario #	3	Event #	4	Page	10 of 24
Event Description:	Component Cooling Water Pump B Trips						

Time	Position	Applicant's Actions or Behavior
OP-901-510 Section E2, Loss of CCW Pump(s)		
	N/A	1. IF CCW is lost to in-service Shutdown Cooling train, THEN implement OP-901-131, SHUTDOWN COOLING MALFUNCTION, AND perform concurrently with this procedure.
	N/A	2. IF Component Cooling Water Pump AB has tripped, THEN Start standby CCW Pump.
		2.1 PLACE CCW ASSIGNMENT SWITCH TO NORM POSITION.
	N/A	3. IF Component Cooling Water Pump A has tripped, THEN align CCW Pump AB for Operation as follows:
	BOP	4. IF Component Cooling Water Pump B has tripped, THEN align CCW Pump AB for Operation as follows:
	BOP	4.1 Position CCW ASSIGNMENT switch to B position.
	BOP	4.2 Verify Open the following valves: • CC-126B/CC-114B CCW SUCT & DISCH HEADER TIE VALVES AB TO B • CC-127B/CC-115B CCW SUCT & DISCH HEADER TIE VALVES AB TO B
	BOP	4.3 Start CC-0001AB, Component Cooling Water Pump AB.
	SRO	4.4 Evaluate AB Electrical Bus alignment for Technical Specification Operability requirements.

Op Test No.:	1	Scenario #	3	Event #	4	Page	11	of 24
Event Description:	Component Cooling Water Pump B Trips							

Time	Position	Applicant's Actions or Behavior
	Note	• **The SRO should enter Tech Spec 3.7.3 (restore w/in 72 hrs or S/D) and Cascading Tech Specs per OP-100-014 (1 hr action to verify electrical power; 2 hr action to verify certain safety related components operable).** • **The CRS should vocalize the 1 hr requirement and assign the OP-903-066 surveillance to either the BOP or ATC operator (BOP is preferred) to satisfy requirement to verify off site electrical power.** • **The 2 hour action per Cascading Tech Specs is to verify components that rely on Train A safety power and EFW pump AB are operable per TS 3.8.1.1.d.** • **With the AB Electrical Bus aligned to Train B, credit can be taken for CCW Pump AB supplying Train B loads. Tech Spec 3.7.3 and Cascading TS can be exited once CCW pump AB is aligned to replace CCW pump B.**

Examiner Note

This event is complete after CCW pump AB is started and the SRO has addressed Technical Specifications or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 5.

Op Test No.:	1	Scenario #	3	Event #	5	Page	12	of 24

Event Description: Selected Pressurizer Pressure Control Channel fails high and Pressurizer Spray Valve RC-301B fails open

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of failed pressure control channel and Spray valve.
		Alarms:
		• PRESSURIZER PRESSURE HI/LO (CABINET H, E-1)
		• PRESSURIZER PRESS SIGNAL DEVIATION (CABINET H, F-1)
		Indications
		• Pressurizer pressure rising OR dropping, as indicated on PRESSURIZER PRESSURE CHANNEL X/Y recorder (RC-IPR-0100)
		• Abnormal Pressurizer Spray Valve operation as indicated on Pressurizer Spray Valve controller (RC-IHIC-0100)
		• Pressurizer pressure deviation as indicated on Pressurizer Pressure controller(RC-IPIC-0100)
		• Both Pressurizer Spray Valves open
	SRO	Enter and direct the implementation of OP-901-120, Pressurizer Pressure Control Malfunction.
	Note	**Due to the rapidly lowering RCS Pressure the SRO can direct steps 2 and 2.1 of section E0 before entering the procedure. The crew should continue to implement OP-901-120 with the EOPs during or after performing Standard Post Trip Actions.**
OP-901-120, Pressurizer Pressure Control Malfunction Section E0, General		
	N/A	1. If Pressurizer Pressure and Level are dropping concurrently, or RCS leakage is otherwise indicated, then go to OP-901-111, Reactor Coolant System Leak.

Op Test No.:	1	Scenario #	3	Event #	5	Page	13	of 24

Event Description: Selected Pressurizer Pressure Control Channel fails high and Pressurizer Spray Valve RC-301B fails open

Time	Position	Applicant's Actions or Behavior
	ATC	2. If Pressurizer Pressure is dropping and any of the following have occurred, then place Pressurizer Spray Controller (RC-IHIC-0100) to MAN and adjust output to 0%: • Pressurizer Pressure Channel X/Y recorder (RCIPR-0100) indicates in-service Pressurizer Pressure Control Channel instrument has failed high • Pressurizer Pressure controller (RC-IPIC-0100) output has failed high • Any Pressurizer Spray Valve (RC-301A <u>or</u> RC-301B) has failed open • Pressurizer Spray Controller (RC-IHIC-0100) output has failed high.
	ATC	2.1 If any Pressurizer spray valve remains failed open, then Place Pressurizer Spray Valves selector switch to select operable Spray Valve.
	Note	**ATC selects Spray Valve A, recognizes that Spray Valve B is stuck open and makes report to the SRO.**
<u>CRITICAL TASK 1</u> **Establish RCS Pressure Control** This task is satisfied by securing sufficient Reactor Coolant Pumps to stop Reactor Coolant System depressurization prior to loss of Subcooled Margin. This task becomes applicable after Pressurizer Spray Valve B, RC-301B, fails open.		
	SRO	5 If Pressurizer Spray Valves controller (RC-IHIC-0100) has failed or is not controlling Pressurizer Pressure, then go to Subsection E3, Pressurizer Spray Valve Malfunction.
OP-901-120, Pressurizer Pressure Control Malfunction Section E3, Spray Valve Malfunction		
	ATC	2. If any spray valve is failed open, then verify the following: c. All Backup Heaters Energized.
		3. If Pressurizer pressure continues to drop, then perform the following:
	ATC	a. Trip the Reactor

Op Test No.:	1	Scenario #	3	Event #	5	Page	14	of 24

Event Description: Selected Pressurizer Pressure Control Channel fails high and Pressurizer Spray Valve RC-301B fails open

Time	Position	Applicant's Actions or Behavior
	ATC	b. Stop Reactor Coolant Pump providing driving head for failed Spray Valve (RCP 1A or 1B)
	Note	**ATC should stop RCP 1B**
	ATC	c. If Pressurizer pressure continues to drop, then continue to secure Reactor Coolant Pumps until Pressurizer pressure stabilizes.
	Note	**SRO should direct the ATC to secure additional RCPs until pressure stabilizes.**
	SRO	d. Go to OP-902-000, Standard Post Trip Actions.
OP-901-120, Pressurizer Pressure Control Malfunction Section E1, Control Channel Failure		
	Note	**This subsection should be performed after the reactor is tripped and the crew is performing Standard Post Trip Actions. It is acceptable for the SRO to hand-off subsection E1 to the ATC and let the ATC perform solo.**
	ATC	1. Verify control channel instrument failure by checking Pressurizer Pressure Channel X/Y recorder (RC-IPR-0100).
	ATC	2. Transfer Pressurizer pressure control to operable channel using Pressurizer Pressure Channel Selector control switch.
	ATC	3. If Pressurizer Pressure control channel is failed high, then perform the following:
	ATC	a. Transfer Pressurizer Lo Level Heater Cutout selector switch to the Operable Pressurizer Pressure control channel.
	ATC	b. Reset Proportional Heater Banks #1 & #2.
	ATC	c. Place Pressurizer Spray Controller (RC-IHIC-0100) to AUTO.
	ATC	4. Verify proper operation of Pressurizer Pressure controller (RC-IPIC-0100) and Pressurizer Pressure controlling or being restored to 2250 PSIA.
OP-902-000, Standard Post Trip Actions		

Op Test No.:	1	Scenario #	3	Event #	5	Page	15	of	24

Event Description: Selected Pressurizer Pressure Control Channel fails high and Pressurizer Spray Valve RC-301B fails open

Time	Position	Applicant's Actions or Behavior
	Note	**During Standard Post Trip Actions, one crew member (typically the BOP) will go to a back panel to restore radiation monitor sample pumps due to some sample pumps requiring restart following a loss of power or voltage dip (i.e. plant loads transfer from UATs to SUTs).**
		NOTE Steps 1 and 2 are immediate actions and satisfy Reactivity Control
	ATC	1. Determine **Reactivity Control** acceptance criteria are met: a. Check reactor power is dropping. b. Check startup rate is negative. c. Check less than **TWO** CEAs are **NOT** fully inserted.
	BOP	2. Verify Main Turbine and Generator tripped: a. Check the Main Turbine is tripped: • Governor valves closed • Throttle valves closed • Turbine Speed lowering
	BOP	b. Check the Main Generator is tripped: • GENERATOR BREAKER A tripped • GENERATOR BREAKER B tripped • EXCITER FIELD BREAKER tripped

Op Test No.:	1	Scenario #	3	Event #	5	Page	16	of 24

Event Description: Selected Pressurizer Pressure Control Channel fails high and Pressurizer Spray Valve RC-301B fails open

Time	Position	Applicant's Actions or Behavior
	BOP	3. Verify maintenance of Vital Auxiliaries a. Check station loads are energized from Off-site power as follows: **Train A** • A1, Non-Safety bus • A2, Non-Safety bus • A3, Safety bus • A-DC Electrical bus • A and C vital AC Instrument Channels **Train B** • B1, Non-Safety bus • B2, Non-Safety bus • B3, Safety bus • B-DC Electrical bus • B and D vital AC Instrument Channels b. Verify CCW flow to RCPs
	ATC	4. Verify RCS Inventory Control: a. Check that **BOTH** of the following conditions exist: • Pressurizer level is 7% to 60% • Pressurizer level is trending to 33% to 60% b. Check RCS subcooling is greater than or equal to 28ºF.
	ATC	5. Check RCS Pressure control: • Pressurizer pressure is 1750 psia to 2300 psia • Pressurizer pressure is trending to 2125 psia to 2275 psia
	ATC	5.1. **IF** Pressurizer Pressure Control system is malfunctioning, **THEN** perform the following: a. Operate Pressurizer Pressure Control system in manual. b. Manually operate heaters and spray to maintain PZR pressure within 2125 to 2275 psia.

Examiner Note

This event is complete after the crew has checked RCS Pressure Control and Pressurizer pressure is under control and restoring or at Lead Examiner's Discretion.

Op Test No.:	1	Scenario #	3	Event #	5	Page	17	of	24

Event Description: Selected Pressurizer Pressure Control Channel fails high and Pressurizer Spray Valve RC-301B fails open

Time	Position	Applicant's Actions or Behavior

Examiner Note
Cue the Simulator Operator when ready for Events 6, 7, and 8

Op Test No.:	1	Scenario #	3	Event #	6, 7,& 8	Page	18	of	24

Event Description: Loss of Off-site Power, 3B-to-2B Bus Tie Fails to Trip on UV, Emergency Diesel Generator A trips on overspeed.

Time	Position	Applicant's Actions or Behavior
	ATC / BOP	Recognize and report indications of Loss of Off Site Power
		Alarms
		• Multiple alarms on all panels
		Indications
		• Control Room Lighting is reduced
		• EDG A starts and then trips
		• EDG B starts but its output breaker remains open
		• 3B-to-2B bus tie breaker is closed
		• Multiple amber lights on the control switches for major loads illuminated due to bus Under Voltage
	SRO	Directs BOP to re-verify Maintenance of Vital Auxiliaries
CRITICAL TASK 2 **Energize at Least One Safety Electrical Bus** **This task is satisfied by the crew taking action to energize the B Safety Bus by tripping the 3B-to-2B Bus Tie breaker prior to failure of Emergency Diesel Generator B due to no Component Cooling Water.** **This task becomes applicable after the loss of offsite power occurs.**		
OP-902-000, Standard Post Trip Actions		
	BOP	3. Verify maintenance of Vital Auxiliaries.
	BOP	a.1 **IF ANY** 3A(B) Safety bus is **NOT** powered from Off-Site Power, **THEN** perform the following:
	BOP	1) Verify associated EDG started.
	BOP	2) Check EDG Output breaker is closed.
	BOP	3) **IF** associated EDG Output breaker is open, **THEN** perform the following:

Op Test No.: 1	Scenario # 3	Event # 6, 7,& 8	Page 19 of 24
Event Description:	Loss of Off-site Power, 3B-to-2B Bus Tie Fails to Trip on UV, Emergency Diesel Generator A trips on overspeed.

Time	Position	Applicant's Actions or Behavior
	BOP	a) <u>Verify</u> stable EDG voltage 3920 - 4350 VAC.
	BOP	b) Verify 3-2 Breaker open.
	Note	**BOP should manually trip the 3-2 breaker**
	N/A	c) IF EDG Output breaker failed to AUTO close, THEN locally close EDG Output breaker.
	BOP	4) Verify CCW available to EDG.
OP-902-000, Standard Post Trip Actions (cont.)		
	ATC	6. <u>Check</u> Core Heat Removal: a. At least **ONE** RCP is operating. b. Operating loop ∆T less than 13ºF. c. RCS subcooling greater than or equal to 28ºF.
	BOP	7. <u>Verify</u> RCS Heat Removal: a. <u>Check</u> that at least **ONE** SG has **BOTH** of the following: • SG level is 10% to 76% NR • Feedwater is available to restore level within 55%-70% NR
	N/A	b. <u>Check</u> Feedwater Control in Reactor Trip Override: • MAIN FW REG valves are closed • STARTUP FW REG valves are 13% to 21% open • Operating Main Feedwater pumps are 3800 rpm to 4000 rpm
	BOP	b.1 Manually operate the Feedwater control system.
	ATC	c. <u>Check</u> RCS T_C is 530 to 550 ºF.
	BOP	d. <u>Check</u> Steam Generator pressure is 885 psia to 1040 psia.
	N/A	e. <u>Reset</u> Moisture Separator reheaters and <u>check</u> the Temperature Control valves closed.

Op Test No.:	1	Scenario #	3	Event #	6, 7,& 8	Page	20	of	24

Event Description: Loss of Off-site Power, 3B-to-2B Bus Tie Fails to Trip on UV, Emergency Diesel Generator A trips on overspeed.

Time	Position	Applicant's Actions or Behavior
	ATC	8. Verify Containment Isolation: a. Check Containment pressure is less than 16.4 psia. b. Check NO Containment Area Radiation monitor alarms OR unexplained rise in activity. c. Check NO Steam Plant Activity monitor alarms OR unexplained rise in activity.
	ATC/BOP	9. Verify Containment Temperature and Pressure Control: • Check Containment temperature is less than or equal to 120ºF. • Check Containment pressure is less than 16.4 psia.
	SRO	10. GO TO Appendix 1, "Diagnostic Flowchart" and diagnose to appropriate EOP.
OP-902-009, Standard Appendices, Appendix 1 Diagnostic Flow Chart		
Examiner Note **Appendix 1 is a flow chart used to diagnose to the correct recovery procedure for the event in progress. The steps below will be followed by a YES or NO to indicate proper flow path.**		
	ATC	Is Reactivity Control met? (YES)
	BOP	Is at least **ONE** 125 VDC **SAFETY** bus energized? (YES)
	BOP	Is at least **ONE** 4.16 KV **NON-SAFETY** bus energized? (NO)
	SRO	**CONSIDER** LOOP/LOFC OP-902-003
	BOP	Is at least **ONE** 4.16 KV **SAFETY** bus energized? (YES)
	ATC	Is at least **ONE** RCP running? (NO)
	SRO	**CONSIDER** LOOP/LOFC OP-902-003
	BOP	Does at least **ONE** SG have adequate FW? (Note 2) (YES)

Op Test No.: 1 Scenario # 3 Event # 6, 7,& 8 Page 21 of 24

Event Description: Loss of Off-site Power, 3B-to-2B Bus Tie Fails to Trip on UV, Emergency Diesel Generator A trips on overspeed.

Time	Position	Applicant's Actions or Behavior
	ATC	Is PZR pressure >1750 psia **AND** stable or rising? (YES)
	ATC	Is PZR level > 7% **AND** stable or rising? (YES)
	BOP	Are **BOTH** SG pressures >885 psia **AND** stable or rising? (Note 5) (YES)
	SRO	Are **ALL** acceptance criteria satisfied? (NO)
	SRO	Has **ANY** event been diagnosed? (YES)
	SRO	Can a single event be diagnosed? (Note 4) (YES)
	SRO	GO TO Appropriate EOP
	Note	**SRO goes to OP-902-003, Loss of Offsite Power/Loss of Forced Circulation Recovery**
OP-902-003, Loss of Offsite Power/Loss of Forced Circulation Recovery Procedure		
	Crew	*1. Confirm diagnosis of a LOOP/LOFC: a. Monitor the SFSCs and check Acceptance Criteria are satisfied.
	Crew	2. Announce a Loss of Offsite Power or a Loss of Forced Circulation is in progress using the plant page.
	SRO	* 3. Advise the Shift Manager to implement the Emergency Plan using EP-001-001, "Recognition & Classification of Emergency Condition".
	SRO	* 4. <u>REFER TO</u> Section 6.0, "Placekeeper" and <u>record</u> the time of the reactor trip.
	SRO	* 5. **IF** power has been interrupted to either 3A or 3B safety buses, **THEN** <u>perform</u> Appendix 20, "Operation of DCT Sump Pumps"
	Note	**SRO should direct this action to a non-licensed operator.**

Op Test No.:	1	Scenario #	3	Event #	6, 7,& 8	Page	22	of	24

Event Description: Loss of Off-site Power, 3B-to-2B Bus Tie Fails to Trip on UV, Emergency Diesel Generator A trips on overspeed.

Time	Position	Applicant's Actions or Behavior
	BOP	* 6. **IF** offsite power has been lost, **THEN** check the Sequencer has timed out for at least **ONE** 4.16KV safety bus.
	BOP	* 7. Check CCW operation a. Check a CCW pump is operating for EACH energized 4.16 KV safety bus.
	Note	**There will be only 1 energized bus in this alignment, but CCW Pump AB could be started. The SRO may direct this action.**
	BOP	a.2 **IF** the AB electrical bus is **NOT** aligned to the side with the faulted CCW pump, AND the Sequencer has timed out, **THEN** start CCW Pump AB as follows: 1) Place the CCW ASSIGNMENT switch to the desired position to replace the faulted pump.
	Note	**Position 'A' should be selected**
	BOP	2) Verify open the CCW SUCT & DISCH HEADER TIE VALVES for the faulted CCW pump: **Train A** • CC 126A/114A • CC 127A/115A
	BOP	3) Start CCW Pump AB.
	BOP	b. **IF** only **ONE** CCW pump operating, THEN split CCW headers using Appendix 35, "Single CCW Pump Operation."
	Note	**If the crew does not start CCW pump AB per step 7.a.2, then they should split CCW headers per Appendix 35.**
OP-902-009, Standard Appendices – Appendix 35, Single CCW Pump Operation		
	BOP	c. **IF** CCW Pump B is operating, **THEN** close CCW Suction and Discharge Header Tie Valves: • CC 127B/115B, AB TO B • CC 200A/727, A TO AB

Op Test No.:	1	Scenario #	3	Event #	6, 7,& 8	Page	23	of	24

Event Description: Loss of Off-site Power, 3B-to-2B Bus Tie Fails to Trip on UV, Emergency Diesel Generator A trips on overspeed.

Time	Position	Applicant's Actions or Behavior
	BOP	2. **IF** an isolated CCW Train does **NOT** have an operating CCW pump, **THEN** perform **ALL** of the following for the AFFECTED CCW Train: • Pull EDG A(B) Overspeed Trip Device • Place HPSI A(B) to "OFF." • Place LPSI A(B) to "OFF." • Place CS Pump A(B) to "OFF." • **IF** HPSI AB aligned for service, **THEN** place Assignment Switch to "NORM."
OP-902-003, Loss of Offsite Power/Loss of Forced Circulation Recovery Procedure (Cont.)		
		*7. (continued)
	BOP	c. Check an Essential chiller is operating for EACH energized 4.16 KV Safety bus: • 3A Safety bus • 3B Safety bus
	Note	**BOP will check Essential Chiller B running on CP-18**
	ATC/BOP	* 8. Check CCW flow to RCPs.
	Note	**If CCW to RCPs is lost for greater than 10 minutes, then CCW to RCPs is not restored. Otherwise the crew will attempt to restore by checking valve alignment on CP-2 and CP-8.**
	BOP	* 9. Perform BOTH of the following: • Verify CW System in operation. REFER TO OP-003-006, "Circulating Water." • Check Condenser vacuum greater than 14" Hg.

Op Test No.:	1	Scenario #	3	Event #	6, 7,& 8	Page	24	of	24

Event Description: Loss of Off-site Power, 3B-to-2B Bus Tie Fails to Trip on UV, Emergency Diesel Generator A trips on overspeed.

Time	Position	Applicant's Actions or Behavior
	BOP	9.1 Perform the following: a. Verify BOTH MSIVs are closed: • MS 124A, MSIV 1 • MS 124B, MSIV 2 b. Verify ALL Steam Generator Blowdown Isolation valves are closed: • BD 102A, STM GEN 1 (IN) • BD 102B, STM GEN 2 (IN) • BD 103A, STM GEN 1 (OUT) • BD 103B, STM GEN 2 (OUT)

Examiner Note

This event is complete after steps to protect the Main Condenser (close MSIVs and SG Blowdown Isolation valves) are performed or at Lead Examiner's Discretion.

Facility: Waterford 3 Scenario No.: **4** Op Test No.: 1

Examiners: ______ Operators: ______

Initial Conditions: Reactor power is ~90%. AB Buses are aligned to Train B. No major equipment out of service. Heater Drain Pump B is secured. Charging Pumps B (lead) and AB running.

Turnover:

Protected Train is B; Maintain power while PMI troubleshoots a Heater Drain Pump B annunciator.

Event No.	Malf. No.	Event Type*	Event Description
1	FW51A	TS – SRO	Condensate Storage Pool level instrument EFW-ILI-9013A fails low. (TS 3.3.3.5, TS 3.3.3.6)
2	CV30A2	C – ATC C – SRO	Letdown Flow Control Valve, CVC-113A, fails closed requiring entry into OP-901-112, Charging or Letdown Malfunction.
3	FW26A	I – BOP I – SRO	Steam Generator #1 Feedwater flow instrument FW-IFR-1111 fails low. OP-901-201, Steam Generator Level Control Malfunction. (TRM 3.3.5)
4	RD02A11	R – ATC N – BOP N – SRO TS – SRO	CEA 11 drops into the core requiring a rapid plant down power in accordance with OP-901-212, Rapid Plant Power Reduction. OP-901-102, CEA or CEDMCS Malfunction. (TS 3.1.3.1)
5	RC23A CV02A	C – ATC C – SRO	RCS Cold Leg leak; Charging Pump A fails to auto-start.
6	RC23A	M – All	The leak grows into a LOCA requiring implementation of OP-902-000, Standard Post Trip Actions and OP-902-002, Loss of Coolant Accident Recovery Procedure. Stop RCPs **(CT 1, Trip RCPs exceeding operating limits)**.
7	CS04B	C – BOP C – SRO	CS-125B, Containment Spray Header B Isolation, fails to auto-open requiring manual action to open CS-125B **(CT 2, Containment Temperature & Pressure control)**.
8	MS11B	M – All	Main Steam Line 2 Break inside containment requiring entry into OP-902-008, Functional Recovery Procedure.
9	CS01A	C – BOP C – SRO	Containment Spray Pump A trips requiring action to override close CS-125A, Containment Spray Header A Isolation **(CT 3, Containment Isolation)**.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

The crew assumes the shift at ~90% power with instructions to start Heater Drain Pump B and continue the power ascension after PMI resolves a problem with the Low Suction Pressure annunciator on Heater Drain Pump B. PMI will not resolve the annunciator problem and the crew will maintain ~90% power. No major equipment is out of service.

After the crew takes the shift, Condensate Storage Pool level indicator EFW-ILI-9013 A will fail low. The SRO should use OP-903-013, Monthly channel Checks, and enter Tech Spec 3.3.3.5 and 3.3.3.6.

After Technical Specifications are addressed, the in-service letdown flow control valve, CVC-113A, fails closed. The SRO should enter OP-901-112, Charging or Letdown Malfunction and implement Section E2, Letdown Malfunction, and place the backup flow control valve, CVC-113B, in-service. The SRO may implement EN-OP-200, Transient Response Rules.

After the backup letdown flow control valve has been placed in service, Steam Generator #1 Feedwater flow instrument FW-IFR-1111 fails low. The Feedwater Control System will respond by increasing Feedwater flow to Steam Generator #1. The SRO should direct the BOP to take manual control and match Feedwater and Main Steam flow. The SRO should enter OP-901-201, Steam Generator Level Control Malfunction. Feedwater controls for Steam Generator #1 may remain in manual as a result of this failure requiring manual control on a plant down power or reactor trip. The Ultrasonic Flow Meter will fail as a result of the instrument failure and require entry into TRM 3.3.5. The SRO may implement EN-OP-200, Transient Response Rules.

After the crew has worked through OP-901-201 and level in Steam Generator 1 is between 50% and 70% Narrow Range, CEA 11 (Reg. Group 4) drops into the core. The SRO should enter procedure OP-901-102, CEA or CEDMCS Malfunction and proceed to section E_1, CEA Misalignment Greater than 7 inches. The SRO will direct the BOP to adjust turbine load to match T_{AVG} to T_{REF} initially and then perform a rapid plant downpower in accordance with OP-901-212, Rapid Plant Power Reduction. RCS direct boration must commence within 15 minutes of the dropped CEA to comply with Technical Specifications and the COLR. The SRO should enter procedure OP-901-501, PMC or COLSS Malfunction. Actions in OP-901-501 are normally performed by the STA. The SRO should evaluate and enter TS 3.1.3.1 action c. The SRO should implement EN-OP-200, Transient Response Rules.

After the reactivity manipulation has been satisfied, an RCS leak will occur. The RCS leak will ramp into a medium break LOCA. Charging Pump A will fail to auto start requiring a manual start by the ATC. The SRO may enter OP-901-111, RCS System Leak, but will soon recognize that Pressurizer level is not being maintained with available Charging pumps and should direct a manual reactor trip and manual initiation of Safety Injection and Containment Isolation. The SRO should implement OP-902-000, Standard Post Trip Actions and diagnose to OP-902-002, Loss of Coolant Accident Recovery Procedure. The ATC should stop RCPs exceeding operating limits as RCS pressure lowers or within three minutes of a Containment Spray actuation **(CRITICAL TASK 1)**. Containment Spray Header B Isolation (CS-125B) will fail to open automatically requiring the BOP to manually open CS-125B **(CRITICAL TASK 2)**.

After the crew diagnoses to OP-902-002, Main Steam Line 2 breaks inside Containment. Containment Spray Pump A will trip on overcurrent. The SRO should go to OP-902-009 Appendix 1, Diagnostics Flowchart and diagnose to OP-902-008, Functional Recovery OR go directly to OP-902-008 based on two events in progress per OP-100-017, Emergency Operating Procedures Implementation Guide. When the SRO performs prioritization Containment Isolation (CI-1) should be the highest priority. The SRO should direct the BOP to override and close CS-125A, Containment Spray Header A Isolation **(CRITICAL TASK 3)**.

The scenario can be terminated once the crew closes Containment Spray Header A Isolation in accordance with OP-902-008, Functional Recovery procedure or at the lead examiner's discretion.

Critical Task

Number	Description	Basis
1	Trip Any RCP Exceeding Operating Limits This task is satisfied by stopping all running RCPs within 3 minutes of loss of Component Cooling Water flow or prior to completing the step that verifies RCP operating limits. This task becomes applicable after either running RCP Vibration alarms actuate OR Containment Spray is initiated, whichever occurs first. (OP-902-002, 9.b or 9.d.1)	The time requirement of 3 minutes is based on the RCP operating limit of 3 minutes without CCW cooling. Continued operation of RCP without CCW or outside of the operating limits could lead to a failure of the RCS pressure boundary at the RCP seal. (TM-OP-100-03, CT-23; ECS98-001, D.10)
2	Establish Containment Temperature and Pressure Control This task is satisfied by manually opening CS-125B, Containment Spray Header B Isolation, prior to exceeding containment design pressure of 44 PSIG or prior to completing Containment Spray (CS) verification in OP-902-002 or exiting the Containment Temperature and Pressure Control Safety Function in OP-902-008. This task becomes applicable after CS is initiated and is critical after CS Pump A trips. (OP-902-002, step 14 or OP-902-008, CTPC-2)	The maximum design pressure of the containment structure is 44 psig. Failure to take action to establish containment pressure and temperature control may result in containment pressure exceeding maximum design and therefore exceed design leakage of containment. The operators monitor containment pressure along with Containment Spray and Containment Fan Cooler operations as verification of adequate containment heat removal and pressure mitigation. (TM-OP-100-03, CT-15; ECS98-001, P.28)
3	Establish Containment Isolation This task is satisfied by closing CS-125A, Containment Spray Header A Isolation, prior to exiting the Containment Isolation (CI-1) Safety Function in OP-902-008. This task becomes applicable after Containment Spray (CS) is initiated and CS Pump A trips. (OP-902-008, CI-1, 1.c.1)	A Loss of Coolant Accident that has occurred inside containment and has not been isolated will result in excess radioactivity leaving containment and being released to the public. (TM-OP-100-03, CT-9)

* **Critical Task** (As defined in NUREG 1021 Appendix D)

** Per NUREG-1021, Appendix D, If an operator or the crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review.

Scenario Quantitative Attributes

1. Malfunctions after EOP entry (1–2)	2
2. Abnormal events (2–4)	3
3. Major transients (1–2)	2
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	1
6. EOP based Critical tasks (2–3)	3

SCENARIO SETUP

A. Reset Simulator to IC-164

B. Verify Scenario Malfunctions, Remotes, and Overrides are loaded, as listed in the Scenario Timeline.

C. Verify reactor power is ~90% with HDPs A and C running and HDP B secured with annunciator F0802, Htr Drain Pump B Suction Press Lo, locked in.

D. Verify all EFW Flow Control Valves are in Auto and caution tags removed.

E. Verify CVC-113A (Normal Letdown FCV) is in service.

F. Ensure Protected Train B sign is placed in SM office window.

G. Place a Protected Equipment cover on running SFP pump C/S.

H. Verify EOOS is 10.0 Green with nothing out of service.

I. Complete the simulator setup checklist.

J. Start Insight, open file Crew Performance.tis.

SIMULATOR BOOTH INSTRUCTIONS

Event 1 Condensate Storage Pool level instrument EFW-ILI-9013 A fails low

1. On Lead Examiner's cue, initiate Event **Trigger 1**.
2. If called as an NAO to check the indication at the Remote Shutdown Panel, wait 2 minutes and report that Condensate Storage Pool Level instrument EFW-ILI-9013 A1 is reading 0%.
3. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.

Event 2 Letdown Flow Control Valve, CVC-113A, Fails Closed

1. On Lead Examiner's cue, initiate Event **Trigger 2**.
2. If Work Week Manager or PMM are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.
3. If called as NAO to place the alternate letdown flow control valve in service, open a copy of OP-901-112 and follow along on step 6 of subsection E2. When directed to slowly open CVC-111B, run Schedule File (CAEP): **OP-901-112 Local Operator Actions\Placing Alternate LDFCV in Service.sch**. Make appropriate reports as the schedule file progresses.

Event 3 Steam Generator #1 Feedwater Flow Instrument FW-IFR-1111 Fails Low

1. On Lead Examiner's cue, initiate Event **Trigger 3**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to the Control Room.

Event 4 CEA 11 Falls into the core/Rapid plant power reduction

1. On Lead Examiner's cue, initiate Event **Trigger 4**.
2. If Work Week Manager or PMI are called, inform the caller that a work package will be assembled and a team will be sent to CEDMCS Alley.
3. If called as RAB and directed to CEDMCs Alley, respond in 3 minutes that you have arrived. If asked, report that there is no apparent cause for the dropped CEA.
4. If Chemistry is called to sample the RCS for Dose Equivalent Iodine due to the down power, acknowledge and report that samples will be taken 2-6 hours from notification time and if asked tell the caller your name is Joe Chemist.
5. If notified as Load Dispatcher (Woodlands) acknowledge the communications and inform the caller that the grid will remain stable with available backup generation.
6. If requested to monitor Polisher Vessel D/P and remove as necessary, acknowledge the report.

Event 5 RCS Cold Leg Leak/Charging Pump A fails to auto start

1. On Lead Examiner's cue, initiate Event **Trigger 5**.
2. If the Duty Plant Manager is called, inform the caller that you will make the necessary calls.
3. If Chemistry is called to perform samples acknowledge the request.

Event 6 RCS Cold Leg Break

1. There is no event trigger for this event (event trigger 5 initiates this event).
2. If the Duty Plant Manager is called, inform the caller that you will make the necessary calls.
3. If Chemistry is called to perform samples acknowledge the request.
4. If called as NAO to verify proper operation of unloaded Emergency Diesel Generators, then wait 2 minutes and manually initiate Event **Trigger 20**. Wait an additional minute and manually initiate Event **Trigger 21** to acknowledge local EDG panels. Report that both A and B EDGs are running properly and unloaded.

Event 7 CS-125B Fails to Open Automatically

1. There is no event trigger for this event.
2. External communications are not expected.

Event 8 Main Steam Line 2 Break inside Containment

1. On Lead Examiner's cue, initiate Event **Trigger 8**.
2. If the Duty Plant Manager is called, inform the caller that you will make the necessary calls.
3. If Chemistry is called to perform samples acknowledge the request

Event 9 Containment Spray Pump A trips / Override CS-125A, CS Header A Isolation

1. There is no trigger for Event 9. CS pump A trip is triggered by Event Trigger 8.
2. If called as an NAO to override CS-125A report you are on your way to the Control Room to pick up the key. Have someone role play as NAO and enter the simulator to simulate getting the key. Wait 1 minute, insert remote CSR13A using Event **Trigger 22**. Make the report to the Control Room that you have done so.
3. If called as an NAO to investigate the trip of CS pump A breaker, report overcurrent flags on all 3 phases.
4. If called as an NAO to investigate CS Pump A, report that the paint on the motor is discolored and there is a strong odor of burnt insulation, but no fire.

At the end of the scenario, before resetting, end data collection and save the file as 2017 Scenario 4-(start-end time).tid. Export to .csv file. Save the file into the folder for the appropriate crew.

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SCENARIO TIMELINE

EVENT	KEY	DESCRIPTION	TRIGGER	DELAY HH:MM:SS	RAMP HH:MM:SS	FINAL
EVENT DESCRIPTION						
1	**FW51A**	**FAIL CSP LPL XMTR EFW-ILT-9013A (0-100%)**	**1**	**00:00:00**	**00:00:00**	**0%**
CONDENSATE STORAGE POOL LEVEL INSTRUMENT EFW-ILI-9013A FAILS LOW						
2	**CV30A2**	**LTDN FLOW CONTROL VALVE CVC-113A FAILS CLOSED**	**2**	**00:00:00**	**00:00:00**	**ACTIVE**
LETDOWN FLOW CONTROL VALVE, CVC-113A, FAILS CLOSED						
3	**FW26A**	**FW FLOW TRANSMITTER 1111 FAIL (0-100% OF RANGE)**	**3**	**00:00:00**	**00:00:00**	**27%**
SG1 FEED FLOW INST (FW-IFR-1111) FAILS LOW TO 27%						
4	**RD02A11**	**DROPPED CEA 11**	**4**	**00:00:00**	**00:00:00**	**ACTIVE**
CEA 11 DROPS INTO THE CORE; RAPID PLANT POWER REDUCTION						
5	**RC23A**	**RCS COLD LEG 1A RUPTURE**	**5**	**00:00:00**	**00:08:00**	**1.5**
	CV02A	**CHARGING PUMP A FAIL TO AUTOSTART**	**N/A**	**00:00:00**	**00:00:00**	**ACTIVE**
RCS COLD LEG LEAK / CHARGING PUMP A FAILS TO AUTO START						
6	**RC23A**	**RCS COLD LEG 1A RUPTURE**	**5**	**00:08:00**	**00:00:00**	**14**
RCS COLD LEG BREAK						
7	**CS04B**	**CS TRAIN B CS-125B FAILS TO AUTO OPEN**	**N/A**	**00:00:00**	**00:00:00**	**ACTIVE**
CS-125B FAILS TO AUTO OPEN						
8	**MS11B**	**MS LINE B BREAK INSIDE CNTMT (0-100% = 40 IN)**	**8**	**00:00:00**	**00:00:00**	**10%**
MAIN STEAM LINE B BREAK INSIDE CONTAINMENT						
9	**CS01A**	**LOSS OF CNTMT SPRAY PUMP A**	**8**	**00:00:00**	**00:00:00**	**ACTIVE**
LOSS OF CNTMT SPRAY PUMP A						
N/A	**EGR26**	**EDG A LOCAL ANNUN ACK**	**20**	**00:00:00**	**00:00:00**	**ACKN**
LOCAL EDG ANNUNCIATOR ACKNOWLEDGE						
N/A	**EGR27**	**EDG B LOCAL ANNUN ACK**	**21**	**00:00:00**	**00:00:00**	**ACKN**
LOCAL EDG ANNUNCIATOR ACKNOWLEDGE						

EVENT	KEY	DESCRIPTION	TRIGGER	DELAY HH:MM:SS	RAMP HH:MM:SS	FINAL
EVENT DESCRIPTION						
N/A	**CSR13A**	**CS-125A REMOTE KEY SW TO CLOSE VALVE**	**22**	**00:00:00**	**00:00:00**	**OVRD**
CS-125A REMOTE KEY SW TO CLOSE VALVE						
N/A	**F_Q12**	**HTR DRAIN PUMP B SUCTION PRESS LO**	**N/A**	**00:00:00**	**00:00:00**	**FAIL ON**
ANNUNCIATOR MALFUNCTION OVERRIDE						

REFERENCES

Event	Procedures
1	OP-903-013, Monthly Channel Checks, Rev. 18 Tech Spec 3.3.3.5 Tech Spec 3.3.3.6
2	OP-901-112, Charging or Letdown Malfunction, Rev. 6
3	OP-901-201, Steam Generator Level Control Malfunction, Rev. 6 TRM 3.3.5
4	OP-901-102, CEA or CEDMCS Malfunction, Rev. 304 OP-901-212, Rapid Plant Power Reduction, Rev. 8 OP-901-501, PMC or COLSS Malfunction, Rev. 15 OP-004-004, Control Element Drive, Rev. 23 Tech Spec 3.1.3.1
5	OP-902-000, Standard Post Trip Actions, Rev. 16 OP-902-009, Standard Appendices, Rev. 315, Appendix 2, Figures OP-902-009, Standard Appendices, Rev. 315, Appendix 1, Diagnostic Flow Chart
6 & 7	OP-902-002, Loss of Coolant Accident Recovery, Rev. 20 OP-902-009, Standard Appendices, Rev. 315, Appendix 2, Figures
8 & 9	OP-902-008, Functional Recovery, Rev. 26 OP-902-009, Standard Appendices, Rev. 315, Appendix 21-A
GEN	EN-OP-115, Conduct of Operations, Rev. 17 EN-OP-115-08, Annunciator Response, Rev. 4 EN-OP-200, Plant Transient Response Rules, Rev. 3 OI-038-000, EOP Operations Expectations / Guidance, Rev. 14 OP-100-017, Emergency Operating Procedures Implementation Guide, Rev. 5

Op Test No.:	1	Scenario #	4	Event #	1	Page	1	of	40

Event Description: Condensate Storage Pool level instrument EFW-ILI-9013 A fails low

Time	Position	Applicant's Actions or Behavior
Examiner Note **During shift turnover the crew will be instructed to hold power at ~90%.** **Cue the Simulator Operator when ready for Event 1**		
	BOP	Recognize and report indications of failed instrument.
		Alarms:
		• CONDENSATE STORAGE POOL LEVEL HI/LO (Cabinet M, A-1)
		• CONDENSATE STORAGE POOL LEVEL LO-LO (Cabinet M, B-1)
		Indications
		• EFW-ILI-9013A Level indicator on CP-8 fails low
		• EFW-ILR-9013A Level recorder on CP-8 fails low
	Crew	Dispatch NAO to the Remote Shutdown Panel to investigate failed indicator.
	SRO	Review Tech Specs based on the failed instrument.
		• Tech Spec review will require use of Tech Spec 3.3.3.5, 3.3.3.6, and OP-903-013, Monthly Channel Checks.
		• Enter Tech Spec 3.3.3.5 action a (Restore w/in 7 days)
		• Enter Tech Spec 3.3.3.6 action 29 (Restore w/in 30 days)
Examiner Note **This event is complete when the SRO has evaluated Technical Specifications or at Lead Examiner's Discretion.**		
Examiner Note **Cue the Simulator Operator when ready for Event 2**		

Op Test No.:	1	Scenario #	4	Event #	2	Page	2	of 40

Event Description: Letdown Flow Control Valve, CVC-113A, fails closed

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of failed Letdown Flow Control Valve.
		Alarms:
		• Letdown Flow Hi/Lo (Cabinet G, C-1)
		• Letdown HX Outlet Pressure Lo (Cabinet G, B-2)
		Indications
		• Letdown flow goes to 0 gpm
		• CVC-113A indicates closed
		• Letdown Flow Control valve not responding to changes in controller output
		• Abnormal Charging AND Letdown flow mismatch.
		• Pressurizer level rising
	SRO	Enter and direct the implementation of OP-901-112, Charging or Letdown Malfunction.
	Note	**The SRO may direct the ATC to stop one of the two running Charging pumps to slow the level rise in the Pressurizer.**
OP-901-112, Section E0, General		
	BOP	1. Stop turbine load changes.
	N/A	2. IF malfunction is due to failure of the Pressurizer Level Control System, THEN go to OP-901-110, PRESSURIZER LEVEL CONTROL MALFUNCTION.
	N/A	3. IF a Charging Malfunction is indicated, THEN go to Subsection E1, Charging Malfunction.
	SRO	4. IF a Letdown Malfunction is indicated, THEN go to Subsection E2, Letdown Malfunction.
OP-901-112, Section E2, Letdown Malfunction		
	ATC	1. IF necessary, THEN maintain Pressurizer level by placing LETDOWN FLOW CONTROL VALVES controller (RC-IHIC-0110) in MAN, and control manually.
	Note	**THE ATC may take manual control of the controller but the letdown valve will not respond.**

Op Test No.:	1	Scenario #	4	Event #	2	Page	3	of 40

Event Description: Letdown Flow Control Valve, CVC-113A, fails closed

Time	Position	Applicant's Actions or Behavior
		NOTE <u>If</u> all Charging Pumps are secured, <u>then</u> LETDOWN STOP VALVE (CVC 101) will close on high REGEN HX TUBE OUTLET temperature if RCS is ≥ 470°F.
	ATC	2. Operate Charging Pumps as necessary to maintain Pressurizer level in accordance with Attachment 1, Pressurizer Level Versus Tave Curve.
	Note	**Pressurizer level will rise after the Letdown valve fails closed. If the crew is slow to take action and PZR level exceeds 62.5%, TS 3.4.3.1 must be entered.**
	SRO/ATC	3. <u>IF</u> Pressurizer level falls below the minimum level for operation of Attachment 1, <u>THEN</u> perform the following: 3.1. Trip the Reactor. 3.2. Manually initiate Safety Injection Actuation. 3.3. Go to OP-902-000, STANDARD POST TRIP ACTIONS.
	Note	**This should not be applicable.**
	N/A	4. <u>IF</u> a leak exists in Letdown System, <u>THEN</u> attempt to locate <u>AND</u> isolate leak.
	N/A	5. <u>IF</u> leak has been isolated, <u>THEN</u> re-establish Letdown in accordance with Attachment 2.
	ATC	6. <u>IF</u> the in service Letdown Flow Control valve (CVC 113A) <u>OR</u> (CVC 113B) is <u>NOT</u> controlling, <u>THEN</u> place standby Letdown Flow Control valve in service as follows:
		<u>NOTE</u> (1) To minimize thermal transients in the system, Letdown and Charging flows should be started as close together as possible. (2) When restoring Letdown, if Letdown Flow is too high Pressurizer Lever will lower below program level, and the backup Charging Pump may automatically start.
	ATC	6.1 <u>IF</u> restoring Letdown, <u>THEN</u> verify at least one charging pump in operation.
	ATC	6.2 <u>IF</u> necessary to maintain Letdown Backpressure, <u>THEN</u> Letdown Backpressure Controller (CVC-IPIC-0201) may be controlled in MAN.
	ATC	6.3 Place Letdown Flow Control Valve Selector switch to BOTH.

Op Test No.: 1	Scenario # 4	Event # 2	Page 4 of 40
Event Description:	Letdown Flow Control Valve, CVC-113A, fails closed		

Time	Position	Applicant's Actions or Behavior
	SRO	6.4 Verify open standby Letdown Flow Cntrl Vlv A(B) Outlet Isolation (CVC 114A) OR (CVC 114B). **(Coordinates with NAO to perform)**
	SRO	6.5 Slowly open standby Letdown Flow Control Valve Inlet Isolation (CVC 111A) OR (CVC 111B). **(Coordinates with NAO to perform)**
	SRO	6.6 Slowly close in service Letdown Flow Control Valve Inlet Isolation (CVC 111A) OR (CVC 111B). **(Coordinates with NAO to perform)**
	ATC	6.7 Close in service Letdown Flow Cntrl Vlv A(B) Outlet Isolation (CVC 114A) OR (CVC 114B). **(Coordinates with NAO to perform)**
	ATC	6.8 Position Letdown Flow Control Valve Selector switch to select operable flow control valve placed in service.
	ATC	6.9 IF letdown is still in service and Letdown Flow Control valve operates properly, THEN place Letdown Flow Controller (RC-IHIC-0110) in AUTO.

Examiner Note

This event is complete when Letdown Flow Control Valve is in Service or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Event 3

Op Test No.: 1	Scenario # 4	Event # 3	Page 5 of 40				

Event Description: Steam Generator #1 Feedwater flow instrument FW-IFR-1111 fails low

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and report indications of Feedwater flow instrument failure.
		Alarms:
		• Steam Generator 1 Steam/FW Flow Signal Dev (Cabinet F, T-17)
		• Steam Generator 2 Steam/FW Flow Signal Dev (Cabinet F, U-17)
		• SG 1 Level Hi/Lo (Cabinet F, U-14)
		• COLSS MASTER (Cabinet L, A-6)
		Indications:
		• Feedwater Flow indicator FW-IFR-1111 fails low
		• Steam Generator 1 Level Rising (SG-ILR1-1105 and 1111)
		• Deviation between steam flow AND feedwater flow on SG 1
	Note	**The Ultrasonic Flow Meter quality goes to BAD on this malfunction. The ATC should not disrupt the CRS and the BOP when trying to stabilize S/G #1 level. The ATC should inform the CRS after the plant is stable and general actions are complete.**
	Note	**TRM 3.3.5 entry is required on a failure of the UFM. TRM 3.3.5 action "a" is entered. The action is to reduce thermal power to less than or equal to 99.5% within 48 hours.**
Examiner Note **When a control system is not operating properly in automatic, it is acceptable for the SRO to direct taking manual control prior to entering the appropriate procedure.**		
	SRO	Directs BOP to take manual control of Feedwater Control System 1 (FWCS) and match Feedwater flow and Steam flow on Steam Generator 1 and restore level to 50-70% NR.
	BOP	Will take manual control of FWCS 1 and Match Feedwater Flow and Steam Flow.
	Note	**Manual control involves taking the Master controller and/or the Main FRV controller to manual (white lights). Most likely the Master controller first and then if necessary the Main FRV. If the high level override setpoint is reached (74% NR) it may be necessary to take all three controllers to manual to stabilize level.** **FW-IFIC-1111 - SG1 Master Controller** **FW-IHIC-1111 - SG1 Main Feedwater Regulating Valve** **FW-IHIC-1105 - SG1 Startup Feedwater Regulating Valve**

Op Test No.:	1	Scenario #	4	Event #	3	Page	6	of 40
Event Description:	Steam Generator #1 Feedwater flow instrument FW-IFR-1111 fails low							

Time	Position	Applicant's Actions or Behavior
	SRO	Enters and directs the implementation of OP-901-201, Steam Generator Level Malfunction
OP-901-201, Steam Generator Level Malfunction, E0, General		
	SRO	1. Go to Attachment 1, General Actions.
OP-901-201, Steam Generator Level Malfunction, Attachment 1, General Actions		
	SRO	Did a Reactor Trip occur? **NO - continue with flowchart**
	SRO/BOP	Observe the affected Steam Generator FWCS controllers **AND** note **ANY** controllers that are behaving erratically. **Steam Generator 1** FW IFIC 1111 , S/G 1 FWCS Master Controller FW IHIC 1111 , S/G 1 Main FRV Controller FW IHIC 1105 , S/G 1 S / U FRV Controller FW IHIC 1107 , SGFP A Speed Controller **Steam Generator 2** FW IFIC 1121 , S/G 2 FWCS Master Controller FW IHIC 1121 , S/G 2 Main FRV Controller FW IHIC 1106 , S/G 2 S / U FRV Controller FW IHIC 1108 , SGFP B Speed Controller
	Note	**BOP should determine that no controllers are malfunctioning.**
	BOP	Place appropriate controllers for the affected FWCS in manual **AND** establish control of S/G level.
	Note	**Controllers should already in MANUAL (prior order)**
	SRO/BOP	Is the output of the affected FWCS Master Controller behaving erratically?
		NO - continue with flowchart
	SRO/BOP	**Verify** SGFP Discharge pressure for BOTH SGFP ' s is matched **AND** is greater than S / G pressures.
		BOP verifies - continue with flowchart
	N/A	Stop turbine load changes except to match Tave and Tref.

Op Test No.:	1	Scenario #	4	Event #	3	Page	7	of 40
Event Description:	Steam Generator #1 Feedwater flow instrument FW-IFR-1111 fails low							

Time	Position	Applicant's Actions or Behavior
	SRO/BOP	Review the following guidelines **AND** restore S /G level to 50-70% NR: 1. **IF** one SGFP Speed controller is in auto, **THEN** use its output to help set the SGFP Speed controller that is in manual. 2. Momentary taps on the raise **AND** lower buttons of the Main Feedwater Reg Valve Controller have a noticeable impact on associated Steam Generator level. 3. Use the Startup Feedwater Reg Valve Controller to control Steam Generator level at low power levels. 4. Use indications on the unaffected FWCS controllers to help set affected FWCS controllers.
	SRO/BOP	Check the following Control Channel indicators to determine if a Control Channel has failed: (See Note 3) • FW IFR 1111, Steam Generator 1 Feedwater Flow (green pen) • FW IFR 1011, Steam Generator 1 Steam Flow (red pen) • FW IFR 1121, Steam Generator 2 Feedwater Flow (green pen) • FW IFR 1021, Steam Generator 2 Steam Flow (red pen) • SG ILR1111, Steam Generator 1 Downcomer Level (green pen) • SG ILR1105, Steam Generator 1 Downcomer Level (red pen) • SG ILR1121, Steam Generator 2 Downcomer Level (green pen) • SG ILR1106, Steam Generator 2 Downcomer Level (red pen)
	Note	**BOP should determine FW IFR 1111, Steam Generator 1 Feedwater Flow (green pen) is failed low (at about ~25% scale).**
	SRO	Control Channel level deviation of > 7%?
		NO - continue with flowchart
	SRO	Main Feedwater Pump Speed Controller malfunction?
		NO - continue with flowchart
	SRO	Is feedwater flow for the affected SG abnormally high?
		NO - continue with flowchart
	SRO/BOP	Determine **AND** correct the cause of the malfunction.
	Note	**BOP should report which controllers are still in MANUAL. SRO and BOP should discuss contingency actions for FWCS 1 being in MANUAL. SRO will conduct a brief at this point.**

Op Test No.:	1	Scenario #	4	Event #	3	Page	8	of	40

Event Description: Steam Generator #1 Feedwater flow instrument FW-IFR-1111 fails low

Time	Position	Applicant's Actions or Behavior

Examiner Note **This event is complete after the SRO has completed the flowchart and Steam Generator 1 level is being controlled or at Lead Examiner's Discretion.**
Examiner Note **Cue the Simulator Operator when ready for Event 4**

Op Test No.: 1	Scenario # 4	Event # 4	Page 9 of 40

Event Description: Control Element Assembly #11 drops into the core

Time	Position	Applicant's Actions or Behavior
	ATC	Recognize and report indications of dropped CEA
		Alarms
		• CEA WITHDRAWAL PROHIBIT (Cabinet H, M-7)
		• RPS CHANNEL TRIP LOCAL PWR DENSITY HI (Cabinet K, A-11)
		• RPS CHANNEL TRIP DNBR LO (Cabinet K, A-12)
		• LOCAL PWR DENSITY HI PRETRIP A/C (Cabinet K, B-11)
		• DNBR LO PRETRIP A/C (Cabinet K, B-12)
		• CEA CHANNEL B DEVIATION (Cabinet K, H-12)
		• CEA CHANNEL C DEVIATION (Cabinet K, K-13)
		• CEA CALCULATOR CHNL B TROUBLE (Cabinet K, K-15)
		• CEA CALCULATOR CHNL C TROUBLE (Cabinet K, K-16)
		• RPS CHANNEL A TROUBLE (Cabinet K, E-18)
		Indications
		• Rod bottom light for CEA 11
		• T_{COLD} dropping
		• LPD and DNBR trips on Channel A (targeted channel)
Examiner Note		
It is acceptable for the SRO to direct a Main Turbine load reduction before entering the off normal procedure to raise T_{COLD}. If the SRO directs this step, the guidance is located on the next page. Direct boration to the RCS must start within 15 minutes of the dropped CEA. Initial Turbine load reduction to raise T_{COLD} does not constitute start of the power reduction.		
	SRO	Enter and direct the implementation of OP-901-102, CEA or CEDMCS Malfunction.
OP-901-102, CEA or CEDMS Malfunction, E_0, General		
	ATC	1. Place CEDMCS Mode Select switch to OFF.
	Note	**CEDMCS should already be in OFF.**

Op Test No.: 1 Scenario # 4 Event # 4 Page 10 of 40

Event Description: Control Element Assembly #11 drops into the core

Time	Position	Applicant's Actions or Behavior
	N/A	2. If any of the following occur, then manually trip the Reactor and go to OP-902-000, Standard Post Trip Actions: • Mode 1, 10 % Power, and one or more Control Element Assemblies drop • Mode 1, 10 % Power, and any Control Element Assemblies are misaligned by >19 inches • Mode 2 and one or more Control Element Assemblies drop • Mode 2 and any Control Element Assemblies are misaligned by >19 inches
	SRO	3. If Control Element Assembly is misaligned >7 inches, then go to section E_1, CEA Misalignment Greater Than 7 Inches.
OP-901-102, CEA or CEDMS Malfunction, E_1, CEA Misalignment Greater than 7 inches		
	SRO	1. Match T_{avg} and T_{ref} by performing the following: ▪ Adjust Turbine load in accordance with OP-010-004, Power Operations. ▪ Adjust RCS boron concentration in accordance with OP-002-005, Chemical and Volume Control.
OP-005-007, Main Turbine and Generator, Section 6.2		
CAUTION THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY. REACTOR POWER, RCS TEMPERATURE, AND MAIN GENERATOR MW LOAD SHOULD BE CLOSELY MONITORED DURING PERFORMANCE OF THIS SECTION.		
	BOP	6.2.1 To change Load/Rate perform the following: 6.2.1.1 Depress LOAD/RATE MW/MIN pushbutton. 6.2.1.2 Depress appropriate numerical pushbuttons for desired load rate. 6.2.1.3 Depress ENTER pushbutton.
NOTE Prior to changing Reference Demand, Main Turbine load must not be changing.		

Op Test No.:	1	Scenario #	4	Event #	4	Page	11	of 40
Event Description:	Control Element Assembly #11 drops into the core							

Time	Position	Applicant's Actions or Behavior
	BOP	6.2.2 To change Main Turbine load, perform the following: 6.2.2.1 Depress REF pushbutton. 6.2.2.2 Depress appropriate numerical pushbuttons for desired MW load. 6.2.2.3 Depress ENTER pushbutton. 6.2.2.4 Depress GO pushbutton. 6.2.2.5 Verify Turbine load change stops at the desired MW load.
OP-901-102, CEA or CEDMS Malfunction, E_1, CEA Misalignment Greater than 7 inches (cont.)		
	SRO	2. Notify Duty Plant Manager and Duty Engineering.
	SRO	3. Record time of CEA misalignment >7 inches in Station Log.
	SRO	4. If CEA misalignment >19 inches, then go to step 8.
CAUTION A POWER REDUCTION MUST BE STARTED WITHIN 15 MINUTES OF CEA MISALIGNMENT >7 INCHES TO COMPLY WITH TECH SPEC 3.1.3.1.		
NOTE (1) Complete the required down-power prior to withdrawal of the affected CEA. (2) If a Shutdown Bank CEA has dropped or is misaligned and is <145 inches withdrawn, then CEA Group Out of Sequence annunciator (A-7 on Cabinet L) is an expected annunciator when performing ASI Control using Regulating Group CEAs.		
	SRO	8. If misalignment >19 inches or affected CEA is not aligned to within 7 inches of all other CEAs in the same group within 15 minutes, then perform the following: ▪ Reduce power in accordance with OP-901-212, Rapid Plant Power Reduction to comply with Technical Specification 3.1.3.1. ▪ Maintain T_{avg} at T_{ref} by adjusting turbine load ▪ If PMC is Operable, then verify CEA Pulse Counter indication is correct or enter the correct CEA position in the PMC database. ▪ Declare COLSS Inoperable and enter OP-901-501, PMC or COLSS Inoperable and perform concurrently with this procedure due to COLSS being Inoperable. ▪ Use SEC CAL PWR (C24230), CBTFSP (C24102), BDELT (C24104), CBDELT (C24103), or TURB PWR (C24101) for indication during power reduction.
Examiner Note **When a full crew complement is present, OP-901-501, PMC or COLSS inoperable would be performed by the STA.**		

Op Test No.:	1	Scenario #	4	Event #	4	Page	12	of	40

Event Description: Control Element Assembly #11 drops into the core

Time	Position	Applicant's Actions or Behavior
OP-901-212, Rapid Plant Power Reduction, E_0, General Actions		
Examiner Note **A Rapid downpower does not have to be started at 30MW/min, but should attempt to eventually reach that value. The SRO will likely select Direct Boration and direct a load reduction rate of ~20 MW/min and acid flow of 15-20 GPM.**		
NOTE (1) A rapid power reduction is defined as approximately 30 MW/minute load reduction on the main turbine. (2) Power Reduction may be stopped at any point. (3) Some Steps of this procedure may not be applicable due to plant conditions. In these cases SM/CRS may NA the step. (4) Steps within this procedure may be performed concurrently or out of sequence with SM/CRS concurrence. (5) During power reduction PMC PID C24650, COLSS DESCENDING PWR TRACK (DUMOUT19), will automatically select and display the correct power indication. OP-010-003, Plant Startup, provides greater detail on which power indications are displayed by PID C24650 based on power level and whether or not the UFM is in service. (6) Volume Control Tank (VCT) level may lower during the down power. Charging pump suction swaps to the RWSP at 5.5% VCT level. Makeup to the VCT in accordance with OP-002-005, Chemical and Volume Control, may be necessary if boration from the RWSP is not desired. (7) Manual CEA Subgroup Selection should be evaluated per OP-004-015, Reactor Power Cutback, when power reduction is secured above 65% power.		
	SRO	1. Begin RCS Boration by one of the following methods: 1.1 Direct Boration or 1.2 Borate from the RWSP using one or two Charging Pump as follows: 1.2.1 Open RWSP to Charging Pumps Suction Isolation, CVC-507. 1.2.2 Close Volume Control Tank Outlet Isolation, CVC-183. 1.2.3 If necessary, then start another Charging pump
	Note	**The crew will direct borate from the BAMTs per OP-002-005, section 6.7**
OP-002-005, Section 6.7, Direct Boration to RCS		

Op Test No.: 1	Scenario # 4	Event # 4	Page 13 of 40				

Event Description: Control Element Assembly #11 drops into the core

CAUTION

THE FOLLOWING SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY.

CAUTION

(1) THIS SECTION AFFECTS REACTIVITY. THIS EVOLUTION SHOULD BE CROSS-CHECKED AND COMPLETED PRIOR TO LEAVING CP-4.

(2) AT LEAST ONE REACTOR COOLANT PUMP IN EACH LOOP SHOULD BE OPERATING PRIOR TO PERFORMING DIRECT BORATION OPERATIONS TO ENSURE PROPER CHEMICAL MIXING.

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.1 Inform SM/CRS that this Section is being performed.

NOTE

When performing a Plant down power where final RCS Boron Concentration needs to be determined, the following Plant Data Book figure(s) will assist the Operator in determining the required RCS Boron PPM change.

- 1.2 Power Defect Vs Power Level
- 1.4.3 Inverse Boron Worth Vs. T_{mod} at BOC
- 1.4.4 Inverse Boron Worth Vs. T_{mod} at Peak Boron
- 1.4.5 Inverse Boron Worth Vs. T_{mod} at MOC
- 1.4.6 Inverse Boron Worth Vs. T_{mod} at EOC

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.2 At SM/CRS discretion, calculate volume of Boric Acid to be added on Attachment 11.6, Calculation of Boric Acid Volume for Direct Boration or VCT Borate Makeup Mode.
	Note	**The crew will most likely use Boric Acid volume in the reactivity sheet provided by Reactor Engineering.**
	ATC	6.7.3 Set Boric Acid Makeup Batch Counter to volume of Boric Acid desired.
	ATC	6.7.4 Verify Boric Acid Makeup Pumps selector switch aligned to desired Boric Acid Makeup Pump A(B).
	ATC	6.7.5 Place Direct Boration Valve, BAM-143, control switch to AUTO.

Op Test No.: 1	Scenario # 4	Event # 4	Page 14 of 40				

Event Description: Control Element Assembly #11 drops into the core

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.6 Place Makeup Mode selector switch to BORATE.
	ATC	6.7.7 Verify selected Boric Acid Makeup Pump A(B) Starts.
	ATC	6.7.8 Verify Direct Boration Valve, BAM-143, Opens.

NOTE

The Boric Acid Flow Totalizer will not register below 3 GPM. The Boric Acid Flow Totalizer is most accurate in the range of 10 - 25 GPM.

	Note	**ATC will likely use manual boric acid flow control. "CVCS Boric Acid Makeup Flow Hi/Lo" on CP-4 is an expected annunciator. Acid flow can be seen on the red pen of recorder BAM-IFR-0210Y on CP-4.**
	ATC	6.7.9 If manual control of Boric Acid flow is desired, then perform the following: 6.7.9.1 Verify Boric Acid Flow controller, BAM-IFIC-0210Y, in Manual. 6.7.9.2 Adjust Boric Acid Flow controller, BAM-IFIC-0210Y, output to >3 GPM flow rate.
	N/A	6.7.10 If automatic control of Boric Acid flow is desired, then perform the following: 6.7.10.1 Place Boric Acid Flow controller, BAM-IFIC-0210Y, in Auto. 6.7.10.2 Adjust Boric Acid Flow controller, BAM-IFIC-0210Y, setpoint potentiometer to >3 GPM flow rate.
	ATC	6.7.11 Verify Boric Acid Makeup Control Valve, BAM-141, Intermediate or Open.
	ATC	6.7.12 Observe Boric Acid flow rate for proper indication.
	ATC	6.7.13 When Boric Acid Makeup Batch Counter has counted down to desired value, then verify Boric Acid Makeup Control Valve, BAM-141, Closed.

NOTE

Step 6.7.14 may be repeated as necessary to achieve desired total boron addition for plant conditions.

Op Test No.: 1 Scenario # 4 Event # 4 Page 15 of 40

Event Description: Control Element Assembly #11 drops into the core

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.14 If additional boric acid addition is required and with SM/CRS permission, then perform the following: 6.7.14.1 Reset Boric Acid Makeup Batch Counter. 6.7.14.2 Verify Boric Acid Makeup Control Valve, BAM-141, Intermediate or Open. 6.7.14.3 Observe Boric Acid flow rate for proper indication. 6.7.14.4 When Boric Acid Makeup Batch Counter has counted down to desired value, then verify Boric Acid Makeup Control Valve, BAM-141, Closed.
	ATC	6.7.15 Verify Boric Acid Flow controller, BAM-IFIC-0210Y, in Manual.
	ATC	6.7.16 Verify both Boric Acid Flow controller, BAM-IFIC-0210Y, output and setpoint potentiometer set to zero.
	ATC	6.7.17 Place Makeup Mode selector switch to MANUAL.
	ATC	6.7.18 Verify Selected Boric Acid Makeup Pump A (B) Stops.
	ATC	6.7.19 Verify Direct Boration Valve, BAM-143, Closed.
	ATC	6.7.20 Place Direct Boration Valve, BAM-143, control switch to CLOSE.
OP-901-212, Rapid Plant Power Reduction, E_0, General Actions (Cont.)		
NOTE To prevent Pressurizer heater cutout, avoid operating with Pressurizer pressure near the heater cutout pressure of 2270 PSIA while on Boron Equalization.		
	ATC	2. Perform Boron Equalization as follows: 2.1 Place available Pressurizer Pressure Backup Heater Control Switches to ON.
	ATC	2.2 Reduce Pressurizer Spray Valve Controller (RC-IHIC-0100) setpoint potentiometer to establish spray flow and maintain RCS pressure 2250 PSIA (2175 – 2265).

Op Test No.: 1 Scenario # 4 Event # 4 Page 16 of 40

Event Description: Control Element Assembly #11 drops into the core

Time	Position	Applicant's Actions or Behavior

CAUTION

REFER TO TECHNICAL SPECIFICATION 3.1.3.6 FOR TRANSIENT INSERTION LIMITS.

	ATC	3. Operate CEAs in accordance with OP-004-004, Control Element Drive, to maintain ASI using CEA Reg. Group 5, 6 or Group P Control Element Assemblies in accordance with OP-010-005, Plant Shutdown, Attachment 9.10, Axial Shape Control Guidelines.

OP-004-004, Section 6.7, Operation of CEAs in Manual Group (MG) Mode

CAUTION

(1) CRITICALITY SHALL BE ANTICIPATED ANY TIME CEAS ARE WITHDRAWN AND THE REACTOR IS NOT CRITICAL.

(2) OBSERVE APPLICABLE GROUP INSERTION LIMITS IN ACCORDANCE WITH TECHNICAL SPECIFICATION 3.1.3.6 (REG GROUP), AND TECHNICAL SPECIFICATION 3.1.3.5 (SHUTDOWN BANKS).

(3) IMPROPER OPERATION OF CEAS IN MANUAL GROUP MODE MAY CAUSE A REACTOR TRIP BASED ON AN OUT-OF-SEQUENCE CONDITION.

(4) CEA INITIALIZATION PROGRAM MUST BE RUNNING IN THE PLANT MONITORING COMPUTER TO HAVE GROUP STOPS AND SEQUENTIAL PERMISSIVES AVAILABLE.

CAUTION

THIS SECTION HAS THE POTENTIAL TO AFFECT CORE REACTIVITY. [INPO 06-006]

	ATC	6.7.1 Verify Plant Monitoring Computer operable in accordance with OP-004-012, Plant Monitoring Computer.
	ATC	6.7.2 Position Group Select switch to desired group.
	Note	**The crew should use group P or Regulating Group 6 CEAs.**

NOTE

The Operator should remain in the area in front of the CEA Drive Mechanism Control Panel when the Mode Select switch is not in OFF.

Op Test No.:	1	Scenario #	4	Event #	4	Page	17	of 40
Event Description:	Control Element Assembly #11 drops into the core							

Time	Position	Applicant's Actions or Behavior
	ATC	6.7.3 Place Mode Select switch to MG and verify the following: • White lights Illuminated on Group Selection Matrix for selected group • MG light Illuminates

	ATC	6.7.4 Operate CEA Manual Shim switch to WITHDRAW or INSERT group to desired height while monitoring the following:
		• CEA Position Indicator selected CEA group is moving in desired direction
		• If Reactor is critical, then monitor the following:
		  • Reactor Power
		  • Reactor Coolant System (RCS) temperature
		  • Axial Shape Index (ASI)

	ATC	6.7.5 When desired set of moves have been completed, then place Mode Select switch to OFF.
OP-901-212, Rapid Plant Power Reduction, E_0, General Actions (cont.)		
	SRO	4. Notify the Woodlands System Load Dispatcher that a rapid power reduction is in progress.
	BOP	5. Announce to Station Personnel over the Plant Paging System that a rapid plant power reduction is in progress.
	ATC	6. Maintain RCS Cold Leg Temperature 536°F to 549°F.
	Note	**BOP may use OP-005-007, Sect. 6.2 instead of step 7 below which accomplishes the same thing.**
	BOP	7. Commence Turbine load reduction by performing the following: 7.1 Depress LOAD RATE MW/MIN pushbutton.
	BOP	7.2 Set selected rate in Display Demand Window.
	BOP	7.3 Depress ENTER pushbutton.
	BOP	7.4 Depress REFERENCE pushbutton.
	BOP	7.5 Set desired load in Reference Demand Window.

Op Test No.:	1	Scenario #	4	Event #	4	Page	18	of 40
Event Description:	Control Element Assembly #11 drops into the core							

Time	Position	Applicant's Actions or Behavior
	BOP	7.6 Depress ENTER pushbutton.
	BOP	7.7 Depress GO pushbutton.
		NOTE If USBSCAL is not in service, the COLSS Steam Calorimetric will be automatically disabled when MSBSCAL, PMC PID C24246, drops below 95% Power, and will revert back to FWBSCAL, PMC PID C24235. This may result in a step change in COLSS indicated Plant Power (BSCAL) of up to 1.0% when this occurs.
	ATC	8. When Reactor Power consistently indicates less than 98% power, as indicated on PMC PID C24631 [MAIN STEAM RAW POWER (MSBSRAW)], or an alternate point provided by Reactor Engineering, then verify the value of C24648 [BSCAL SMOOTHING VAL. APPLD (DUMOUT17)] automatically changes to 1.
	N/A	9. If C24648 does not automatically change to 1, then inform Reactor Engineering and set the value of 1 for COLSS power smoothing constant K24250, [ADDRSSBL SMOOTHING FOR BSCAL (ALPHA)] in accordance with OP-004-005, Core Operating Limits Supervisory System.
	SRO	10. Following a Reactor Power change of >15% within a one hour period, direct Chemistry Department to sample Reactor Coolant System (RCS) for an isotopic iodine analysis two to six hours later.
	BOP	11. When Condensate flow is <18,000 gpm, verify Gland Steam Condenser Bypass, CD-154, Closed (PMC PID D02404).
	BOP	12. Monitor Condensate Polisher differential pressure and remove Polishers from service to maintain system pressure in accordance with OP-003-031, Condensate Polisher/Backwash Treatment.
	BOP	13. When Reactor Power is approximately 70% or Heater Drain Pump flow is unstable, then remove Heater Drain Pumps from service by taking pump control switches to Stop.
		OP-901-102, CEA or CEDMS Malfunction, E_1, CEA Misalignment Greater than 7 inches (cont.)

Op Test No.:	1	Scenario #	4	Event #	4	Page	19	of 40

Event Description: Control Element Assembly #11 drops into the core

Time	Position	Applicant's Actions or Behavior
	SRO	9. If either of the following occur, then within one hour declare CEA Inoperable and verify acceptable Shutdown Margin in accordance with OP-903-090, Shutdown Margin: ▪ Misaligned CEA is in Shutdown Bank and cannot be withdrawn to ≥145 inches **[T.S. 3.1.3.5]** or ▪ Any CEA is misaligned from its group by >7 inches and cannot be aligned **[T.S. 3.1.3.1]**

Examiner Note

The procedure directs the <1 hour action of the applicable Technical Specification. The SRO may not have enough time to further evaluate Technical Specifications associated with CEAs and therefore not be able to make an initial determination. It may be necessary to ask after the scenario is concluded.

Time	Position	Applicant's Actions or Behavior
	SRO	Reviews the following Technical Specification and determines applicable actions: • 3.1.3.1 action c
	ATC	10. Monitor the following for compliance with Technical Specifications: ▪ Linear Heat Rate (LPD) **[T.S. 3.2.1]** ▪ Departure from Nucleate Boiling Ratio **[T.S. 3.2.4]** ▪ Azimuthal Power Tilt **[T.S. 3.2.3]** ▪ ASI **[T.S. 3.2.7]**
	ATC	11. Perform the following to verify compliance with Technical Specification 3.2.3: ▪ Verify COLSS is detecting Azimuthal Power Tilt as influenced by the misaligned CEA. ▪ If measured Azimuthal Power Tilt exceeds the TS Limit specified in the COLR, then comply with Technical Specification Action 3.2.3.b. ▪ If measured Azimuthal Power Tilt exceeds CPC Power Tilt Allowance, then adjust CPC Power Tilt allowance to ≥ the measured value in accordance with OP-004-006, Core Protection Calculator System.

NOTE

If the CEA misalignment is due to a dropped rod then the ACTM card for the dropped rod may need to be reset if the CEA is not responding to a withdrawal demand.

Time	Position	Applicant's Actions or Behavior
	ATC	12. Maintain ASI within ±0.05 of target ESI to limit potential impact of transient Xenon on core peaking using Manual Group or Manual Sequential.

Op Test No.:	1	Scenario #	4	Event #	4	Page	20	of 40
Event Description:	Control Element Assembly #11 drops into the core							

Time	Position	Applicant's Actions or Behavior
	N/A	13. Correct cause of CEA misalignment.
	SRO	14. If initial Reactor power is ≥75 %, then notify Chemistry Department to sample Reactor Coolant System for an isotopic iodine analysis within two to six hours due to a power reduction of ≥15 % in one hour.

Examiner Note

This event is complete after the Reactivity Manipulation is satisfied and the SRO has evaluated Technical Specifications or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Events 5, 6 & 7

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	21	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
		Examiner Note **The RCS leak will ramp up to a LOCA over a period of 8 minutes. Indications may be slow at first.**
	ATC / BOP	Recognize and report indications of RCS Leak.
		Alarms
		• CONTAINMENT WATER LEAKAGE HI (Cabinet N, L-20)
		• CONTAINMENT WATER LEAKAGE HI-HI (Cabinet N, K-20)
		• PRESSURIZER PRESSURE HI/LO (Cabinet H, E-1)
		• CIAS TRAIN A(B) LOGIC INITIATED [Cabinet K, E-19(20)]
		• SIAS TRAIN A(B) LOGIC INITIATED [Cabinet K, G-19(20)]
		• CSAS TRAIN A(B) LOGIC INITIATED [Cabinet K, H-19(20)]
		• MSIS TRAIN A(B) LOGIC INITIATED [Cabinet K, L-19(20)]
		• SUBCOOLED MARGIN LO [Cabinet M(N), M-7(17)]
		• RPS CHANNEL TRIP PZR PRESSURE LO (Cabinet K, A-16)
		• RPS CHANNEL TRIP CNTMT PRESSURE HI (Cabinet K, A-17)
		• ESFAS CHANNEL TRIP CNTMT PRESSURE HI (Cabinet K, L-17)
		• CNTMT SPRAY HDR B FLOW LO (Cabinet N, F-14)
		• CLASS 1E RAD MONITORING SYS ACTIVITY HI-HI (Cabinet SA, K-4)
		Indications
		• Lowering Pressurizer level.
		• Lowering Pressurizer pressure.
		• Containment Pressure and Temperature rising
		• Containment activity rising
		• Containment water level rising
		• ESFAS components actuating
		• CS-125B indicates CLOSE (GREEN)
	Note	**The SRO may enter Off-Normal procedure OP-901-111, Reactor Coolant System Leak, but will not have time to take substantive actions.**
	Note	**The ATC may recognize that Charging Pump A did not auto start and manually start Charging Pump A at this time.**

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	22	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
	Note	**The SRO may direct the ATC to manually trip the reactor. The ATC will trip the reactor using the 2 Reactor Trip pushbuttons at CP-2.**
	Note	**The SRO may direct the ATC to manually initiate Safety Injection Actuation (SIAS) and Containment Isolation Actuation (CIAS) at CP-7.**
	SRO	After the reactor is tripped, the SRO will direct the ATC and BOP to carry out Standard Post trip Actions.
OP-902-000, Standard Post Trip Actions		
	Note	**During Standard Post Trip Actions, one crew member (typically the BOP) will go to a back panel to restore radiation monitor sample pumps due to some sample pumps requiring restart following a loss of power or voltage dip (i.e. plant loads transfer from UATs to SUTs).**
<u>NOTE</u> Steps 1 and 2 are immediate actions and satisfy Reactivity Control		
	ATC	1. <u>Determine</u> Reactivity Control acceptance criteria are met: a. <u>Check</u> reactor power is dropping. b. <u>Check</u> startup rate is negative. c. <u>Check</u> less than **TWO** CEAs are **NOT** fully inserted.
	BOP	2. <u>Verify</u> Main Turbine and Generator tripped: a. <u>Check</u> the Main Turbine is tripped: • Governor valves closed • Throttle valves closed • Turbine Speed lowering
	BOP	b. <u>Check</u> the Main Generator is tripped: • GENERATOR BREAKER A tripped • GENERATOR BREAKER B tripped • EXCITER FIELD BREAKER tripped

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	23	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
	BOP	3. Verify maintenance of Vital Auxiliaries a. Check station loads are energized from Off-site power as follows: **Train A** • A1, Non-Safety bus • A2, Non-Safety bus • A3, Safety bus • A-DC Electrical bus • A and C vital AC Instrument Channels **Train B** • B1, Non-Safety bus • B2, Non-Safety bus • B3, Safety bus • B-DC Electrical bus • B and D vital AC Instrument Channels b. Verify CCW flow to RCPs
	ATC	4. Verify RCS Inventory Control: a. Check that **BOTH** of the following conditions exist: • Pressurizer level is 7% to 60% • Pressurizer level is trending to 33% to 60% b. Check RCS subcooling is greater than or equal to 28ºF.
	Note	**ATC should verify Charging Pumps A and B are running. Charging pump A requires manual starting. Charging pump AB will automatically stop on SIAS.**
	ATC	5. Check RCS Pressure control: • Pressurizer pressure is 1750 psia to 2300 psia • Pressurizer pressure is trending to 2125 psia to 2275 psia
	ATC	5.2 **IF** PZR pressure is less than 1684 psia, **THEN** verify **BOTH** of the following have initiated: • SIAS • CIAS
	ATC	5.3 **IF** PZR pressure is less than 1621 psia, **THEN** verify **ONE** RCP in each loop is stopped.

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	24	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior

CRITICAL TASK 1

Trip Any RCP Exceeding Operating Limits

This task is satisfied by stopping all running RCPs within 3 minutes of loss of Component Cooling Water flow or prior to completing the step that verifies RCP operating limits.

This task becomes applicable after either running RCP Vibration alarms actuate OR Containment Spray is initiated, whichever occurs first. (OP-902-002, 9.b or 9.d.1)

(This Critical Task is included here because of the possibility the crew may perform the task based on RCP pressure-temperature limits. The actual step that verifies RCP operating limits is in OP-902-002, LOCA.)

Time	Position	Applicant's Actions or Behavior
	ATC	5.4 **IF** PZR pressure is less than the minimum RCP NPSH of Attachments 2A-B, "RCS Pressure and Temperature Limits," **THEN** stop **ALL** RCPs.
	Note	**The ATC should monitor RCS Pressure and Temperature Limits and stop RCPs when NPSH requirements are not being met. The following two pages include two Pressure-Temperature figures (non-harsh and harsh) for your information.**

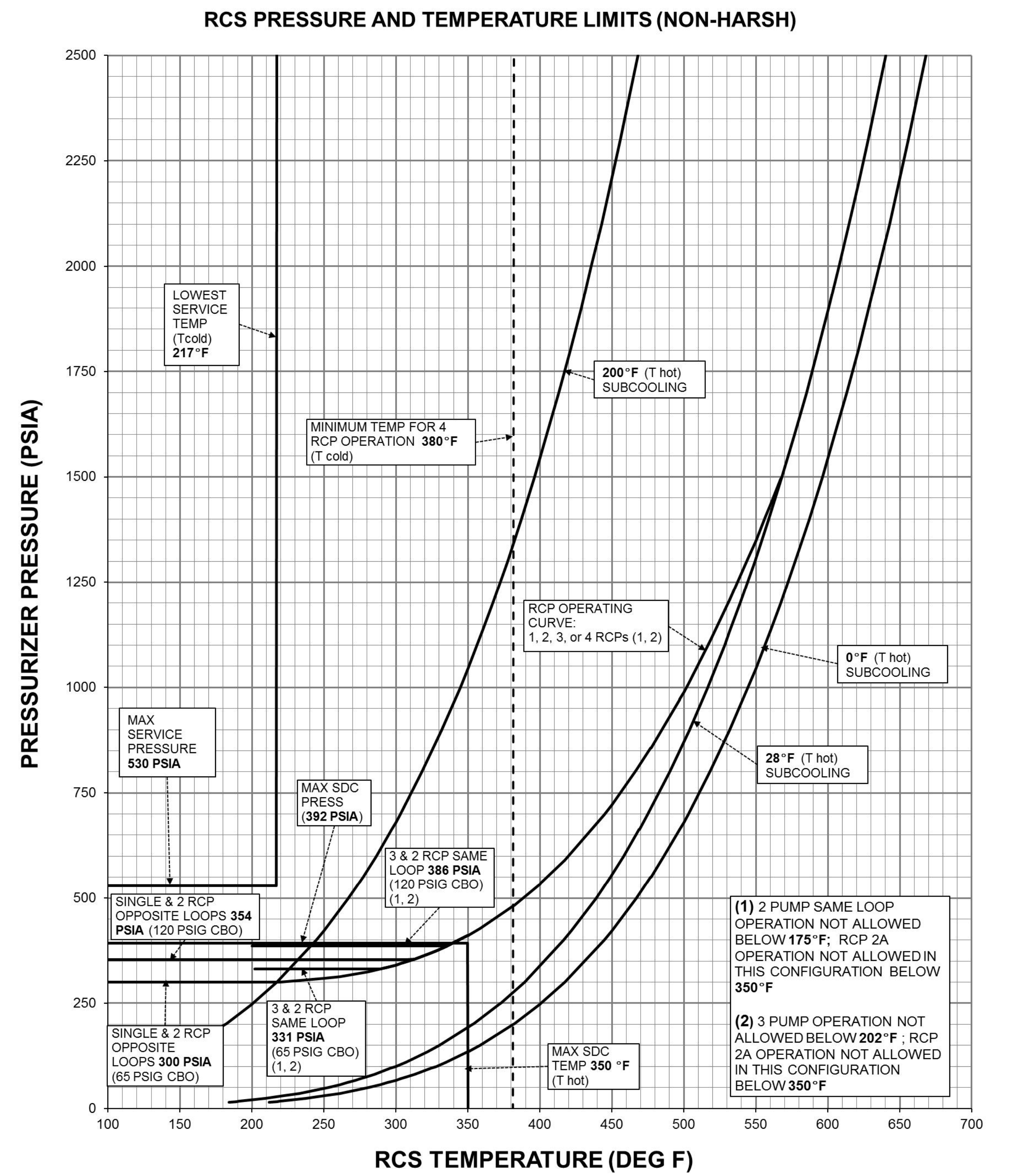
Examiner Note

Harsh environment is defined as Containment Temperature greater than or equal to 200F.

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	25	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

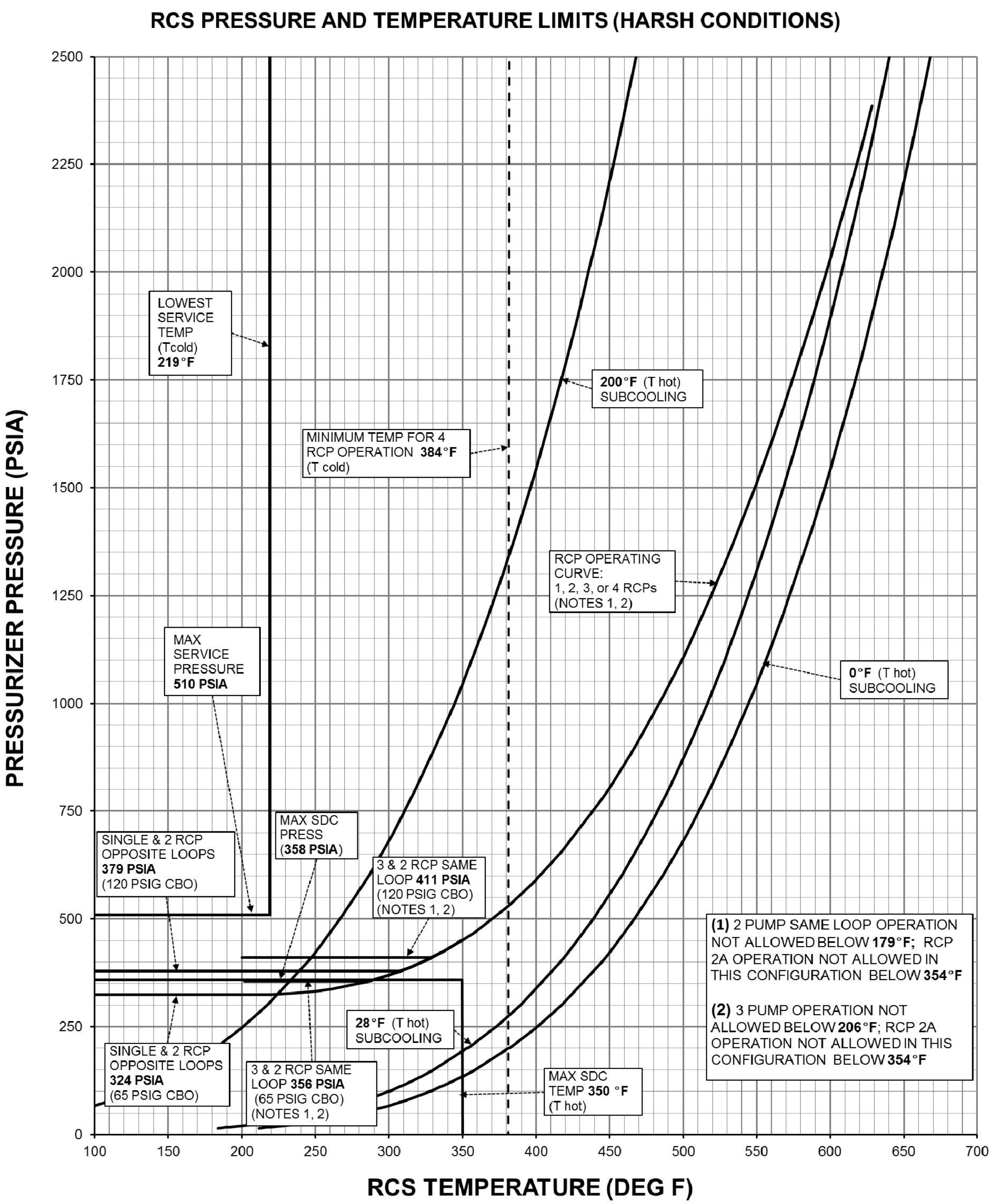
Time	Position	Applicant's Actions or Behavior



Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	26	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior



Op Test No.: 1	Scenario # 4	Event # 5, 6, 7	Page 27 of 40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
	ATC	6. Check Core Heat Removal: a. At least **ONE** RCP is operating. b. Operating loop ΔT less than 13ºF. c. RCS subcooling greater than or equal to 28ºF.
	BOP	7. Verify RCS Heat Removal: a. Check that at least **ONE** SG has **BOTH** of the following: • SG level is 10% to 76% NR • Feedwater is available to restore level within 55%-70% NR
	Note	**If MSIS has NOT actuated and any Main FW Reg valve or Startup FW Reg valve controller was in manual prior to the reactor trip, then the BOP must manually adjust controllers in accordance with steps 7.b & 7.b.1.**
	BOP	b. Check Feedwater Control in Reactor Trip Override: • MAIN FW REG valves are closed • STARTUP FW REG valves are 13% to 21% open • Operating Main Feedwater pumps are 3800 rpm to 4000 rpm
	BOP	b.1 Manually operate the Feedwater control system.
	ATC	c. Check RCS T_C is 530 to 550 ºF.
	BOP	d. Check Steam Generator pressure is 885 psia to 1040 psia.
	BOP	e. Reset Moisture Separator reheaters and check the Temperature Control valves closed.
	ATC	8. Verify Containment Isolation: a. Check Containment pressure is less than 16.4 psia.
	ATC	a.1 **IF** CNTMT pressure is greater than or equal to 17.1 psia, **THEN** verify **ALL** of the following: • CIAS is initiated • SIAS is initiated • MSIS is initiated

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	28	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
	ATC	8. Verify Containment Isolation (cont.): b. Check NO Containment Area Radiation monitor alarms OR unexplained rise in activity. c. Check NO Steam Plant Activity monitor alarms OR unexplained rise in activity.
	ATC/BOP	9. Verify Containment Temperature and Pressure Control: • Check Containment temperature is less than or equal to 120ºF. • Check Containment pressure is less than 16.4 psia.
	BOP	9.2 **IF** Containment pressure is greater than or equal to 17.1 psia, **THEN** verify **ALL** available Containment Fan Coolers are operating in emergency mode.

CRITICAL TASK 1

Trip Any RCP Exceeding Operating Limits

This task is satisfied by stopping all running RCPs within 3 minutes of loss of Component Cooling Water flow or prior to completing the step that verifies RCP operating limits.

This task becomes applicable after either running RCP Vibration alarms actuate OR Containment Spray is initiated, whichever occurs first. (OP-902-002, 9.b or 9.d.1)

(This Critical Task is included here because of the possibility the crew may perform the task based on Containment Spray initiation (loss of CCW).)

CRITICAL TASK 2

Establish Containment Temperature and Pressure Control

This task is satisfied by manually opening CS-125B, Containment Spray Header B Isolation, prior to exceeding containment design pressure of 44 PSIG or prior to completing Containment Spray (CS) verification in OP-902-002 or exiting the Containment Temperature and Pressure Control Safety Function in OP-902-008.

This task becomes applicable after CS is initiated and is critical after CS Pump A trips. (OP-902-002, step 14 or OP-902-008, CTPC-2)

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	29	of 40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	9.3 **IF** Containment pressure is greater than or equal to 17.7 psia, **THEN** verify **ALL** of the following: • CSAS is initiated • **ALL** available Containment Spray pumps are delivering flow greater than 1750 gpm • **ALL** RCPs are stopped
	SRO	10. GO TO Appendix 1, "Diagnostic Flowchart" and diagnose to appropriate EOP.
OP-902-009, Standard Appendices, Appendix 1 Diagnostic Flow Chart		
Examiner Note **Appendix 1 is a flow chart used to diagnose to the correct recovery procedure for the event in progress. The steps below will be followed by a YES or NO to indicate proper flow path.**		
	ATC	Is Reactivity Control met? (YES)
	BOP	Is at least **ONE** 125 VDC **SAFETY** bus energized? (YES)
	BOP	Is at least **ONE** 4.16 KV **NON-SAFETY** bus energized? (YES)
	BOP	Is at least **ONE** 4.16 KV **SAFETY** bus energized? (YES)
	ATC	Is at least **ONE** RCP running? (NO)
	SRO	Consider LOOP/LOFC OP-902-003
	BOP	Does at least **ONE** SG have adequate FW? (Note 2) (YES)
	ATC	Is PZR pressure >1750 psia **AND** stable or rising? (NO)
	ATC	Is RCS Subcooling <28F **AND** stable or lowering? (YES)
	ATC/BOP	Is SGTR Indicated? (Note 3) (NO)
	SRO	**Consider** LOCA OP-902-002

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	30	of 40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
	ATC	Is CNTMT pressure <16.4 psia **AND** stable or lowering? (NO)
	ATC	Are CNTMT Rad monitor(s) in alarm or unexplained rise? (YES)
	SRO	**Consider** LOCA OP-902-002
	ATC/BOP	Is SGTR Indicated? (Note 3) (NO)
	BOP	Are **BOTH** SG pressures >885 psia **AND** stable or rising? (Note 5) (YES)
	SRO	Are **ALL** acceptance criteria satisfied? (NO)
	SRO	Has **ANY** event been diagnosed? (Note 4) (YES)
	SRO	Can a single event be diagnosed? (Note 4) (YES)
	SRO	**GO TO** Appropriate EOP
	Note	**SRO goes to OP-902-002, Loss of Coolant Accident Recovery**
	Note	**The BOP may secure AH-12 A or B on SRO direction after initiation of SIAS at CP-18.**
	CREW	When Containment Temperature rises above 200 F, update crew on need to use bracketed parameters due to harsh environment in Containment.
OP-902-002, Loss of Coolant Accident Recovery		
NOTE The Shift Chemist should be notified if a SIAS or CIAS has occurred. The secondary sampling containment isolation valves should not be opened following an SIAS or CIAS until directed by the Shift Chemist.		
	SRO	*1. Confirm diagnosis of a LOCA: a. Monitor the SFSCs and check Safety Function Status Check Acceptance criteria are satisfied. b. **IF** SG sample path is available, **THEN** direct Chemistry to sample **BOTH** SGs for activity.

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	31	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

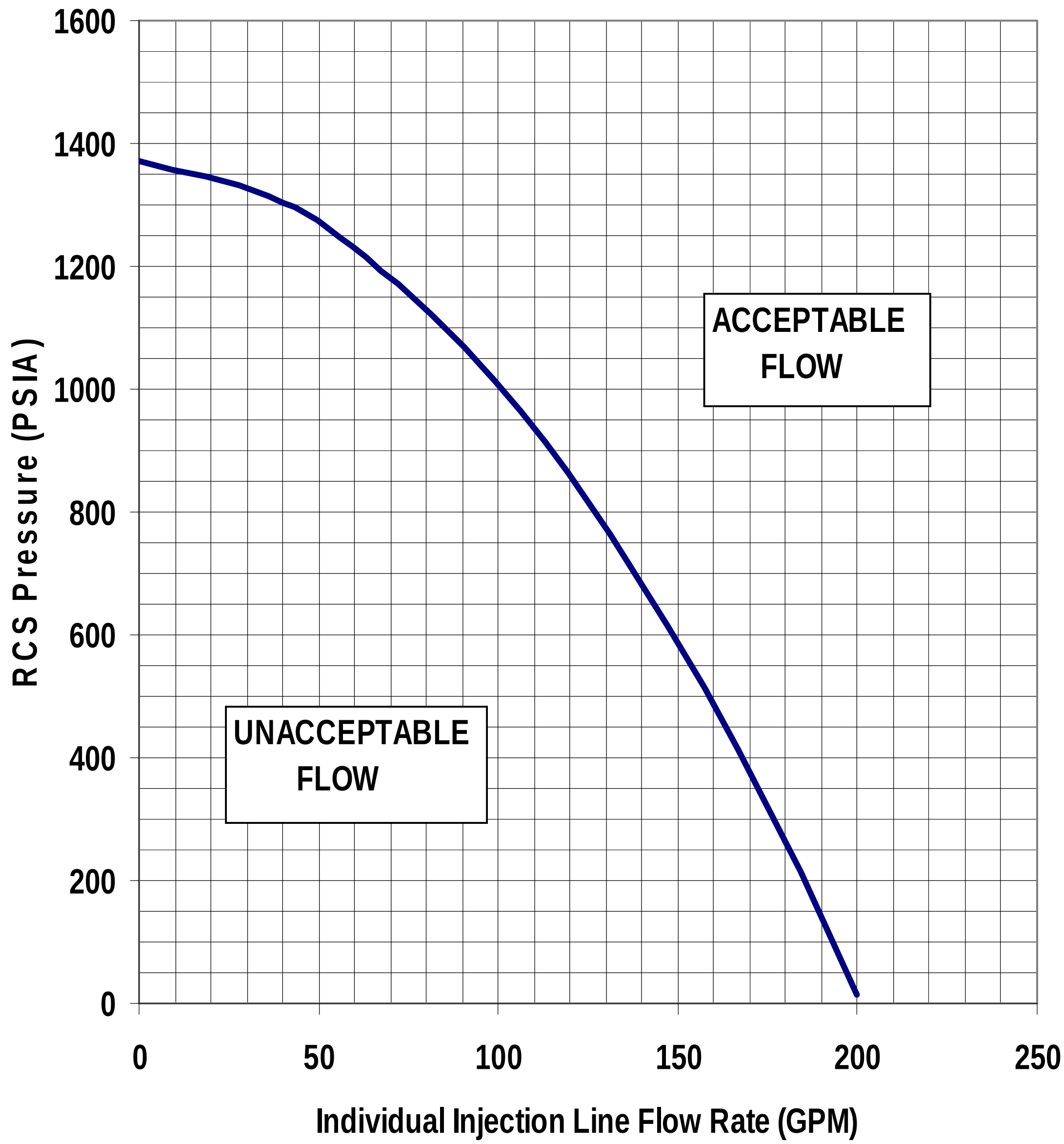
Time	Position	Applicant's Actions or Behavior
	Crew	2. Announce a Loss of Coolant Accident is in progress using the plant page.
	SRO	*3. Advise the Shift Manager to implement the Emergency Plan using EP-001-001, "Recognition & Classification of Emergency Condition."
	SRO	*4. REFER TO Section 6.0, "Placekeeper" and record the time of the reactor trip.
	N/A	*5. **IF** power has been interrupted to either 3A or 3B Safety bus, **THEN** perform Appendix 20, "Operation of DCT Sump Pumps."
	ATC/BOP	*6. Check SIAS has actuated.
	BOP	*7. **IF** SIAS has actuated, **THEN** perform the following: a. Verify Safety Injection pumps have started.
	BOP	b. Check Safety Injection flow is within the following: • Attachment 2-E, "HPSI Flow Curve" • Attachment 2-F, "LPSI Flow Curve
	ATC	c. Verify **ALL** available Charging pumps are operating.
	Note	**Step 7.c provides another opportunity for the ATC to manually start Charging pump A (if not already performed).**
Examiner Note **HPSI and LPSI flow curves are included in the next two pages. Injection flow should be satisfactory.**		

Op Test No.: 1	Scenario # 4	Event # 5, 6, 7	Page 32 of 40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

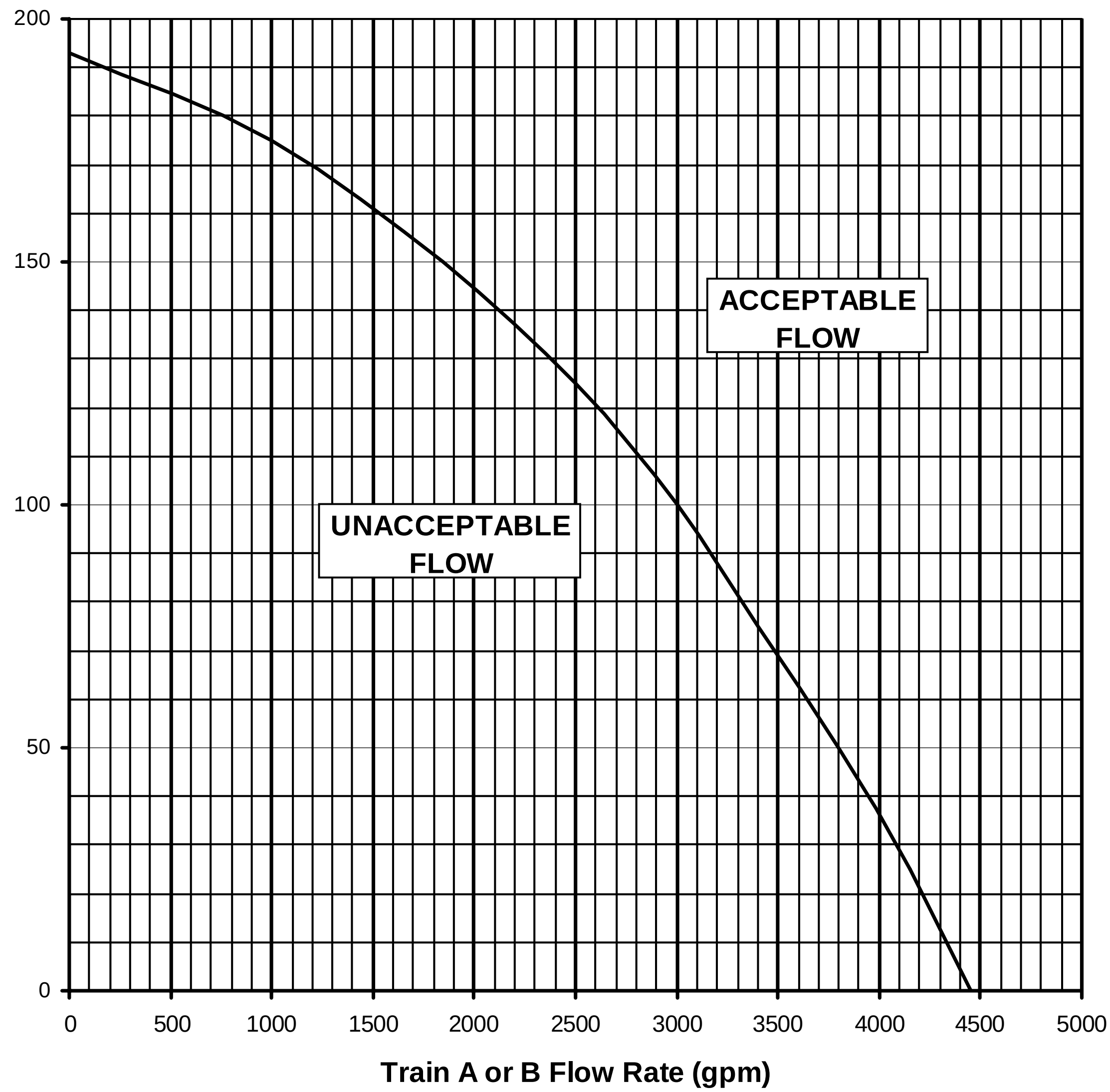
Time	Position	Applicant's Actions or Behavior

Attachment 2-E: HPSI Flow Curve



Op Test No.: 1	Scenario # 4	Event # 5, 6, 7 Page 33 of 40
Event Description:		RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically
Time	Position	Applicant's Actions or Behavior

Attachment 2-F: LPSI Flow Curve



Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	34	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
		*7. (continued)
	N/A	d. **IF** RWSP on Purification, **THEN** isolate RWSP using Appendix 40 "Isolate RWSP from Purification."
	ATC	*8. **IF** PZR pressure is less than 1621 psia, **AND** SIAS is actuated, **THEN** perform the following: a. Verify **ONE** RCP in each loop is stopped.
	ATC	b. Check Pressurizer pressure is greater than the minimum RCP NPSH of Attachment 2A-D, "RCS Pressure and Temperature Limits."
	ATC	9. **IF** RCPs are operating, **THEN** perform the following**:**
	ATC/BOP	a. Verify CCW available to RCPs.
	ATC	a.1 **IF** CCW is lost to RCPs, **AND** is **NOT** restored within 3 minutes, **THEN** stop the affected RCP(s).
	ATC	b. **IF** a CSAS is initiated, **THEN** stop **ALL** RCPs.
	ATC	d. Check RCP operating parameters: • NPSH, REFER TO Attachment 2A-D, "RCS P-T Limits" • Bearing Temperatures less than or equal to 225°F • Bleed Off Temperature less than 200°F • Cooling Coils Return CCW Temp less than 155°F • At Least Two Seals per RCP operable
	ATC	d.1 **IF ANY** RCP operating limit exceeded, **THEN** stop affected RCP(s).
	BOP	*10. Check CCW operation: a. Check a CCW pump is operating for each energized 4.16 KV Safety bus: • 3A Safety bus • 3B Safety bus
	N/A	b. **IF** only **ONE** CCW pump operating, **THEN** split CCW headers using Appendix 35, "Single CCW Pump Operation."

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	35	of	40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
	BOP	c. Check an Essential chiller is operating for EACH energized 4.16 KV Safety bus: • 3A Safety bus • 3B Safety bus
	ATC	11. Isolate the LOCA: a. Verify **ALL** Letdown Isolation valves are closed: • CVC 101, LETDOWN STOP VALVE • CVC 103, LETDOWN ISOL VALVE • CVC 109, LETDOWN ISOL VALVE
	BOP	b. Verify **All** RCS Sampling Containment Isolation valves are closed: **Train A** • PSL 107, HOT LEG • PSL 204, PZR SURGE • PSL 304, PZR STEAM **Train B** • PSL 105, HOT LEG • PSL 203, PZR SURGE • PSL 303, PZR ISOL VLV
NOTE SIAS will cause a CCW surge tank level rise due to higher heat loads.		
	BOP	c. Check RCS to CCW boundary is intact by **ALL** of the following: • CCW Radiation monitor AB Hi Alarm clear • No abnormal rise in CCW Radiation monitor AB reading • No unexplained rise in CCW Surge Tank level
	ATC/BOP	*12. Check LOCA is NOT outside Containment by evaluating the following: • Auxiliary Building Radiation Monitor trends normal and alarm clear • No unexplained rise in Auxiliary Building Sump levels • No abnormal rise in Waste Tank level

Op Test No.:	1	Scenario #	4	Event #	5, 6, 7	Page	36	of 40

Event Description: RCS Cold Leg leak; Charging Pump A fails to auto-start, Loss of Coolant Accident, CS-125B Fails to open automatically

Time	Position	Applicant's Actions or Behavior
	SRO	*13. **IF ANY** of the following conditions exist: • Containment pressure is greater than 17.1 psia • SIAS is actuated due to low RCS pressure • Containment Area Radiation monitors greater than the Hi Alarm **THEN** perform the following:
	ATC/BOP	a. Check CIAS is initiated. a.2 Verify that an Isolation valve is closed for each Containment penetration required to be closed.
	Note	At a minimum, the ROs should check CIAS TRAIN A LOGIC INITIATED (Cab. K, E-19) and CIAS TRAIN B LOGIC INITIATED (Cab. K, E-20) alarms on CP-2, Trip Path lights for CIAS extinguished on CP-7 and the bottom row of containment isolation valve indications on CP-2 and CP-8.
	BOP	b. Verify **ALL** available Containment Fan Coolers operating in emergency mode.
	ATC/BOP	* 14. **IF** Containment pressure is greater than or equal to 17.7 psia, **THEN** perform the following: a. Verify CSAS is initiated.
	BOP	b. Verify **ALL** operating Containment Spray pumps are delivering flow greater than 1750 gpm.
	Note	BOP must open CS-125B to establish flow on CS Train B.

Examiner Note

This event is complete when the crew has diagnosed into OP-902-002, Loss of Coolant Accident, stopped all RCPs and manually opened CS-125B or at Lead Examiner's Discretion.

Examiner Note

Cue the Simulator Operator when ready for Events 8 and 9

Op Test No.:	1	Scenario #	4	Event #	8, 9	Page	37	of 40
Event Description:	Main Steam Line 2 Break Inside Cntmt, Containment Spray pump A Trip							

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	Recognize and report indication of Main Steam Line Break on SG 2 and trip of Containment Spray pump A
		Alarms
		• RPS CHANNEL TRIP SG2 PRESSURE LO (Cabinet K, E-16)
		• SG 2 PRESSURE LO PRETRIP A/C (Cabinet K, F-16)
		• SG 2 PRESSURE LO PRETRIP B/D (Cabinet K, G-16)
		• ESFAS CHANNEL TRIP PRESS SG1 > SG2 (Cabinet K, L-15)
		• PRESS SG1 > SG2 ESFAS PRETRIP A/C (Cabinet K, M-15)
		• PRESS SG1 > SG2 ESFAS PRETRIP B/D (Cabinet K, N-15)
		• CNTMT SPRAY PUMP A TRIP/TROUBLE (Red Alarm) (Cab. M, B-4)
		Indications
		• SG 2 Pressure lowering on CP-8 and CP-1 indicators
		• SG 2 Level lowering on CP-8 and CP-1 indicators
		• CS Spray pump A Control Switch Amber light illuminated
		• CS Spray pump A Control Switch Green "Off" light illuminated
		• No CS flow indicated for Train A on CP-8
	SRO	Recognize two events in progress and either goes directly to OP-902-008, Functional Recovery, or returns to the diagnostics flowchart and diagnoses into OP-902-008.
OP-902-008, Functional Recovery - Entry		
	CREW	1. Announce that the Functional Recovery Procedure is in progress using the plant page.
	SRO	*2. Advise the Shift Manager to implement the Emergency Plan using EP-001-001, "Recognition & Classification of Emergency Condition."
	SRO	3. REFER TO the "Placekeeper" and record the time of the reactor trip.
	N/A	*4. **IF** PZR pressure is less than 1621 psia, **AND** SIAS is actuated, **THEN** perform the following: a. Verify **ONE** RCP in each loop is stopped. b. **IF** PZR pressure is less than the minimum RCP NPSH of Attachment 2A-D, "RCS Pressure and Temperature Limits," **THEN** stop **ALL** RCPs.
	Note	**RCPs should be secured by this time.**

Op Test No.:	1	Scenario #	4	Event #	8, 9	Page	38	of 40
Event Description:	Main Steam Line 2 Break Inside Cntmt, Containment Spray pump A Trip							

Time	Position	Applicant's Actions or Behavior
	N/A	*5. **IF** RCPs are operating, **THEN** perform the following: a. **IF** a CSAS is initiated, **THEN** stop **ALL** RCPs.
	N/A	b. Verify CCW available to RCPs.
NOTE The Shift Chemist should be notified if a SIAS or CIAS has occurred. The secondary sampling containment isolation valves should not be opened following an SIAS or CIAS until directed by the Shift Chemist.		
	SRO	6. Direct Chemistry to sample **BOTH** SGs for activity and boron.
	N/A	*7. **IF** AC power is lost to **BOTH** 3A and 3B Safety buses, **THEN** perform the following within 30 minutes from the onset of SBO:
	N/A	*8. **IF** AC power is lost to **BOTH** 3A and 3B Safety buses, **THEN** direct NAOs to perform **ALL** of the following within 30 minutes from the onset of SBO:
	N/A	*9. **IF** power has been interrupted to either 3A or 3B Safety buses, **THEN** perform Appendix 20, "Operation of DCT Sump Pumps."
	SRO	*10. Identify success paths to be used to satisfy each safety function using **BOTH** of the following: • Resource Assessment Trees • Safety Function Tracking Sheet
	Note	**The CRS should use the Resource Assessment Trees to identify success paths. The Shift Technical Advisor uses the Safety Function Tracking Sheet to identify success paths.**
	N/A	*11. Perform Safety Function Status Checks using Section 6.0, "Safety Function Status Check."
	Note	**Safety Function Status Checks are normally performed by the STA.**
	SRO	* 12. Prioritize Safety Functions based on **ALL** of the following: a. Instructions for those Safety Functions which do **NOT** meet any success path. b. Instructions for those Safety Functions for which success path one criteria is **NOT** met. c. Instructions for the remaining Safety Functions.

Op Test No.:	1	Scenario #	4	Event #	8, 9	Page	39	of	40
Event Description:	Main Steam Line 2 Break Inside Cntmt, Containment Spray pump A Trip								

Time	Position	Applicant's Actions or Behavior
	Note	If the RCS is saturated, SRO should determine priorities and paths as follows on the Safety Function Tracking Sheet: (Priorities may vary depending on time parameters checked; however, Priority 1 should be CI-1) • Reactivity Control, RC-1 = **6** • Maintenance of Vital Auxiliaries (DC), MVA-DC-1 = **7** • Maintenance of Vital Auxiliaries (AC), MVA-AC-1 = **8** • RCS Inventory Control, IC-2 = **2** • RCS Pressure Control, PC-2 = **3** • RCS and Core Heat Removal, HR-2 = **4** • Containment Isolation, CI-1 = **1** • Containment Temperature and Pressure Control, CTPC-2 = **5**
	Note	If the RCS is subcooled, SRO should determine priorities and paths as follows on the Safety Function Tracking Sheet: (Priorities may vary depending on time parameters checked; however, Priority 1 should be CI-1) • Reactivity Control, RC-1 = **5** • Maintenance of Vital Auxiliaries (DC), MVA-DC-1 = **6** • Maintenance of Vital Auxiliaries (AC), MVA-AC-1 = **7** • RCS Inventory Control, IC-2 = **2** • RCS Pressure Control, PC-1 = **8** • RCS and Core Heat Removal, HR-2 = **3** • Containment Isolation, CI-1 = **1** • Containment Temperature and Pressure Control, CTPC-2 = **4**
CONTAINMENT ISOLATION, CI-1		
	SRO	*1. **IF ANY** of the following conditions exist: • Containment pressure is greater than 17.1 psia • SIAS is actuated due to low RCS pressure • Containment Area Radiation monitors greater than the Hi Alarm setpoint **THEN** perform the following:
	ATC/BOP	a. Check CIAS is initiated.
	BOP	b. Verify **ALL** Containment Fan coolers are operating in Emergency mode.
	BOP	c. **IF** CNTMT pressure greater than 17.7 psia, **THEN** check **BOTH** CS pumps operating.

Op Test No.:	1	Scenario #	4	Event #	8, 9	Page	40	of 40

Event Description: Main Steam Line 2 Break Inside Cntmt, Containment Spray pump A Trip

Time	Position	Applicant's Actions or Behavior
	BOP	c.1 **IF ANY** CS-125, Containment Spray Header Isolation is open, **AND** the associated CS pump is **NOT** operating, **THEN** close the valve using Attachment 21-A, "CS-125 Override."

CRITICAL TASK 3

Establish Containment Isolation

This task is satisfied by closing CS-125A, Containment Spray Header A Isolation, prior to exiting the Containment Isolation (CI-1) Safety Function in OP-902-008.

This task becomes applicable after Containment Spray (CS) is initiated and CS Pump A trips. (OP-902-008, CI-1, 1.c.1)

Attachment 21-A, CS-125 Override

Time	Position	Applicant's Actions or Behavior
	BOP	1. Override CS 125A, CNTMT Spray HDR A Isolation as follows: a. Place CNTMT Spray Pump A Control switch to "OFF."
	NAO	b. Obtain key 76 from SM office.
	NAO	c. Place keyswitch, Containment Spray 125A Override, to "OVERRIDE." (located on the side of Auxiliary Panel 1, +35 Relay Rm)
	BOP	d. Place CS 125A, CNTMT SPRAY HEADER A ISOL valve to "OPEN" and THEN to "CLOSE."

Examiner Note

The scenario can be terminated once the crew closes CS-125A or at Lead Examiner's Discretion.